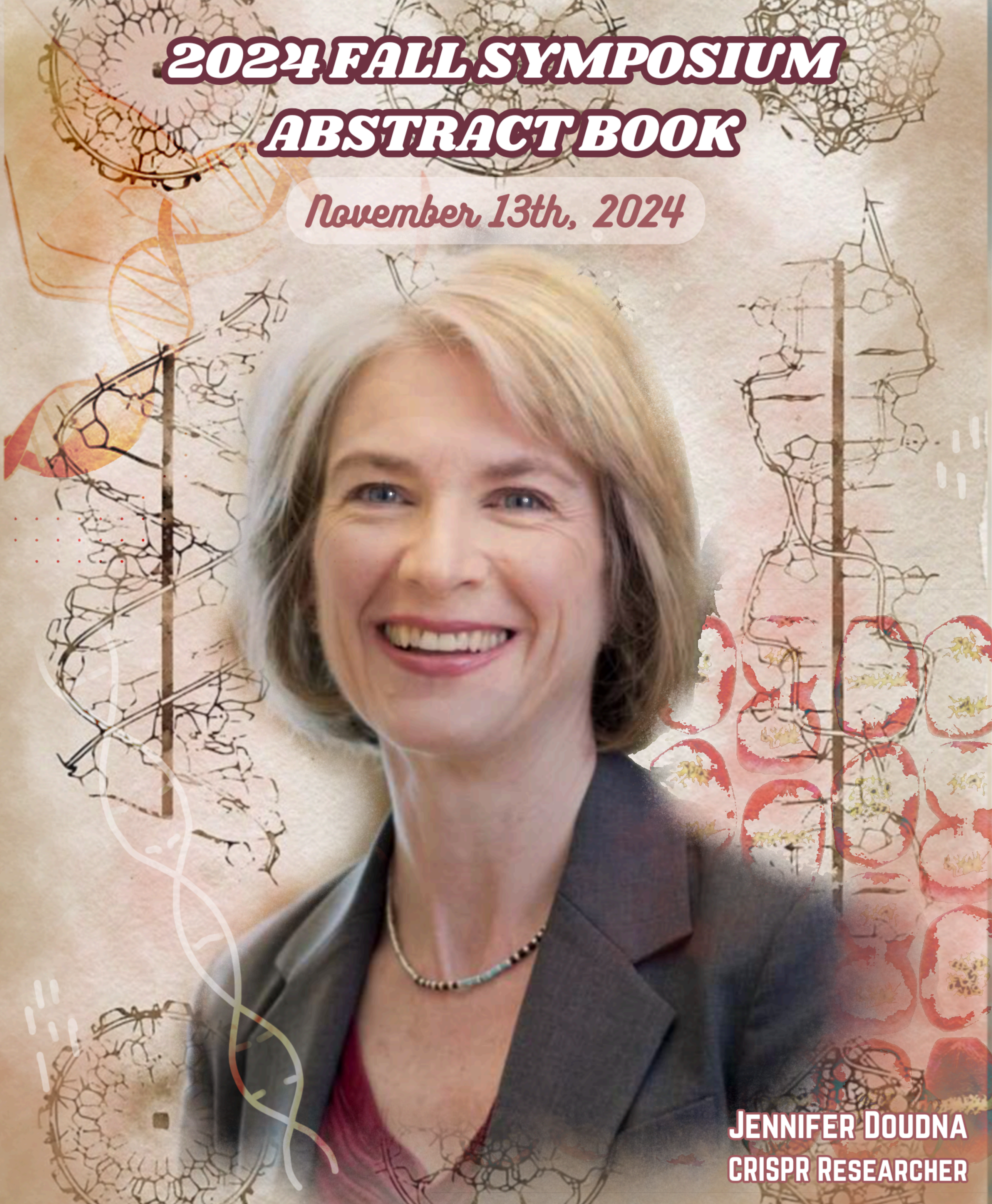
2024 FALL SYMPOSIUM ABSTRACT BOOK

November 13th, 2024



Jennifer Doudna
CRISPR Researcher

Artist's Statement

Sarrinah Saif

Awarded the 2020 Nobel Prize in Chemistry, Jennifer Doudna is a groundbreaking researcher in the field of CRISPR technology who has fundamentally transformed our understanding of genetic engineering. Alongside her team, she co-developed the CRISPR-Cas9 gene-editing tool, which allows for precise modifications to DNA. Her work has opened doors to the vast potential of CRISPR not only for scientific discovery but also for addressing complex challenges in medicine, agriculture, and beyond. By advocating for the responsible use of this powerful technology, Doudna emphasizes the importance of balancing innovation with moral considerations. These contributions pave the way for novel developments that challenge us to reflect on our future in the face of unprecedented scientific accomplishments.

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Could ancestors of Brassica Oleracea var italica Hold the Key to Improved Fatty Acid Content?

Authors: Alaina Kleine, Seyram Akahoho, Andres Reyes-Salinas, Gabriel Saraiva Raimundo, Larissa Laforest, Satya Swathi Nadakuduti, Kelly Balmant

Though kids across America would protest, broccoli consumption is up to almost 8lbs per capita! Generations of breeding have prioritized yield in crops, often at the expense of nutritional traits. This genetic lag effect impacts human health, particularly in the availability of nutrients like omega-3 fatty acids, which are essential for heart health, cognitive function, and hormone regulation. As demand for plant-based omega-3 sources grows due to dietary preferences and concerns over fish oil production, broccoli, with its favorable omega-6 to omega-3 ratio of 1:3, presents a promising alternative.

Despite this, most broccoli breeding programs focus on traits beneficial to growers rather than human health. This study investigates the omega-3 fatty acid profiles of 20 commercial hybrid and landrace broccoli cultivars. Lipid extractions from the broccoli heads were analyzed using Gas Chromatography-Mass Spectrometry (GC-MS), revealing significant variation in alpha-linolenic acid (ALA) content across genetic backgrounds.

Understanding the genetic regulators behind these variations not only holds the potential to boost broccoli's nutritional profile but also offers insight into the broader mechanisms that govern plant diversity and nutrient composition. By integrating the untapped potential of nutritional genomics to maintain yield efficiency while enhancing both diversity and public health outcomes.

Agricultural and Life Sciences

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Sweetpotato Seed Systems: Role of Grower Associations in Promoting Seed Health in Tanzania

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Prevotella corporis Prevents and Reverses Protein Aggregation in Caenorhabditis elegans Through Activation of a Protective Stress Response

Authors: Yoan Argote, Alyssa Walker, Daniel Czyz

The sporadic onset of 90% of neurodegenerative Protein Conformational Disease (PCD) cases underscores the need to identify factors involved in disease pathogenesis. A growing body of literature has established a correlation between gut dysbiosis and PCDs. Recent work in our laboratory has identified the impact of 229 human bacterial isolates on PCD-associated proteins using Caenorhabditis elegans expressing polyglutamine, Aβ1-42, tau, and α-synuclein. We have determined that toxic protein aggregation is robustly suppressed by Prevotella corporis, regardless of the disease-associated protein in the host, suggesting an upstream bacterial effect on host proteostasis. These findings are consistent with literature that associates a depletion in the Prevotella genus with increased PCD occurrence and severity. Here, we elucidate the mechanistic basis of the observed proteoprotective effect that P. corporis has a on the host, specifically the effects this bacterium uniquely exerts on the heat shock response (HSR) and oxidative stress response (OSR), the interactions between these pathways, and their resulting effects on toxic protein aggregation in the host. Using C. elegans expressing hsp70p::GFP as a readout for the HSR and DAF-16::GFP for the OSR, we found that P. corporis not only induces the HSR but also the disaggregation of polyglutamine aggregates, providing mechanistic insights into how this proteoprotective bacterium affects host proteostasis. Our findings suggest a role for bacteria in the sporadic development of PCDs by affecting host stress responses and altering the host's transcriptome, galvanizing a novel microbial approach for managing neurodegenerative disease.

Agricultural and Life Sciences

Percieved Knowledge of Yi Culture: A Comparison Between Yi and Non-Yi Students at China West Normal University

Authors: Anne Marie Arthington, and Vanessa Hull

There are more than 9 million Yi people living in China, 4.5 million of which are living in Yunnan Province and 2.5 million in Sichuan Province, making them the largest minority in Sichuan province. Each ethnic minority group in China has their own history, as well as their own cultural practices separate from overall Chinese (Han) traditions. Their autonomous region, Liangshan, has become a tourist destination in Sichuan, and many Chinese go to experience their festivals, and try on their traditional dress. Since they are the largest ethnic minority in Sichuan, it raises the question, how much do non-Yi people living in Sichuan province know about them and their practices? To gain more insight and attempt to answer this question, a mixed-methods survey was distributed to equal parts Yi and non-Yi undergraduate students at China West Normal University in Nanchong, Sichuan. Analysis of survey results revealed that non-Yi students have a good working knowledge on very general parts of Yi culture, such as important components of festivals and dress. However, as expected, the Yi responses were more detailed, and often different than the non-Yi responses. An example of this concerned important details of Yi traditional dress; non-Yi would answer "colorful" while Yi would answer "hero band" both of which are correct, but the Yi answer is much more specific and culturally grounded. There were also significant gaps in knowledge when comparing between Yi student respondents. This could be attributed to the fact due to modernization, and the economic state of Liangshan province, many Yi people have moved away and are more removed from their traditional cultural practices. Based on the findings of this study, future research should compare knowledge across different age groups, especially between college-age Yi students and their grandparents to see how cultural traditions have shifted across generations.

Agricultural and Life Sciences

How a tiny camera can see life and death for trees in a warming climate

Authors: Chaise Brown, Medelin Kant, Cross Heintzelman, Marylou Mantova, William Hammond

Climate change has intensified extreme heat and drought events worldwide, resulting in widespread tree mortality. One in five pine tree species has experienced pulses of climate-induced tree mortality. The genus Pinus is internationally important due to its central role in the renewable timber and pulp sectors of the bioeconomy, with Pinus taeda (loblolly pine) holding the same role in the Southeastern United States. Our research goal was to investigate the physiological tolerance to compound hotter drought of loblolly pine by imposing an extreme 7-day heatwave atop drought event capable of risking tree death. We measured physiological limits using a variety of instruments, some of which I built and deployed to obtain high-frequency, rapid, non-destructive measurements of plant stress response. One of these instruments is an optical dendrometer which monitors tree water status by measuring high-resolution stem width changes with a time-lapse camera. In our study, 68 potted ~2-year-old trees were grown in four environmentally controlled growth rooms. Half of the trees (n=34) grew and developed vegetative tissue at a maximum temperature of 27.5 C representing current climate conditions, with the other half growing in warmer conditions at a maximum of 32.5 C representing future climate conditions. Current and future climate tree populations were exposed to heatwaves (or not) with or without drought stress in a factorial design. For trees under hotter-drought stress, we found that trees grown in future climate conditions had a ~45% lower mortality compared to trees grown under current climate conditions. This reveals the potential for trees to acclimate to future warmer conditions to reduce future mortality risks. The fluctuations in tree stem diameter, measured by the optical dendrometers, signaled the response of tree physiological decline or growth and hotter-drought death or recovery from severe stress.

Agricultural and Life Sciences

What are the impacts of hunting over time on frugivore community assemblages in Western Amazon?

Authors: Alyssa Cabrera, Dr. Therese Lamperty, and Dr. Bette Loiselle

Tropical ecosystems have global importance because of the biodiversity they host and natural processes they drive, such as nutrient cycling, carbon storage and water quality management. However, they are also heavily exploited for natural resources via activities such as hunting, deforestation, and oil extraction. In tropical systems, hunting, especially of larger-bodied frugivores, leads to alterations in faunal communities that may disrupt key ecological processes, like seed dispersal. The objectives of this study were to assess how hunted frugivore communities have changed over the last 15 years by comparing species richness, functional diversity, mean body mass, and frugivore community compositions among a defaunated site and a faunally-intact site. This was accomplished by comparing trail surveys and camera traps results to compare data collected with previous studies that found lower abundances of larger-bodied frugivores in the defaunated site. The hypotheses and expected results of the study are that 1) there will be higher species diversity and functional diversity in the faunally-intact site than in the defaunated site, 2) there will be a greater abundance of smaller, secondary seed dispersers and a lower abundance of larger-bodied frugivores in the defaunated site, relative to the faunally-intact site, leading to community downsizing, and 3) avian frugivore assemblages at the defaunated site will be more species rich and robust than they were 15 years ago, showing an extent of recovery.

Agricultural and Life Sciences

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The effect of anthropogenic noise on nest attendance behavior in eastern bluebird pairs

Authors: Megan Caufman, Katie Sieving

As human infrastructure continues to expand, anthropogenic noise increases in intensity and extent. It is important for us to understand how anthropogenic noise affects wildlife species living in urban areas, such as the Eastern bluebird (Sialis sialis), in order to make effective management decisions. Previous studies have shown that increased anthropogenic noise decreases hatching success for Eastern bluebirds. However, the exact mechanism for why this occurs remains unclear. In this study, we examined the effect of anthropogenic noise on nest attendance behavior in Eastern bluebird pairs. We used photos taken at nest boxes inhabited by Eastern bluebirds across an anthropogenic noise gradient on the University of Florida campus. 11 of the 15 boxes also received playback of construction noise. We sampled photos from 9:00 am to 11:00 am, and for each photo, recorded the behaviors that the female and male were exhibiting. The behaviors recorded included: head poking out of the box, head peeking out of the box, perched on the box, perched near the box, gaping, at the box hole, and leaving/returning to the box. The number and types of behaviors an individual bird engaged in were recorded per hour. We analyzed the data by running a principle component analysis and using a general linear mixed model to test for differences across the varying noise levels and playback treatments. We found that females were more likely to peek, poke, and gape when playback was present, indicating stress and less time spent incubating the eggs. Male behavior, on the other hand, was not affected by the change in anthropogenic noise levels.

Agricultural and Life Sciences

The Impact of Breed Composition on Coat Length and Diameter in Beef Cattle

Authors: Sarah Chen, Gabriel A. Zayas, Camila Santos-Rojas, Raluca G. Mateescu

As climate changes, cattle must develop mechanisms to regulate and maintain thermal balance to ensure production reaches peak efficiency. Every year, the beef industry loses about $370 million due to heat stress which lowers fertility, immunity, feed intake, and overall production in cattle. While cattle use various methods to regulate body temperature, coat and hair properties play a crucial role in the ability to regulate heat. Shorter coats allow for more efficient heat dissipation, while longer coats can hinder this process. This study analyzed how the breed composition of beef cattle, specifically Brahman and Angus, influences coat length and diameter. Hair samples from Brangus cattle from two Florida commercial producers, the Seminole Tribe of Florida (n = 2,649) and Williamson Cattle Company (n = 819), and from the University of Florida's Multibreed Angus-Brahman and Brahman herd (n = 385) were analyzed. Short and long hair length and diameter were measured in millimeters using ImageJ software. Brahman breed composition for all animals was estimated in a previous study using the GGF250K SNP array. To analyze the relationship between Brahman breed composition and the various hair traits a linear model was utilized. Each linear model included the Brahman breed composition as a continuous variable and incorporated collection group as a fixed effect to control for variability. This study found that Brahman breed composition had a significant effect on both short and long hair lengths, but no significant effect on hair diameter. For 10% increase in Brahman breed composition, we observed a 0.327 mm (P<0.001) decrease in short hair length, and 0.861 mm (P<0.001) decrease in long hair length. These findings highlight the strong influence of Brahman genetics on hair length, which may enhance thermoregulation efficiency.

Agricultural and Life Sciences

Risky Business: How Individual Boldness Influences Predation Risk

Authors: Marin Chester, Rebecca McKee, Robert McCleery

Animal personalities, or consistent behavioral differences between individuals, have been observed in many species. Personality traits, such as boldness, can influence foraging strategies and anti-predator tactics, thereby affecting individual fitness. The life-history tradeoff hypothesis (LHT) suggests that bolder individuals acquire more resources than shyer individuals, but have lower survival due to their high-risk behavior. To test this hypothesis, we quantified the boldness of wild hispid cotton rats in the Florida Everglades. After first capturing individuals in Sherman traps, we recorded their behavior during emergence tests, where a short latency to emerge indicated boldness. After quantifying their boldness, we attached radio collars with mortality sensors to cotton rats and released them at their points of capture. We then monitored rats every 24-48 hours to assess their survival. We found that boldness was repeatable over time, supporting individual personality in cotton rats. We also found that there was no relationship between boldness and predation risk, contradicting the predictions of the LHT. Our findings add to a growing body of evidence challenging the predictions of the LHT, particularly in the context of field settings, where a variety of environmental factors may affect the relationship between personality traits and predation risk.

Agricultural and Life Sciences

Implication of nitric oxide (NO) signaling in Staphylococcus aureu

Authors: A'mya Chin, Dr. Kelly Rice and Connor Meenan

Staphylococcus aureus poses a significant health threat due to its metabolic versatility and antibiotic resistance. S. aureus nitric oxide (NO) production modulates its respiration and contributes to virulence. To understand if this NO affects non-NO producing S. aureus cells, we are optimizing the use of green fluorescent protein (GFP) NO sensors. We will also engineer Escherichia coli to express GFP when exposed to NO, and will use this strain in co-culture to determine if S. aureus NO is sensed by E. coli. These studies will determine if S. aureus NO can travel intercellularly, and if it impacts non-NO producing cells.

Agricultural and Life Sciences

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The Role of the Orc1 Homologs in the Regulation of Ploidy and DNA Replication in Haloferax volcanii

Authors: Cooper Kelsey, Julie Maupin-Furlow, Daniel Gal

Haloferax volcanii is an obligate halophilic archaeon belonging to the family Haloferacaceae that originates from the Dead Sea. This archaeon has become a model organism for studying archaeal cell biology due to its relatively easy growth conditions, short generation time (2 hours) and facile genetics. The genome of H. volcanii is relatively stable compared to other archaea and encodes many biotechnologically applicable halophilic enzymes that can be applied to a wide range of scientific, technological and medical fields. (Haque, 2020) This project aims to further the understanding the role of the Orc1 homologs in the regulation of ploidy and DNA replication in Haloferax volcanii. The binding of these Orc1 homologs to origin binding sites (ORBs) within the Haloferax volcanii genome will be explored. One of the techniques we are using to do this is microscale thermophoresis, which is a biophysical technique that measures the motions of molecules in response to temperature gradients to quantify biomolecular interactions. Microscale thermophoresis uses an infrared laser to create a microscale of temperatures that allows us to examine how these different conditions affect the binding of the Orc proteins to specific ORBs. Purified Orc1 homologs will be fluorescently tagged and binding affinity for different ORBs will be determined. This will provide information regarding specificity of Orc proteins to ORB sites and whether they are competing for the same binding sites and which ones. Then we can better understand how these Orc proteins influence DNA replication, ploidy of the Haloferax volcanii.

Agricultural and Life Sciences

Patient Centric Precision Ketogenic Therapy Facilitated Through Cloud Based Software.

Authors: Zoe Craig, Samantha Waterman, Dr. Edgard Andrade, and Dr. Peggy Borum

Patients in the Precision Ketogenic Therapy (PKT) clinic are diagnosed with seizure disorders, but often have no treatment options. The PKT ratio (fat grams/protein grams + carbohydrate grams) reduces dietary carbohydrates to facilitate a reduction in seizure symptoms. PKT Patient Centric Care considers each patient's symptoms, concerns, and goals. This is accomplished through the 1) creation of personalized recipes designed according to food preferences, 2) creation of diet prescriptions meeting current nutrient needs and inducing nutritional ketosis, and 3) continuous support for diet preferences and cultural restrictions. An interdisciplinary geographically dispersed team including PKT staff, caregivers, physicians, nurses, health educators and dieticians is essential. Collaboration is facilitated by many Microsoft tools including Teams, Loop, Lists, Projects, Planner, Word, Excel, PowerPoint and Power BI. Teams is a hub for communication among everyone in the PKT program and stores Word, Excel, and PowerPoint files created for the program. Project is used for long-term detailed organization of actions needed by patients such as updates to diet prescriptions and recipes. Loop facilitates the communication and tracking of activities currently being performed and often uses Planner to delegate tasks and update progress. Lists is used for a summary of the current information of patents being treated and is the source of some of the data for individual patient portals created with Power BI. The remote and instantaneous access of Microsoft Teams allows for patient centric care to take place in a remote setting promoting flexibility and efficiency. Cloud based tools foster continuous collaboration and communication that is essential to patient centric care.

Agricultural and Life Sciences

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A Liver-Fat Crosstalk for Iron Flux During Healthy Beiging of Adipose Tissue

Authors: Jinying Yang, Limin Shi, Anna L. Cubito, James F. Collins, Zhiyong Cheng

Beiging of adipocytes is characteristic of a higher number of mitochondria, the central hub of metabolism in the cell. However, studies show that beiging can improve metabolic health or cause metabolic disorders. Here we discuss a liver-fat crosstalk for iron flux associated with healthy beiging of adipocytes. Deletion of the transcription factor, a protein that control gene activity, FoxO1 in adipocytes (adO1KO mice) induces a higher iron flux from the liver to white adipose tissue, concurrent with higher activity of mitochondrial biogenesis that increases iron demands. In addition, adO1KO mice adopt an alternate mechanism to sustain mitophagy, which enhances mitochondrial quality control, thereby improving mitochondrial respiratory capacity and metabolic health. However, the liver-fat crosstalk is not detectable in adipose Atg7 knockout (ad7KO) mice, which undergo beiging of adipocytes but have metabolic dysregulation. Autophagic clearance of mitochondria is blocked in ad7KO mice, which accumulates dysfunctional mitochondria and elevates mitochondrial content but lowers mitochondrial respiratory capacity. Mitochondrial biogenesis is comparable in the control and ad7KO mice, and the iron influx into adipocytes and iron efflux from the liver remain unchanged. Therefore, activation of the liver-fat crosstalk is critical for mitochondrial quality control that underlies healthy beiging of adipocytes.

Agricultural and Life Sciences

Designing RNA Aptamer Biosensor for Burkholderia thailandensi

Authors: Sebastian Guerra, Ayana I. Febles, Melinda S. Donahey, Layla A. Schuster, Marc G. Chevrette

Abstract Natural products (NPs) constitute a significant majority of FDA-approved antibiotic and anticancer drugs, making them crucial in addressing the rising cases of cancer and antimicrobial resistance. Bacteria are key sources of NPs, with the genes responsible for their biosynthesis located in biosynthetic gene clusters (BGCs). Despite this, many BGCs encode unknown products and remain transcriptionally silent in laboratory conditions, stalling NP discovery efforts. To overcome this challenge, we have developed biosensors to identify modulators of BGC expression in bacteria under abiotic and biotic stimuli. By inserting promoter-containing regions upstream of monomeric red fluorescent protein (mRFP) or RNA Fluorescent Light-up Aptamers (RNA FLAps), we can visualize BGC activation in vivo. The modular design of these biosensors also allows for the inclusion of predicted BGC regulatory genes, enabling further exploration of BGC expression and regulation. Bacteria harboring these BGC biosensors will be subjected to various stimuli, with fluorescence-based assays employed to monitor changes in response. Our approach, scalable and cost-effective, augments traditional methods like transcriptomics or LC-MS. Additionally, the biosensors remain stable in culture without antibiotics, minimizing unintended elicitors of BGC expression. Introducing biosensors to a variety of bacterial species will provide insights into how bacterial community co-culture influences BGC regulation, potentially revitalizing NP discovery and development.

Agricultural and Life Sciences

Communal Coping for Cardiovascular Health in Colorectal Cancer Survivors

Authors: Tara Fenelon, Esha Chakraborti, Atheena Kuriakose, and Melissa J. Vilaro, PhD

Colorectal cancer (CRC) survivors face elevated cardiovascular disease (CVD) risk due to treatment effects, lifestyle factors, and age, with nearly half of non-cancer deaths among them attributable to CVD. Thus, lifestyle changes, such as following a heart-healthy diet and incorporating communal coping strategies (e.g., shared appraisal and collaboration related to illness), are essential for post-treatment adults navigating health during survivorship. This pilot study used lived experience of Black CRC survivors, their social support networks, and medical professionals to explore acceptability of a proposed behavior change intervention to reduce CVD risk in post-treatment CRC survivors. Cardiologists and oncologists participated in brief, online interviews, while CRC survivors (n=5) and their friends/family (n=6) attended online focus groups to discuss behavior change support needs. Discussions were recorded, transcribed, and analyzed for emergent themes. Additionally, five dyads (n=10) engaged in an interactive meal preparation task, during which conversations were recorded and analyzed with LIWC-22 to measure communal coping. Participants also completed self-report questionnaires, veggie meters, and provided blood pressure and saliva samples for inflammatory biomarkers. Clinician interviews revealed insights on cardiac surveillance guidelines, interdisciplinary collaboration, change capacity, and patient perceptions. Focus group data indicated that healthy eating, enjoyment, and medication adherence were vital for intervention design, with a preferred duration of 3-4 months and weekly sessions. The interactive meal prep task was feasible, yielding a suitable communal coping score. Recruitment challenges and saliva sample collection analysis are discussed. A behavior change intervention promoting communal coping skills among post-treatment CRC survivors is feasible and acceptable, effectively addressing their needs and providing a valuable resource supported by clinicians to improve cardiovascular health and overall well-being.

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Influence of Ethanol Concentration on the Extraction of Cannabinoid and Volatile Compounds for Dry-Hemped Beer

Authors: Santiago Cárdenas-Pinto, Jacob Gazaleh, Drew Budner, Shea Keene, Leena Dhoble, Abhisheak Sharma , Brian Pearson, Zhen Jia, Boce Zhang, and Katherine Thompson-Witrick

In recent years, industry hemp (Cannabis sativa) has shown increased attention following its reclassification from the enactment of the Agricultural Improvement Acts of 2014 and 2018. This reclassification has ignited interest for applications of industrial hemp, particularly in states like Florida, where it has potential to become an economically valuable alternative crop. Cultivation of hemp may serve as a profitable alternative to citrus and would further diversify Florida's agricultural sector and other sectors. In Florida, the brewing industry contributes over 4.14 billion USD to the economy. Yet, sourcing local ingredients incurs substantial production costs, quality, and lower profitability. The global demand for hops has been steadily increasing for the past several decades. This study aims to ascertain the potential of industrial hemp as an aromatic enhancer in beer production. The study will focus on how ethanol content (3, 6, and 9% ABV w/v) influences the extraction of soluble compounds by assessing the aromatic profile as well as the cannabinoid content of beer dry hopped with industrial hemp. The Hemp was produced at the mid-Florida Research Center, University of Florida. The cannabinoid content was analyzed by UF's Translation Drug Development Core laboratory. Hemp essential oils were analyzed following the official ASBC method (Hop-13). A base beer was produced and fermented using Diamond Lager yeast. The beer was fermented for 10 days and had a final ABV of 5.5%. In order to achieve the desired ABV content of the beers, all beers were adjusted using the same concentration (water + alcohol). Beer was "dry-hemped" for five days using 0.53 g of hemp flowers. The volatile profile of the finished beer was assessed using GC-MS. PCA analyses were conducted on the data to determine how closely the beer aligned with the original product. In summary, ethanol concentration appears to have no impact on the extraction efficiency of cannabinoids but does appear to influence volatile compounds when hemp is added to beer through the dry-hemping process.

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Analysis of TAL effector-Mediated Disease Phenotypes in Plants

Authors: Kyra Hertz, Jose Carlos Huguet-Tapia, Mukesh Jain, and Frank White

Transcription Activator-Like effectors (TALes) are proteins that are synthesized in plant pathogenic bacteria and injected into plant cells. The proteins function as DNA sequence-specific transcription factors and are hypothesized to target the promoter sequences of host disease susceptibility (S) genes. Upon expression, S genes facilitate disease symptoms and possibly result in higher pathogen populations in the infected tissue. The TALe family is relatively young in evolutionary terms and genes for the factors appear to be spreading through pathogens of the genus Xanthomonas, enhancing the virulence and adaptation to new hosts. We are examining the contribution of TALe genes in three diseases. We will be examining TALe gene variants of three Xanthomonas species that cause diseases on cashew, soybean, and mango and identify specific TALe and host genes that contribute to the respective disease.

Agricultural and Life Sciences

Dear Florida, Inclusive Sex Ed Is Not Bad: A Review of Sex Education and Florida Policies

Authors: Ann-Marie Iannone

The state of Florida currently implements restrictive and exclusive policies surrounding sex education curricula. Current literature suggests that inclusive and comprehensive sex education elicits positive effects, including increases in knowledge of safe, medically-accurate information and decreases in sexual violence and bullying. To further understand how sex education impacts emerging adults, I ask: How does the type of k-12 sex education a student receives impact their understanding of sexual violence within and without LGBTQ+-inclusive contexts as an emerging adult? Using a qualitative approach, I interviewed 12 undergraduates at the University of Florida while also presenting them with scenarios of sexual violence to find and examine relationships between sex education and understanding of sexual violence. Most participants were able to distinguish between consensual and nonconsensual sexual interactions and rated nonconsensual scenarios as more concerning. However, they attributed most of their understanding of consent to informal sources rather than school. Informal sources may provide risky and illegitimate information. All participants also reported their school's sex education curriculum did not cover LGBTQ+ inclusion or was covered very shallowly. My findings suggest that inclusive, comprehensive sex education needs to be incorporated in schools. So that youth do not seek information on sexual violence and other topics from potentially risky sources and promote LGBTQ+ inclusive attitudes.

Agricultural and Life Sciences

A New Disease Threat to Cacao in the Caribbean: Developing Strategies for Frosty Pod

Authors: Alejandra Alzamora, Daniel M. George, Lauren G. Jaworski, Jacobo Robledo, Aaron I. Plex Sula, Karen A. Garrett

Frosty pod rot (FPR) of cacao (caused by Moniliophthora roreri) has been widely studied in Central and South America and currently is invading other parts of the Western Hemisphere. FPR may be the greatest disease threat to cacao if it reaches major production areas, such as Africa and Asia, because it renders cacao pods unmarketable and severely limits yield. FPR was first reported in the Caribbean in Jamaica in 2016, highlighting the need for integrated multi-country risk assessments in the Caribbean for proactive and functional surveillance planning. The objective of this study is to evaluate the potential spread of FPR in the Dominican Republic, Puerto Rico, Jamaica, and Haiti, integrating publicly available data and expert knowledge. To assess the pathogen's distribution, we are combining models, such as species distribution models that predict the pathogen's climate suitability, with information from expert knowledge elicitation (e.g., the movement of pods for germplasm, exchange of planting materials, utilization of resistance cacao cultivars). We are evaluating the pathogen's potential spread based on cropland connectivity and the potential movement of the pathogen between subnational cacao-growing regions through multiple dispersal pathways, such as cacao pods, planting materials, human movement, and wind patterns. The resulting national epidemiological risk maps indicate which cacao-producing areas are likely to be at high risk for FPR in the Caribbean and identify candidate geographic priorities for regional risk mitigation. This epidemiological study aims to provide a foundation to inform multinational strategies for the proactive targeted surveillance and regional management of cacao health.

Agricultural and Life Sciences

Investigating soil bacterial isolates from the Gainesville area for their potential to inhibit rice blast disease and produce plant growth-promoting metabolites.

Authors: Lainey Kemmerer, Timothy Johnson, Garrett Ellward, Daniel Czyz, and Jessie Fernandez

Rice blast disease, caused by Magnaporthe oryzae, destroys 10-30% of rice crops globally each year, posing a significant threat to food security. To combat this destructive pathogen, our research explores biological control agents (BCA) as a sustainable alternative to chemical control methods for mitigating rice blast. To investigate biological control against M. oryzae, we tested twenty-four Gainesville soil isolate samples in a direct 1:1 antagonistic assay. Two additional bacterial samples (Bacillus subtilis strain UD1022 and Pseudomonas chlororaphis strain EA105) were added as positive controls. From this assay, we found that five of the isolates: DC01, DC05, DC09, DC13, and TJ01 showed between 10-50% inhibition of fungal growth. Based on these results, we conducted volatile assays to assess whether the isolates could release inhibitory compounds. Four isolates—DC01, DC09, DC13, and TJ01—exhibited 20-60% inhibition through volatile production. To identify the bacterial strains, we performed 16S rRNA sequencing, the species are as follows, DC01: Bacillus sp., DC05: Serratia sp., DC09: B. altitudinis, DC13: B. pumilus, and TJ01: B. aerophilus. Beyond their antagonistic properties, we evaluated these isolates for plant growth-promoting properties, including indole-3-acetic-acid production (IAA), phosphate solubilization, and nitrogen fixation in vitro. From these assays, we found DC09 shows prominent plant growth promoting characteristics. DC09 displayed the strongest potential, producing 75.89 ng/µL of IAA, achieving a phosphate solubilization index of 7.12, and testing positive for nitrogen fixation. These traits suggest DC09 could enhance plant growth in field conditions. Currently, we are conducting in planta studies to confirm the efficacy of these isolates in promoting growth and reducing disease lesions in rice infected with M. oryzae. Our findings highlight DC09 as a promising BCA, offering both disease mitigation and plant growth promotion. This dual functionality provides an eco-friendly and cost-effective alternative to traditional chemical methods.

Agricultural and Life Sciences

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Investigating Protein-Protein Interactions Between Citrus sinensis and Candidatus Liberibacter asiaticus Using a Yeast-2-Hybrid System

Authors: Payson Keown, Mayerli Tatiana Borbón Cortés, Wenxiu Ma, Nian Wang

Candidatus Liberibacter asiaticus (CLas) is a bacterial pathogen that causes Citrus Huanglongbing (HLB) disease in citrus trees. This disease affects the phloem tissue within citrus trees, causing them to wither and die, reducing crop yields significantly. There is no cure for HLB due to the elusive nature of CLas. Currently, CLas has not been cultured, so the understanding of its infection mechanism remains limited. By understanding the interactions between CLas and sweet orange (Citrus sinensis), better preventative measures can be made through gene-editing. The research presented is part of a wider study of 26 effector genes in CLas. 4 genes were studied (CLas_1-CLas_4) using a Yeast -2-Hybrid (Y2H) system to determine protein-protein interactions between the chosen CLas genes and Citrus sinensis genes. The CLas genes were cloned into the binding domain (BD) vector and grown in yeast Gold strain. The citrus DNA was cloned into the activation domain (AD) and transferred to yeast Y187 strain. Successful interactions were determined using a Gal-4-based assay with media deficient in leucine, tryptophan, histidine, and adenine. The successful protein-protein interactions were further confirmed by PCR amplification of the AD vector and characterization by Sanger sequencing. Identification of the targets of CLas effectors provides useful information regarding how CLas interferes with plant physiology and targets for genome editing for disease resistance against HLB.

Agricultural and Life Sciences

Isolation and Examination of Inhibition of alpha glucosidase by Phenolic-enriched Extracts, from UF Advanced Pepper Breeding Lines, Before and After Exposure to a Heat Treatment.

Authors: McKenna Kupcha, Emily Puckett, and Bala Rathinasabapathi

Alpha-glucosidase is a carbohydrate-hydrolyzing enzyme located in the small intestine. Its primary function is breaking down carbohydrates through cleaving the 1-4 glycoside bonds of sugars. This process results in the release of D-glucose, which is absorbed into the bloodstream. This results in an increased level of blood glucose, known as Postprandial Hyperglycemia (PPHG). This has important implications for diabetes mellitus (DM), a disorder where individuals have an increased blood glucose level due to insulin resistance. Synthetic inhibitors have been proven to decrease the activity of α-glucosidase and thus comparatively decrease the blood sugar. These synthetic inhibitors, commonly acarbose, are sold as a treatment for disorders relating to PPHG and are highly effective. However, a natural inhibitor would be a better treatment due to availability and price. In previous studies inhibition of alpha-glucosidase has been shown to lower PPHG through limiting the absorption of free glucose. This research will focus on testing the presence of alpha-glucosidase inhibitors in different cultivars of Capsicum chinense and Capsicum baccatum peppers.Two cultivars from each species will be analyzed via in-vitro spectrophotometric assays, measuring the inhibitory effect on alpha-glucosidase. The enzyme substrate is p-nitrophenyl-alpha-D-glucopyranoside (p-NPG), and when alpha-glucosidase binds to it, it releases p-nitrophenol (pNP). The spectrophotometer measures pNP levels, thus measuring the activity of alpha-glucosidase. The higher the pNP level, the more active the enzyme, thus less pNP present indicates greater inhibition. Once the presence of an inhibiting compound is confirmed, samples from each cultivar will be heated to 93℃ and the inhibition activity measured. This will suggest whether or not the active component is denatured by the heat attributed to consumption practices. The overall aim of this experiment is to prove the viability of the consumption of Capsicum chinense and Capsicum baccatum peppers as a lifestyle change to decrease the symptoms of DM.

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Racial Justice on Campus During Times of Crisis

Authors: Selora Langston, Rose Seus, Marcella Diaz, Dr. Kimberly Wiley

Black college students have encountered numerous challenges due to the impact of the COVID-19 pandemic and the reinvigoration of the Black Lives Matter (BLM) movement. The pandemic had a disproportionate impact on Black students compared to their white peers, a disparity that was exacerbated by the heightened focus on racial issues during the BLM movement. This study employs qualitative methods to gain deeper insights into Black students' experiences during this critical time. The present study was divided into two data analysis phases. The first phase revealed a disconnect between the support provided by universities and communities and the actual needs of Black students. The second phase explores the extent to which the theory of interest convergence influences the experiences of Black students in crises, particularly regarding access, representation, and equitable opportunities. A qualitative examination of interest convergence was performed, utilizing thematic analysis of photographs, narratives, interviews, and group listening sessions. The data were analyzed for core tenets of critical race theory, racialized labor, and concepts of psychological trust. The findings suggest that the needs of Black students were distinct from those of their white peers, with Black students' concerns being addressed primarily when they aligned with those of the majority. Furthermore, Black students perceived universities' efforts to offer them support as performative. Thus, universities should ask Black students directly about their needs and how to support them.

Uncovering the Impact of Defaunation on Amazonian Snakes

Authors: Owen McCool and Therese Lamperty

Defaunation, the local declines of large-bodied mammals from a region, is becoming more widespread across the tropics. Specifically, it has been an area of concern for the Amazon rainforest in recent years as a result of overhunting. Current research shows that these losses of large mammals can lead to increases in abundance of small mammals, the prey of many species of snake. However, defaunation's link with snake populations is relatively unexplored in the Americas as of right now. To address this gap, we conducted visual encounter surveys at two different field sites in the Ecuadorian Amazon, one with defaunation conditions and one that was faunally intact. We estimated snake abundance and diversity through a variety of methods, and additionally examined the differences in snake feeding guilds between the sites. Very early preliminary results indicate potential variation in snake detection rates and species composition, and functional group differences. The defaunated site had slightly lower detection rates and lower species diversity per survey hour while the faunally intact site had a higher diversity of non-mammal eating snake species. The continued analysis into this project will be crucial to understanding how a widespread phenomenon affects an important, and often overlooked, group of animals. Snakes serve vital roles as both predators and prey in many of their habitats, and understanding the top-down effects of defaunation can provide insight into future conservation efforts.

Agricultural and Life Sciences

Extracellular vesicles from Salmonella-infected macrophages provide antigen-specific adaptive immunity

Authors: Ryan Mulcare, Saloni Bhimani, Dr. Mariola Ferraro

Role of Small Extracellular Vesicles in Adaptive Immune Response against Salmonella: Salmonella enterica serovar Typhimurium is a major non-typhoidal Salmonella (NTS) pathogen, primarily acquired through contaminated food or water, causing over 1.35 million infections annually in the United States. This pathogen utilizes its Type III Secretion System (T3SS) to introduce effector proteins that aid in invasion, infection, and survival within host cells, including phagocytes such as macrophages (MΦ). Salmonella-infected MΦs release small extracellular vesicles (sEVs) that facilitate intercellular communication and have been known to play a role in immune responses. Previous proteomic studies by our group have identified the presence of Salmonella effector proteins, including SopB, CirA, and OmpA, within sEVs derived from Salmonella-infected MΦs. These antigens have shown potential immunogenic properties, making them prime candidates for further study. In this study, recombinant SopB, CirA, and OmpA were cloned into E. coli BL21(DE3) competent cells and purified using affinity chromatography. The purified proteins were integral to evaluating the antigen-specific immune responses elicited by sEVs. Mice were immunized with sEVs derived from Salmonella-infected MΦs, followed by two booster doses. Humoral immune responses were assessed through enzyme-linked immunosorbent assays (ELISA), measuring serum IgG production against LPS-treated Salmonella, followed by SopB, CirA, and OmpA, This study provided insight into the role of sEVs in inducing Salmonella-specific immune responses. Given that SopB and CirA have demonstrated protective antigenic properties and OmpA exhibits adjuvant-like effects, this work could inform future vaccine strategies leveraging sEVs to enhance immune protection against Salmonella infections.

Agricultural and Life Sciences

Alteration to Heavy Whipping Cream Nutrition Facts and the Subsequent Impact on Precision Ketogenic Therapy

Authors: AnnMarie Munecas, Samantha Waterman, Parrish Winesett, Peggy Borum

Precision Ketogenic Therapy (PKT) is a personalized nutrition-based approach to medical therapy. It focuses on the patient's specific nutrition needs, while maintaining them in a state of ketosis. Patients achieve ketosis by following their prescribed ketogenic ratio, which is the ratio of grams of fat to grams of carbohydrate and protein. It is vital that PKT recipes are precise, as PKT calls for the ketogenic ratio to remain steady. To maintain precision, we pay great attention when making recipes to the food sources, their specific brands, and each product's Nutrition Facts Label. Zero carbohydrate fat sources are extremely valuable for PKT recipes, and a former example of such was the Organic Valley Heavy Whipping Cream. The company, however, has recently altered the nutrient composition of the product. The unannounced change impacted PKT patients directly, altering the ketogenic ratio they received for every meal with Organic Valley Heavy Whipping Cream. For example, a recipe which originally had a ketogenic ratio of 2.25:1 dropped to 1.72:1. Since each recipe uses different quantities of cream, the ratio decrease would vary per meal and the patient would receive differing "doses" of PKT. If variation to the ratio remains unknown for an extended period, it could lead to suboptimal therapy and adverse health outcomes for the patient. Along with compromising the medical therapy's efficacy, this change may impact our patient's quality of life. Adding an ingredient to a PKT recipe could call for a complete reconstruction of the meal, potentially altering its original taste and appearance. It also impacts patients who are tube-fed, as the added oil shortens the life of their tube lines. Using food as precision medicine can be extremely impactful on a patient's health, however medical therapy like PKT cannot be successfully accomplished without transparent and accurate food composition data.

Dynamics of Pollinator Interactions in Urban Southwestern China

Authors: Ella O'Brien, Aleida Wells, and Vanessa Hull

Urban green spaces are essential for maintaining biodiversity as they provide habitat for pollinators in city landscapes. However, these green spaces vary significantly in their level of urbanization. This study examines how different levels of urbanization affect the abundance and diversity of pollinators in Nanchong, a city in the Sichuan province of southwest China. Nanchong is a city of over two million people surrounded by a rich and diverse ecosystem, including hundreds of species of pollinators. We examined the differences of pollinator interaction between areas of high urbanization (urban parks) and relatively low urbanization (temple areas and farmlands). For this study, we placed six one-meter by one-meter quadrants over different flowering plants in each of our chosen study sites. We observed pollinator sightings and interactions with the plants over 10-minute periods, recording the types of plants and pollinators present. Our findings indicate similar levels of pollinator abundance, but a higher level of interaction and pollinator diversity in areas with less urbanization. Especially in China, where population density and urbanization are high, it is helpful to understand what types of urban green spaces are most conducive to pollinator interactions and biodiversity, therefore informing greenspace management in highly urban environments.

Agricultural and Life Sciences

The Role of KSHV-encoded cGAS-STING Inhibitors in Lytic Replication

Authors: Khushil Patel, Beatriz Veronese, Zhe Ma

Kaposi's sarcoma-associated herpesvirus (KSHV) establishes persistent infection in the host by encoding a vast network of proteins that aid in the evasion of innate immunity pathways. The cGAS-STING is a potent immune sensor pathway associated with antiviral responses, and this pathway is able to inhibit the reactivation of KSHV from latency. Previously, we have identified multiple cGAS/STING inhibitors encoded by KSHV, which highlights the critical anti-KSHV role of this pathway and suggests the importance of these inhibitors on optimal KSHV lytic replications. In this study, we aim to validate and further investigate three of these promising inhibitors (ORF48, ORF55, and ORF67). Our hypothesis is that these viral proteins inhibit the cGAS-STING pathway to facilitate KSHV replication. We utilized short interfering RNAs (siRNAs) to knockdown ORF48, ORF55, or ORF67 in iSLK.219 cells, a cell line that harbors the entire KSHV genome. We report that knockdown of ORF48, ORF55, and ORF67 significantly impairs lytic replication of KSHV, as demonstrated by reduced lytic gene, lytic protein expression, viral genome replication, and infectious virion production. We are further dissecting the mechanism by which these ORFs suppress the cGAS-STING pathway to facilitate replication.

Agricultural and Life Sciences

Investigating the function of LsORE15 in leaf development and senescence in lettuce (Lactuca sativa)

Authors: Gabriella Perez and Tie Liu

Leaf structure plays a significant role in determining how well lettuce retains moisture, nutrients, and overall quality during storage. Understanding leaf development can provide insights into the arrangement of cells, tissues, and cuticle layers that influence moisture retention and resistance to wilting. Leaf development is the process by which leaf primordia mature into functional leaves responsible for photosynthesis, gas exchange, and water movement. Additionally, leaf development is closely tied to the onset of senescence (aging) in lettuce leaves. Identifying and characterizing genes in lettuce that regulate leaf development has important implications for agriculture and crop science and could be applied to other leafy greens. ORE15 is a transcription factor that has been linked to longer leaf life, larger leaves, and delayed senescence. Previous studies have shown a higher level of ORE15 expression in younger leaves that decreases as the tissues mature. In this study, we aimed to characterize the LsORE15 gene and its role in the early leaf development and senescence of lettuce (Lactuca sativa). We have successfully generated LsORE15 mutant in lettuce using CRISPR/Cas9 gene editing technology. In the T1 generation, we observed dwarf plants with severe up-curling phenotypes. We are examining the T2 lines and evaluating their expression patterns compared to the wild type. Additionally, an LsORE15 overexpression line will be generated to further characterize the role of LsORE15 in lettuce. RNA sequencing of the mutant plants will also be conducted to identify the potential targets of LsORE15 during leaf development and senescence.

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Streamlining Digitization: Enhancing Lepidoptera Data Accessibility through OCR and Automated Sorting

Authors: Luke Slaughter, Colin Price

Digitization refers to the process of converting physical data into digital forms, making it more accessible for museum data use in research, conservation, and educational work. The McGuire Center for Lepidoptera & Biodiversity at the Florida Museum of Natural History houses one of the world's largest collections of Lepidoptera, with more than 10 million specimens representing most of the world's 20,000 known butterfly species. This collection is vital for studying the shifts in species range, phenology, and morphology. However, the full potential of these collections is often limited by their physical form due to digitization being time-consuming and requiring specialized skills in specimen handling and databasing. Therefore, this project aims to streamline the process of digitization by utilizing JPEG images of the specimen and their labels and feeding them into the Tesseract optical character recognition (OCR) engine, manually, in batches. Tesseract OCR then reads the images and extracts the text data. Then the tailored Python program autonomously moves the newly extracted text into a spreadsheet and sorts the label data into the correct category using the spaCy neural network. After this, the images and their sorted data are batch uploaded into the Symbiota Collections of Arthropods Network (SCAN) and Global Biodiversity Information Facility (GBIF). Preliminary results have proven fruitful, Tesseract OCR can read most labels but struggles to read messy handwriting and has trouble recognizing symbols. The future target of this project is to offer a simple-to-implement program that facilitates institutions' digitization projects, broadening ecological and conservation research, supporting global efforts to monitor biodiversity, and addressing environmental challenges.

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Sub-therapeutic Concentrations of Antibiotics Induce Prophage-driven Superinfection Exclusion and Fitness Cost in Pseudomonas aeruginosa.

Authors: Michael Bucher, Cristian Puente, Naveen Sehdev, Daniel Czyz

Bacteria can naturally produce antibiotics within their native soil environment, but often at sub-inhibitory concentrations; consequently, the exact role of antibiotics within bacterial native communities remains unknown. We have shown that subtherapeutic quantities of naturally occurring antibiotics can induce the Pseudomonas prophage Pf4, and superinfection of Pseudomonas aeruginosa cells by this phage leads to their reduced virulence, as demonstrated by impaired twitching motility, compromised macrophage evasion, and increased killing by macrophages in vitro. Thus, the production of subtherapeutic concentrations of antibiotics by environmental microbes may provide the producers an evolutionary advantage associated with reduced fitness induced by prophages in the competing bacteria. Collectively, these results reveal the role of naturally occurring antibiotics in altering fitness by phage-mediated superinfection exclusion and provide potential clinical implications in the application of phage therapy.

Agricultural and Life Sciences

The effect of defaunation and vegetation structure on rodent populations and their parasites in an African savanna

Authors: Thaleia Roda, Minenhle Ngcobo, Sandra Romao, Dr. Sebastian Botero, Dr. Samantha Wisely

Defaunation is a global phenomenon with important consequences for biodiversity, ecosystem functioning, and local livelihoods. Herbivore loss in African savannas can result in dramatic changes in vegetation structure that can influence a broad range of species and ecological processes. This investigation explored the effect of herbivore defaunation and land management on savanna rodents and their parasites. In particular, we focused on Strongyloid nematode parasites that are susceptible to vegetation changes due to their indirect life cycle. We hypothesized that as grass and canopy cover increases from herbivore exclusion, rodent abundance and parasitic burden will increase since increased grass cover may protect rodents from predation and the decreased sunlight will protect nematodes from desiccation. We tested our hypotheses at the Mlawula Nature Reserve where 20 plots simulated different levels of herbivore presence and savanna bush encroachment management. Sherman traps were used to capture rodents and collect fecal samples that were inspected for nematode egg counts. Using the data collected in 2023 and 2024, we found that grass and shrub cover had a positive linear relationship with single-striped grass mouse abundance, and that grass cover has a negative relationship with parasite intensity infecting the single-striped grass mouse. The results of this study will advance our understanding of parasite and rodent ecology in association to changing landscapes from defaunation and help to direct future land management practices in African savannas.

Agricultural and Life Sciences

Evaluating plant growth regulators as insecticide alternatives on landscape plants

Authors: Margaret Shealy, Gabi Tateo, Kendra Wagner, Adam Dale

Plants in urban landscapes offer services that directly benefit human and environmental health. Unfortunately, these services are frequently reduced by insect pest outbreaks in urban landscapes. Aphids are one of the most common herbivorous insects that reach damaging densities on landscape plants. The current standard approach for suppressing aphids is insecticide applications, primarily systemic insecticides. There is mounting evidence showing there are harmful effects of insecticides on beneficial insects like pollinators. Plant growth regulators (PGRs) are formulated chemistries that can be applied to plants to alter plant growth and development. Plant growth regulation is typically done to reduce plant maintenance like pruning and improve plant aesthetics. Previous research also suggests that PGRs may negatively affect insect pests by suppressing population growth, which could provide a safer alternative to insecticides in some scenarios. To determine if PGRs affect aphid population densities in urban landscapes, we selected 27 crape myrtle trees (Lagerstroemia indica) and 18 podocarpus shrubs (Podocarpus macrophyllus) on the University of Florida's main campus. A subset of each species was treated with the PGR, paclobutrazol, in June 2024 and we recorded metrics of aphid performance, population growth, and plant health until November 2024. Results will show a snapshot of how plant growth regulators may affect aphid performance on two common landscape plants, which can help direct more sustainable future landscape pest management decisions for aphids and other sap-feeding insects.

Agricultural and Life Sciences

Seizure Monitoring for Precision Ketogenic Therapy

Authors: Caden Shiver - Author, Sri Renduchintala - Mentor, Maria Bruzzone - Mentor, Peggy Borum - Mentor

Our Precision Ketogenic Therapy program (PKT) uses nutrients in a precision medicine approach to treat seizures of patients with refractory epilepsy. Precision medicine requires that the treatment intervention and the monitoring of patients are personalized and precise. It is recognized that seizures differ and that simply counting seizures does not have the precision required for precision medicine. Published seizure scales also have limited precision and are often not included in published papers concerning ketogenic therapy. The number of observed seizures is usually used today to monitor the response of patients with epilepsy to a particular ketogenic therapy. Different types of seizures have different impacts on patients. The same type of seizure occurring at different times may have different impacts due to differences in characteristics of that particular seizure including length, severity, and postictal status. Additional characteristics such as vocalization, changes in breathing, changes in skin color, and clustering of seizures may also occur. The individualized system we use to monitor the overall impact of the visually observed seizures on the patient's day is termed Seizure Load (SL). The absolute value of the SL at any one time is not as important as the trend of the values with time. Length of the seizure can be measured as a number. Other characteristics are qualitative assessments of the observer and are analyzed as categorical data based on ranking scales prepared with the guidance of the observer. Monitoring SL can be very labor intensive for people observing the seizure and for the people analyzing the data. Data management processes are being developed to enhance the collection, management, analyses, and visualization of the data.

Agricultural and Life Sciences

Types and amounts of dietary supplements by college students and nutritional knowledge

Authors: Isabella Simonpietri and Jeanette Andrade

According to the 2020-2025 Dietary Guidelines for Americans, adults between the ages of 18-30 years of age, should obtain all their nutritional needs through food. The objective of this study was to determine the relationship between dietary supplements, dietary intake, and nutrition knowledge among college students through an online survey. The hypothesis was that there would be a negative relationship between nutrition knowledge, dietary supplements, and dietary intake in that limited nutrition knowledge and dietary intakes of protein, vitamins, and minerals, would lead to higher consumption of dietary supplements. College students were recruited at University of Florida to complete a 20 item Qualtrics survey. Questions included nutrition knowledge about recommended daily allowances and upper limits of vitamins, diets followed, consumption of energy drinks, intake of dietary supplements, and demographics. Frequencies and descriptives were calculated using Excel. Majority of participants (n=104) were female (n=64, 61.0%), Hispanic/Latino (n=40, 38.5%) and reported following an omnivore diet (n=84, 79.8%) with at least 50% of their meals including an animal by-product. A total of 45 respondents (43.3%) answered they consume 2 or less meals daily and majority of respondents reported that they never took a protein and/or micronutrient supplement. Thirty-three respondents (31.7%) reported that they took a multivitamin 3 or more times per week. Of those who reported taking a supplement, 56% took them to improve their overall health while 45% indicated that they were to fill nutrient gaps. Lastly, 84% of respondents were able to identify the correct definition for tolerable upper intake level and few participants indicated that they consumed energy drinks. These results suggest that participants may not be consuming as many dietary supplements as other studies suggest, and it encourages future studies on the reasons for consuming dietary supplements as well as the correlation between this and nutrition knowledge.

Agricultural and Life Sciences

Printer to Palate: Exploring Consumer Awareness, Intentions, and Attitudes towards 3D-Printed Foods

Authors: Savannah Stephens, Leah Lederer, Dr. Adam Watson

3D printed foods represent an innovative intersection of technology and culinary arts, heralding a paradigm shift in the way we conceptualize and produce edibles. This emerging field utilizes specialized 3D printing technology to construct intricate and customizable food structures layer by layer, transforming raw ingredients into novel shapes and textures. Beyond mere gastronomic novelty, 3D printed foods hold potential for addressing issues such as personalized nutrition, food sustainability, food logistics, and culinary creativity. The process allows for precise control over ingredient composition, catering to specific dietary requirements, while also minimizing waste. As this technology advances, it sparks intriguing possibilities for reshaping traditional culinary landscapes and meeting the evolving demands of modern consumers. This research project will investigate consumers' awareness, intentions, and attitudes towards 3D printed foods. A survey designed to assess a range of psychological and socio-economic factors associated with consumers' acceptance and use of this technology's potential will be deployed at a large multi-cultural higher education institution. The study aims to provide nuanced insights into the intricate interplay of factors influencing the adoption of 3D printed foods, contributing to a deeper understanding of their potential integration into mainstream culinary practices. The findings are expected to inform industry stakeholders, policymakers, and educators, guiding the development and implementation of strategies that align with consumer preferences and foster the widespread acceptance of 3D printed foods in the future.

Agricultural and Life Sciences

Genetic Analysis of Virulence Traits of Clavibacter Nebraskensis, The Agent of Leaf Blight of Maize.

Authors: Mary Tamer, Jose Carlos Huguet-Tapia, Mukesh Jain, and Frank White

Clavibacter nebraskensis (Cn) is the agent of Goss's bacterial wilt and leaf blight in maize (corn) and has re-emerged as an important disease in North America. The bacteria colonize the vascular tissues in the plant, and infection presents itself on leaves through water-soaked spots (freckles) and necrotic leaf lesions. Genetic tools for Clavibacter species are limited and few genetic analyses have been done on Cn and other Clavibacter-related disease complexes. Here, we report generating a comprehensive chemical mutagenized library for Cn isolate Cn06-1. The library of mutagenized isolates will be screened for virulence, carotenoid biosynthesis, and other traits related to host infection. Mutant isolates will be analyzed using NexGen deep sequencing (MUT-seq) and single nucleotide polymorphism comparisons. Preliminary sequence analysis of three variant Cn field isolates - Cn06-1 (pathogenic), Cn7850 (nonpathogenic), and CnHF4 (nonpathogenic) indicate that comparative will identify candidate virulence genes. Preliminary candidate genes will be presented and discussed.

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Bacteria-Mediated Regulation of Host Stress Responses

Authors: Matthew F. Tibi, Alyssa C. Walker, Yoan M. Argote, Daniel M. Czyz

Proper regulation of the heat shock response (HSR) and oxidative stress response (OSR) is crucial for maintaining organismal protein homeostasis ("proteostasis"). Disruption of the proteostasis network can lead to protein misfolding and aggregation, which hallmarks neurodegenerative protein conformational diseases (PCDs). Neurodegenerative PCDs are a leading cause of geriatric death and disability worldwide and currently lack cures and a defined etiology. Recent evidence suggests a potential link between gut microbiota alterations and PCDs, but the specific bacterial strains involved, and the underlying mechanisms remain unclear. To elucidate the role of bacteria in PCD pathogenesis, we previously screened 229 human bacterial isolates for their impact on toxic protein aggregation in Caenorhabditis elegans expressing polyglutamine (polyQ), tau, Aβ1-42, and α-synuclein. Our results showed bacteria consistently either suppress or enhance protein aggregation, indicating their effect on the host proteostasis network rather than targeting specific proteins. Here, we further explore how proteotoxic and proteoprotective bacteria influence host proteostasis, focusing on the HSR and OSR. Using transcriptional fusion reporters for HSR (hsp70p::GFP) and OSR (gcs-1p::GFP, a downstream target of SKN-1/Nrf2), we reveal a pattern in which certain proteoprotective bacteria activate the host HSR, while certain proteotoxic bacteria trigger the host OSR. These results reveal distinct mechanisms through which bacteria influence host proteostasis and protein aggregation. Together, our findings highlight the potential of manipulating microbial communities to enhance host proteostasis, presenting a promising strategy for addressing diseases characterized by dysregulated proteostasis and protein aggregation.

Agricultural and Life Sciences

Transformative Capacity and Food Security Status in Florida Communities and Households with Low-Income

Authors: Vicki Freedman, Sean Tzoucalis, Miranda Badolato, David Diehl, Jenee Duncan, Karla Shelnutt, Anne Mathews

Background: Food security (FS) status is associated with various health components. According to the Center for Nutrition and Health Impact (CNHI), one factor related to FS status is household resilience, a household's ability to cope with financial stress. A component of resilience is transformative capacity (TC), which comprises community-level factors, including community services and resources (CSR), financial outlook (FO), and neighborhood cohesion (NCS), affecting a household's ability to change its long-term financial situation Objective: To determine if TC varies by FS status among households with low-income. Methods: In the fall of 2023 and spring of 2024, 74 low-income Florida households with at least one child participated in a literacy and nutrition program across 5 counties. One guardian per household completed the USDA FS Survey Module and the CNHI's TC instrument. Households were categorized as food secure or insecure, and mean TC were compared across groups cross-sectionally using an independent samples T-test. Results: Most participants were white (n=42, 57%) and female (n=69, 93%). Most households (69%) were food insecure (very low: n=25, 34%; low: n=26, 35%; marginal: n=10, 13%; high: n=13, 18%). Scaled from 1 to 5, mean TC for food-insecure households was 2.8 (CSR: 2.4; FO: 3.7; NCS: 3.2) and 3.3 (CSR: 2.9; FO: 3.9; NCS: 3.6) for food-secure households. TC did not differ across households (overall p=0.435; CSR p=0.089; FO p=0.591; NCS p=0.800). Conclusion: Although TC is a component of household resilience related to FS status, measures of TC may not differentiate amongst households with low-income with varying levels of FS status. Due to the limited participant pool, further research should be done to confirm how TC relates to FS.

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Photoperiod effect on vegetative growth of two southern highbush blueberry (SHB) genotypes

Authors: Nathaniel Zhivotovsky, Sarah da Silva Benevenute, Gerardo H Nunez

Blueberry, a perennial plant, respond to changes in day length by altering their growth pattern and physiological processes. Short days and low temperatures are known to promote flower bud initiation in these plants, while long days and high temperatures promote vegetative growth. However, variability in photoperiod responses has been identified in some southern highbush blueberry (SHB) elite genotypes from the UF Blueberry Breeding program, suggesting a different vegetative and reproductive growth pattern on these plants. Therefore, the objective of this work is to investigate the photoperiod requirements for vegetative growth of 'Arcadia' and 'FL16-64'. A controlled environment experiment was conducted in the Horticultural Sciences Department of UF, following a CRD design with four photoperiod treatments (8h, 8h + 1h, 12h, and 16h). Temperature was maintained at 28°C day/20°C night and light intensity at 180 PPFD. Each treatment consisted of 6 plant replications of each genotype. Data on chlorophyll content (SPAD) were collected using a leaf spectrometer. Leaf area index (LAI) was assessed using top-down photographs quantified in imageJ software. All data were collected at week one, five and ten of the experiment. Our results suggest that longer photoperiods promote vegetative growth in both genotypes. SPAD was significantly higher in 'Arcadia' at the beginning of the experiment ($P<0.001$), which could indicate an early prioritization of photosynthetic efficiency. Moreover, LAI was greater at the longest photoperiod treatment for both genotypes, but 'FL16-64' had significantly greater LAI than 'Arcadia'. These findings suggest that although a longer photoperiod increased vegetative growth by increasing SPAD and LAI in both genotypes, these genotypes may exhibit different growth strategies. 'Arcadia' may focus on early photosynthetic efficiency, while 'FL16-64' allocates resources towards sustained leaf expansion. Future research should explore the physiological mechanisms regulating resource allocation and vegetative growth under different photoperiods.

Agricultural and Life Sciences

The implementation and comparison of Gaussian Splatting against Photogrammetry and NeRFs in Unreal Engine 5 to create real-time hyper-realistic radiance field 3D renders for application in object and environment building

Authors: Maxwell Scherer, Nick Heitzman

As technology evolves, there is an increasing demand for efficient, hyper-detailed real-time 3D models. This research investigates the most effective methods for creating such renders by comparing the viability of Gaussian Splatting, Neural Radiance Fields (NeRFs), and Photogrammetry in generating environments, objects, and related workflows. Gaussian Splatting utilizes Gaussian rasterization, NeRFs leverage deep learning techniques, and Photogrammetry relies on tessellating point clouds. Each method exhibits unique strengths and weaknesses. The study evaluates the impact of these techniques on hardware performance, measuring metrics such as frame rates, render times, and GPU/CPU temperatures during both creation and viewing. Additionally, this research explores innovative applications of these technologies in virtual production, specifically in the development of hyper-realistic virtual sets using volume display screens and Unreal Engine 5 for camera tracking. Gaussian Splatting starts with point clouds to create structure from motion, generating hyper-realistic renders from image sequences. Central to this method are ellipsoidal Gaussian splats, which can be optimized for variable density based on the scene's complexity. For instance, low-density splats may represent the sky, while high-density splats are used for detailed objects like trees. Photogrammetry also applies the structure from motion concept to generate 3D meshes from camera points, which are subsequently textured for realism. Conversely, NeRFs utilize a neural network approach, employing multi-layer perception to create 3D shapes through progressive ray tracing from 2D images. This research aims to delineate the effectiveness of these methodologies in achieving hyper-realistic 3D modeling.

DESIGNING A REVOLUTION

Authors: Caswell Shamblin

Massive cultural changes in the 1960s USA led to widespread community action. Notable movements include The Civil Rights Movement, Black Power, Chicano, Gay Rights, Anti-Vietnam, and Feminist movements. Community Action groups and campaigns today continue to see this era's designs as a model for successful visual communication in an activist context. How can we learn from visual elements such as graphic symbols, icons, color palettes, or materials, as seen in the American protest work of the 1960s and 1970s? How can we use and adapt these methods for a contemporary context? This project provides a close reading of a visual material cross-section of graphic works from this period. It groups this information into symbolic themes and applies that knowledge for present day activists. The main research methods are image cataloging, visual analysis, and contextual framing. Precise formulas for successful protest art and design are impossible and counter-productive. Each work which made an impact in its time made that impact through a combination of contemporary events, individual creativity and audience adaptation. Civil Rights artist-designer/activists catalyzed social change through their mass production and distribution of successful protest images. Activists and artists/designers today can seek inspiration from the techniques of the 1960s for their own change-making work.

Enhancing Patient Comprehension and Procedural Preparedness through a 3D-Printed Model of Supraventricular Tachycardia (SVT) Pathophysiology and Treatment Modalities

Authors: Ella Mendelowitz, Sydney Sylvester, Nina Fiedler, Julie Han, Izabela Zmirska, Sneha Suresh, Utsav Sharma, Mohammad Al-Mousily

Managing Supraventricular Tachycardia (SVT) requires intricate surgical interventions, elucidating feelings of pre-operative anxiety for pediatric and adult patients, potentially stifling the impact of the surgery regarding recovery and outcomes. This study proposes using a customized 3D-printed model of the heart exhibiting the specific pathophysiological features of SVT in bolstering patients' understanding of their condition and impending surgical strategies, thereby aiming to reduce preoperative anxiety and enhance procedural preparedness. The model emphasizes the aberrant conduction pathways characteristic of SVT and the surgical access points, providing a tangible, visual representation of the disorder and the therapeutic approach. Creating the SVT model involved meticulously importing a pre-existing heart structure from Solidworks into Onshape for necessary modifications. The representations of the additional atrial opening utilized in surgical correction and the aberrant conduction loop contributing to SVT were critical to the model. Enhancements for user interaction included the incorporation of handles for manipulation ease and a protective box housing essential circuitry while also serving as a stand. The model's distinctiveness was further augmented by integrating customizable LEDs, programmed via Arduino, to simulate the erratic electrical activity in SVT. These LEDs, powered by an independent battery source, were strategically placed to illuminate the model without the necessity of penetrating multiple material layers, thus offering an accurate, dynamic display of cardiac electrical conduction in SVT. Our hope for the interactive 3D model is to improve patients' grasp of SVT significantly, and the operative procedure can substantially lower anxiety levels, which is paramount for pediatric cases. The cost-effective nature of 3D printing makes this approach replicable and scalable, highlighting the immense potential of such educational tools in healthcare settings as mechanisms to reduce patient anxiety.

Arts

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Yttrium Ion Release and Phase Transformation in Yttria-Stabilized Zirconia Under Acidic Conditions: Implications for Dental Implant Durability

Authors: Haochen Zhu, Chao-Ching Chiang, Valentin Craciun, Griffin M. Deane, Fan Ren, and Josephine F. Esquivel-Upshaw

Titanium is a standard material for dental implants, but Yttria-stabilized zirconia (YSZ) is emerging as a promising alternative due to its superior biocompatibility and aesthetic qualities. However, YSZ is susceptible to phase transformation from the tetragonal (t-ZrO_2) to the monoclinic (m-ZrO_2) phase, especially under low-temperature degradation (LTD). This transformation compromises the mechanical strength and longevity of zirconia implants, raising concerns about their long-term performance. A key factor in this transformation is the leaching of Yttrium ions (Y^{3+}), which stabilize the t-ZrO_2 phase.

This study investigates the influence of Y^{3+} leaching on YSZ stability under simulated oral cavity conditions, using constant immersion and pH cycling techniques. Zirconia discs were divided into three groups: constant immersion in a single pH environment, acid-to-base pH cycling, and base-to-acid pH cycling. Inductively coupled plasma (ICP) analysis revealed significant Y^{3+} release in acidic conditions, while Zirconium ion (Zr^{4+}) release remained minimal. X-ray photoelectron spectroscopy (XPS) showed a shift in Zirconium 3d binding energy, suggesting a phase transformation due to Y^{3+} depletion. X-ray diffraction (XRD) confirmed the formation of the monoclinic phase, with a monoclinic peak emerging after exposure to acidic environments.

These results highlight that Y^{3+} leaching, particularly under acidic conditions, accelerates the t-to-m phase transformation in YSZ, reducing its structural stability. This study emphasizes the importance of pH management for YSZ implants, as pH fluctuations in the oral cavity may compromise their long-term performance through LTD and surface degradation.

Dentistry

Breaking the Glass Ceiling: Women Representation in Orthodontic Societies' Leadership and Awards

Authors: Sarah Abu Arqub, Violet Knobel, Dur Abdullah Alomair, and Dalya Al-Moghrabi

This cross-sectional study evaluated women's representation in orthodontic societies, focusing on leadership roles, award recipients, and award namesakes. Orthodontic societies affiliated with the World Federation of Orthodontists (WFO) that had accessible websites with sufficient information about board members were included. Gender distribution of board members, awards recipients, and award namesakes for orthodontic societies was extracted in a pre-piloted sheet. Societies were grouped by region, and the percentage of female board members per region was calculated. Board member roles and gender distribution for each role were summarized. The percentage of current female orthodontic society presidents was calculated. Additionally, the number of female award recipients and award namesakes were extracted and summarized as percentages. A total of 119 orthodontic societies were identified, of which 67 were included in the analysis. Central and South America had the highest board representation of women (53.7%) and female presidents (60%), while North America had the lowest board representation (22.2%) and no female presidents (0%). Women predominantly occupied administrative and secretarial support roles in orthodontic societies (47.2%), and were underrepresented in leadership roles. The European Federation of Orthodontics (FEO) had the highest percentage (80%) of female award recipients, while the American Board of Orthodontics (ABO) had the lowest (15%). Overall, female representation among award recipients and namesakes remains limited. Efforts should be made by orthodontic societies to address these issues by implementing targeted initiatives to increase female recognition and representation in leadership roles.

Artificial intelligence for the prediction of location and severity of impacted maxillary teeth

Authors:Adrienne Kramer, Ye Jin An, Sofia Koves, Madhur Upadhyay, Sarah Abu Arqub

Introduction:

Accurately locating and classifying impacted teeth using minimal ionizing radiation (ALARA principle) remains a clinical challenge. This study aimed to develop an artificial intelligence (AI)-based algorithm for the automatic detection and assessment of the location and severity of impacted maxillary teeth, thereby improving diagnostic and prognostic accuracy.

Materials and Methods:

A dataset of 467 panoramic radiographs was collected from UF and UCONN. To enhance the training process, data augmentation techniques (rotation, cropping, translation, brightness adjustment) were applied, resulting in 1,304 X-rays for annotation and testing. The Deeplabv3-ResNet50 model was utilized for semantic segmentation, classifying each pixel in the X-rays to identify teeth. The algorithm was trained and evaluated using IoU (Intersection over Union) analysis to assess performance accuracy, with 320 annotated X-rays serving as the ground truth.

Results:

The developed AI model demonstrated significant improvement after data preprocessing. Without preprocessing, the model's IoU score was 0.401. Data augmentation improved the IoU score to 0.554, and increasing the sample size raised it further to 0.594. Doubling the image resolution resulted in an IoU score of 0.678. Excluding third molars (UR8, UL8, LL8, LR8) improved the IoU score to 0.710, indicating enhanced performance.

Conclusion:

The AI-based algorithm developed in this study showed strong potential for the automatic identification and localization of impacted maxillary teeth. Exclusion of third molars, which tend to have structural abnormalities, improved performance. The findings demonstrate that increasing image resolution and employing data augmentation significantly enhanced the model's accuracy, though it also increased training time due to computational limitations

Dentistry

A Comparative Analysis of Technologies in Heart Rate Monitoring: Justification for E-Skin as a Superior Alternative

Authors: Aanya Bhandari, Dr. Aaron Costin

This paper presents a comprehensive review of current technologies employed in heart rate (HR) monitoring, with a specific focus on the emergence of electronic skin (e-skin) as a superior alternative. The competitive analysis highlights the limitations of traditional HR monitors, such as wearable devices and chest straps, in terms of accuracy, comfort, and adaptability. By synthesizing recent advancements, this study demonstrates the potential of e-skin technology in enhancing real-time HR monitoring and justifies its application in the development of next-generation health monitoring systems.

A Case for Climate Justice in Design Education

Authors: Hannah Gutierrez

Climate change is an intersectional issue with impacts that extend far beyond the environment alone. Environmental hazards caused by climate change affect global economic and social systems, and disproportionately impact minorities. The climate justice movement emerged in 1982 as a response to the unequal impacts of climate change. This paper analyzes how climate justice education in design can mitigate climate change by encouraging sustainable and resilient design. The design and construction field as a whole is a large contributor of greenhouse gas emissions which are known to exacerbate climate change. Through prioritizing energy efficiency and sustainable design, building's greenhouse gas emissions can be significantly reduced. Climate justice education through a human centered approach fosters a personal connection to climate change as an issue. It is important to educate the next generation of designers so that they can put their education into practice, and develop personal stake in combating climate change.Through an analysis of climate change focused research, this paper concludes that climate justice education is imperative for creating competent designers that can address climate change and its impacts.

Passive Design Techniques in The Florida Cracker House

Authors: Haylee Reisen, Vandana Baweja

Climate change is an existential threat requiring the transition from fossil fuels to non-carbon-based energy sources. One way to reduce carbon footprint is to understand how historical buildings achieved thermal comfort before the advent of air conditioning. This study examines the Cracker House typology, an 18th century innovation in Floridian vernacular architecture. The pioneers built a protype using what is known as Passive Design, a strategy that allows users to control indoor climatic elements without mechanical conditioning systems. In Passive Design, the building envelope and fenestration design allow residents to moderate their interior climate. They utilize aspects of orientation, topography, sun control devices, and heat gain control through thermal mass to manage the transfer of heat from outside to inside. This study established a methodology to examine examples of the Cracker typology and determine how these houses function as examples of Passive Design through optimal building form and orientation. The researcher studied six Cracker Houses – with different orientations and architectural permutations of porches – through archival sources and field work. The researcher established a standardized temperature grid to measure surface temperatures and determine the impact of natural ventilation at one-meter intervals for each structure. This study concluded that when using natural ventilation techniques, while there are greater ranges of surface temperatures in the interior spaces, Cracker Houses with porches along the south facade generally have greater levels of cooling between different levels of enclosure. At the same time, having natural ventilation open caused lower rates of temperature fluctuations throughout the day. This study is meant to be the start of a framework that can be extended to encompass a greater range of comfort factors in these structures for the testing of Passive Design techniques.

Closing Content Knowledge Gaps: AP Chemistry Exam Content and Score Distribution Analysis

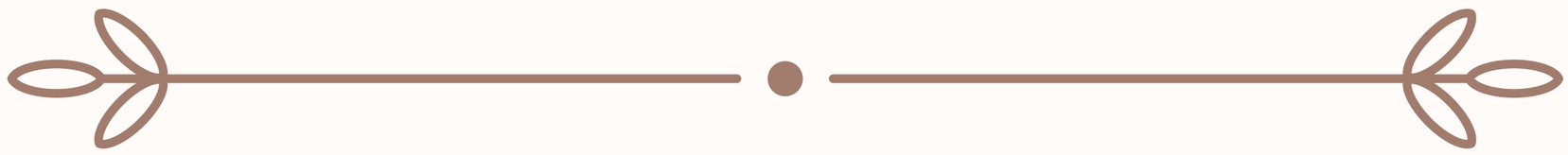
Authors: Bella Cherin, Gayle Evans

This study aims to report on the alignment of the College Board's reported content breakdown for Advanced Placement (AP) chemistry and the actual content breakdown that students encounter on the exam. Released AP practice exams for the years 2017-2019 were coded based on subtopics and percentage of topic breakdown by exam was calculated for multiple choice questions (MCQs) and free response questions (FRQs). Topic representation averages were calculated across the years 2014-2019 to determine the topics more likely to be present in the MCQ section versus the FRQ section. Common student misconceptions were identified by analyzing exam score distribution and percent correct by topic. Average MCQ scores were calculated based on percent correct by topic. A literature review examined teacher pedagogical content knowledge (PCK) to determine the practicality of recommendations made by this report. It was found that the reported ranges for content distribution set by the College Board were close to actual content distribution in released exams. We noted topics more highly represented in the multiple choice versus free response sections of the exam to provide guidance to teachers about how to best address these topics with their students. It was found that many students struggle with topic eight as students score constantly lower on questions involving acids and bases. Based on content distribution, student misconceptions, and the findings in the literature review recommendations are made to AP chemistry teachers on how to distribute the curriculum in their classrooms.

Education

Remote Access to Side Channels

Authors: Landon Amaba, Yunkai Bai, Domenic Forte



Traditional software-based antivirus approaches have become predictable and easy to bypass. The 742% growth in supply chain attacks since 2020 proves that numerous critical systems are currently vulnerable to malicious attacks. We developed a standalone embedded system, to do side channel analysis of critical systems remotely. Remote access to side-channel (RASC) systems have been developed and tested in our group to detect malware and other anomalies on critical systems from power and EM measurements in real-time. To date, RASC has monitored side-channels on an Arduino UNO running at 1MHz. This project involves the development of a new version of RASC that can monitor more complex microcontrollers, e.g., 32 bits running at 200MHz+. Improvements to our current hardware will allow for developments in both our malware detection algorithms and disassembly classifications, allowing for more complex and relevant benchmarks to be tested. Applying our technology to real critical systems allows legacy systems to continue to operate without the fear of exploited vulnerabilities.

Engineering

Examining the Effects of Verapamil-Releasing 3D-Printed, Polymeric Scaffolds on in vitro Blood Vessel Network Formation

Authors: Amanda Bradley, Sierra Jackson, Maegan Cremer, Cherie Stabler

Angiogenesis is key for the successful integration of cellular constructs. Although not its clinical application, verapamil has shown an impact on in vivo vascularization. In order to improve the vascularization of porous 3D-implants, this long-term study observes the direct impact of verapamil drug release from polymeric scaffolds on the formation of in vitro blood vessels.

Reverse-cast 3D-printed PDMS scaffolds were created with verapamil (concentration: 0%, 0.05%, and 0.25%). Negative space was filled with fibrin, NHLFs, and GFP-HUVECs, and media was replaced every 24h. Scaffolds were confocal imaged on d7, d14, and d21 and analyzed for vascular differences in ImageJ. Concurrently, verapamil elution data was collected daily and analyzed by multiple reaction monitoring.

Verapamil was successfully integrated into and released from a PDMS construct. Over 21 days, both 0.05% and 0.25% scaffolds display a first-order release profile. Steady-state, reached on d8, averaged 24 ng/mL and 356.6 ng/mL respectively. Across tested time points, 0.05% scaffolds showed significant increases in vessel coverage compared to other concentrations, but was comparable to 0% scaffolds on d14. Scaffolds containing verapamil experienced increased vessel diameter compared to 0% but only on d7.

Verapamil was successfully integrated into a PDMS scaffold, with tunable first-order kinetics. 0.05% verapamil has a significant impact on vessel coverage and d7 vessel thickness in vitro when compared to lower and higher concentrations. There is a visual increase in vessel length and branching over time in verapamil groups, as well as d7 vascular islands which future work aims to quantify.

Engineering

Advancement of Exploration Components for In-Space Servicing

Authors: Christina Caride, Amy Felt, Robert Kuczajda, Brian Nufer

I worked as a NASA Office of STEM Engagement (OSTEM) intern during the Summer 2024 term, in the Exploration Payloads Branch (NE-L5) at the Kennedy Space Center, under my mentor Brian Nufer. My primary assignment was to continue development of a previous working electronic controller for the Advancement of Exploration Components for In-Space Servicing (AXCIS) project and develop LabVIEW software for an overall system testbed controller. This work specifically includes designing and expanding functionality on the LabVIEW script, such as new connections and an additional GUI that interacts to a schematic of the test assembly. It also entails the design and fabrication of an electronic controller to run the system from the host computer to the instrumentation.

I spent time on the LabVIEW script testing compatibility to the script and the electrical hardware including the CompactRIO and the connections for each module. The module's features include analog input, analog output, digital input, digital output, temperature input, etc. The LabVIEW software that will be used with the test system performs data logging and acquisition, reads/records pressure data from pressure transducers/gauges to TDMS files, opens/closes valves, and sets target pressures for the overall test system instrumentation.

The electronic controller and manuals to operate it were designed and built to allow for a modular approach to data acquisition and testing. Because of this, the controller has the capacity to seamlessly integrate pressure transducers, solenoid valves, thermocouples, RTDs, regulators, and many other digital and analog instruments. The controller issues digital commands in the form of voltage signals to digital output devices. A typical configuration would be the switching of solenoid valves. The controller originally had the capacity to concurrently control and monitor the state of six separate solenoid valves which has then expanded by changing the circuit breaker tolerance, digital output ports, and/or the number of digital output cards.

Engineering

A High-Throughput Computational Investigation of Protein-Polymer Bioconjugates with Molecular Dynamics Simulation

Authors: Pedro Cintrón Baerga, Ziyue Dong, Kayla Sprenger

Proteins are essential biomolecules whose functions are directly related to their three-dimensional structures. However, many natural proteins exhibit limited stability and reduced enzymatic activity, which restricts their application in industrial and medical fields. To enhance protein properties, bioconjugation techniques inspired by natural glycosylation have been developed. This study focuses on PEGylation, the covalent attachment of polyethylene glycol (PEG) chains to proteins, which is commonly employed to improve solubility, reduce immunogenicity, and extend circulation time.

We investigated the effects of methoxy polyethylene glycol (methoxyPEG) conjugation on Hen Egg White Lysozyme (PDB: 1LYZ), a model antimicrobial protein, through high-throughput molecular dynamics (MD) simulations. Conjugation is achieved via modified cysteine residues, and simulations are extended to 1000 nanoseconds to capture detailed conformational changes. Our results show that methoxyPEG enhances protein backbone rigidity, suggesting increased stability, while surface residues become more dynamic due to protein-polymer interactions. These findings reveal that non-covalent interactions, particularly hydrophobic effects, play a critical role in modulating protein structure and function, explaining the typical reduction in enzymatic activity upon conjugation.

This research provides new insights into optimizing PEGylation techniques to enhance protein stability and function, offering valuable guidelines for designing bioconjugates for therapeutic and biomaterial applications.

Engineering

Synthesis and Analysis of Ceria-Zirconia Hybrid Oxide Catalysts for High Selectivity in the Reverse Water-Gas Shift Reaction

Authors: Sean W. Clark, Ruby Morris, Emma Gibson

The reverse water-gas shift (RWGS) reaction holds great potential for the repurpose of CO2 released by industrial processes. Carbon dioxide produced may be, with the application of high temperatures and a stream of hydrogen gas over a catalyst, converted into carbon monoxide (CO), an essential building block for the C1 chemical industry, and can be utilized in the Fischer-Tropsch process to produce a myriad of different hydrocarbons, from fuels to components for polymers, and many other crucial chemicals used within industry.

The RWGS reaction is a slightly endothermic reaction, and as a result, requires high temperatures to produce meager conversion rates, with current catalysts. However, novel transition metals are being explored, that are cheaper, operate at lower temperatures, and yield very high conversion rates. Copper, for example, is much cheaper than the industry standard of platinum or molybdenum, and performs better, especially at lower temperatures. The dispersion of copper can also be increased by the presence of urea in the wet-impregnation technique, which boosts conversion rates, due to the increased quantity of "ideal" active sites. As for supports, solid solution hybrid oxides have the potential to increase the performance of these catalysts by allowing the easier formation of oxygen vacancies, essential for the initiation of the reaction. Cubic ceria-zirconia hybrid oxide (CexZr1-xO2) nanoparticles hold great promise as a support for the copper catalysts in the $x > 0.8$ range, as the interstitial zirconium ions induce lattice strain which lowers the activation energy of oxygen vacancy formation caused by the reduction of Ce4+ to Ce3+.

Here, it is necessary to explore the physical and chemical properties of such solid solution nanoparticles, such as particle size, specific area, phase composition and crystal structure. The catalytic performance of these copper-loaded particles will also be determined, using a newly built combined RWGS and WGS reactor.

Engineering

A Compact Sub-Scalp Device for Powering Brain Implants

Authors: Jeremiasz Dados, Rylee Faherty, Gabrielle Summers, Han Wu, Kaitlyn Burstiner, Adam Khalifa

This study explores the system design of an RF transmitter used to power next-generation wireless implantable medical devices. A human-scale, battery powered, proof-of-concept device delivers a 433 MHz signal at ~30 dBm in ~500 µs/s pulses to a transmitter (Tx) coil. The novel device successfully emulates the bulky function generators and power amplifiers which are often used for powering implantable devices.

Engineering

Investigating the Bone Marrow Immune Response during Sepsis using In Vitro and In Silico Models

Authors: Alexandra Davidov, Caleb Faison, Julia Jamieson, Anuj Master, and Jing Pan.

To further the global understanding of sepsis, the UFlorida iGEM team developed in silico and in vitro bone marrow organoid models. In silico, we were able to successfully simulate the growth and differentiation of induced pluripotent stem cells (iPSCs) into a healthy steady-state iPSC-derived bone marrow organoid. We also implemented a pathogenic function into the model and achieved states of aseptic death and full recovery to an altered equilibrium. This model predicted and quantified the immune system's cellular and inflammatory response to a sepsis-like infection. Additionally, we improved the biomanufacturing of in vitro iPSC-derived bone marrow organoids by optimizing iPSC culture and organoid production techniques. We established an improved four-phase differentiation protocol that enhanced aggregation, oxygen level tolerance, organoid viability, and morphology. The development of these dual ex vivo platforms provides a deeper understanding of the cellular changes triggered by sepsis in human bone marrow.

Engineering

Antiviral immunity via de novo tandem repeat proteins

Authors: Jordan Lewis, Stephen Tang, Samuel Sternberg

Recent advancements in molecular biology have unveiled diverse bacterial defense mechanisms against phage infections, prominently featuring defense-associated reverse transcriptases (DRTs). This study focuses on DRT2, a minimal system comprising an RT domain and a noncoding RNA (ncRNA), capable of mounting an abortive infection (Abi) response. We investigate the DRT2-mediated defense mechanism, where the RT performs rolling-circle reverse transcription (RCRT) on ncRNA, generating long cDNA products with concatenated repeats. Upon phage infection, this single-stranded cDNA undergoes second-strand synthesis, forming double-stranded DNA transcribed into concatenated mRNA. The resulting mRNA encodes a nearly endless ORF (neo), which induces programmed cell dormancy, effectively halting bacterial growth.

Our research aims to decipher the biological pathway from Neo protein expression to growth arrest, exploring Neo's oligomerization, subcellular localization, and 3D structure. The goal of this study is to enhance our understanding of the DRT2 defense mechanism, highlighting the potential for innovative biotechnological applications and challenging traditional paradigms of genetic information encoding.

Engineering

Silk nanoparticles: Leveraging protein diversity for drug delivery

Authors: Rebecca Liwang, Andrea Orozcotorres, Lauren Eccles, and Whitney Stoppel

Silk fibroin is a natural polymer that can be manipulated for the creation of biomaterials, such as silk films and microspheres, because of its advantageous structure, biocompatibility, biodegradability, and mechanical properties. Specifically when considering its applications in drug encapsulation and delivery, silk is a suitable material for a nanoparticle system due to its high efficiency in encapsulation of bioactive molecules and tunable release kinetics. In this work, silk fibroin from two silk fiber-producing species, Plodia interpunctella and Bombyx mori, is investigated for biomaterial fabrication due to distinct differences in the amino acid composition and structure of the silk fibroin proteins. We compare the extent to which variances in molecular weight, protein composition, and charges between Plodia interpunctella and Bombyx mori silk influence their capabilities of encapsulation and delivery. Moreover, we evaluated the encapsulation of Alcian Blue and riboflavin, two small molecules with varying size and charge, as an initial comparison of the silk particle systems for drug delivery. Bombyx mori and Plodia interpunctella silk nanoparticles are formed from aqueous silk polymer solution through polyvinyl alcohol (PVA) phase separation. Small molecules can be encapsulated in silk particles through mixing with the silk polymer solution prior to inducing phase separation. We examine particle morphology through scanning electron microscopy (SEM), particle size, stability, and polydispersity through dynamic light scattering (DLS), and encapsulation efficiency through microplate absorbance measurements. In the future, we intend to apply our work towards molecules that are more relevant to biomedical advances that may help improve the current standing of medical treatments.

Engineering

Utilizing 3D Printing to Optimize Silk Fiber Production for Biomaterial Applications

Authors: Isabel L Matías Cruz, Lauren E Eccles, Whitney L Stoppel

The silk produced by the silkworm Bombyx mori has been extensively studied for biomaterial applications, but its rearing and collection presents challenges primarily due to its lack of environmental control (humidity, temperature, etc.). Variations in environmental parameters can increase variability of silk production and resulting silk fiber properties, leading many groups to investigate alternative insect silks, such as that of Plodia interpunctella (P. interpunctella). P. interpunctella can be produced in controlled laboratory settings with limited property variability in collected silk. P. interpunctella are grown in insect rearing boxes in insect incubators, spinning silk fibers along the walls of the container throughout their life cycle. This study aims to utilize 3D printed structures to enhance the yield of silk fiber production of P. interpunctella by increasing surface area available for silk deposition. Customized 3D-printed structures, designed using Onshape software, are inserted into rearing boxes. We hypothesize that increasing hard surface areas within the rearing container will improve our ability to collect higher masses of spun fibers absent of insect debris or contaminants and may increase the total amount of silk produced by the population during a singular life cycle. We aim to improve the total amount silk collected per life cycle per insect rearing box. Silk production is analyzed by mass, sheet thickness, and quality through scanning electron microscopy (SEM), thermal assessments (TGA, DSC), and spectroscopy (FTIR) after collection from the rearing box and 3D printed insert. We will evaluate variability between fibers located on the rearing containing and the 3D printed insert to see if the surface structure impacts fiber deposition. We will also compare silk collected from different populations (different rearing containers, n=3) to evaluate batch to batch variability. This work supports efforts in our research group to evaluate the commercialization potential for silk fibers produced by P. interpunctella.

Engineering

Decellularized Peripheral Nerve Based Injectable Hydrogel for Injured Spinal Cord Regeneration

Authors: Kennedy Moes, Gopal Agarwal, Christine E. Schmidt

Spinal cord injury (SCI) can result in permanent loss of sensory and motor functions. According to the World Health Organization, it is estimated that 15.4 million people were living with SCI globally in 2021. Currently, there are no FDA-approved treatments for locomotor recovery after SCI. Decellularized human peripheral nerves have shown the potential to promote axonal regeneration in peripheral nerve diseases. However, developing an injectable hydrogel using decellularized human nerves is still a challenge due to the presence of lipids. In this study, we developed an injectable hydrogel using decellularized human sciatic nerve (iHPN). Developing an injectable hydrogel allows us to develop a minimum invasiveness hydrogel solution that can be directly administered at the site of injury. Furthermore, the presence of pro-regenerative cues like Collagen I, laminin, and various growth factors can promote axonal regeneration in the injured spinal cord. In the current study, human nerves were decellularized modifying the Hudson protocol previously published by our lab, and delipidated using various organic solvents. The nerves were then digested and neutralized to p.H. 7.4 and to match the CNS native mechanical strength genipin, a natural crosslinker was used. The resultant hydrogels exhibited injectability and mechanical strength that can support neuronal cell growth. Overall, iHPN has the potential to promote axonal regeneration in the injured spinal cord and can also be used clinically as a delivery vehicle for SCI regeneration.

Engineering

AI Meets Qualitative Analysis: Validating LLMs for Automated Theme Coding

Authors: Nishant Nagururu, Ashish Aggarwal

Qualitative research is widely applied across diverse academic disciplines, but its inherent complexity makes it difficult to scale. Traditional qualitative analysis requires the development of relevant themes —recurring concepts that reflect key ideas in the data—through manual examination of the unstructured data. Once identified, these themes guide the coding process, a method of systematically tagging the data with descriptive labels that correspond to each theme. Coding allows researchers to categorize the data, enabling them to recognize patterns, make comparisons, and draw conclusions. While this method is effective for extracting insights from qualitative data, it is subjective, time-consuming, and requires cross validation between multiple human coders, making it impractical for large datasets.

The advent of Large Language Models (LLMs) offers the potential to automate both theme identification and data coding. However, there is limited evidence validating the reliability of LLMs in this context, especially for research applications where accurate thematic classification is critical. LLMs are known to be prone to hallucinations and inconsistent reasoning, which makes it essential to rigorously assess their performance in qualitative analysis.

Therefore, the present study seeks to address this gap by investigating the potential of LLMs to automatically code unstructured data based on predefined themes. Specifically, we evaluate the LLM's coding accuracy by comparing its performance against cross-validated human coders. The dataset consists of education and career histories from thousands of engineering alumni at the University of Florida, scraped from LinkedIn profiles. Human coders labeled the data according to eight predefined thematic categories. The LLM demonstrated promising results, achieving an average accuracy of 89% across all categories. These findings suggest that LLMs hold significant potential for automating the entire thematic analysis process in the future, which would revolutionize the scale, speed, and feasibility of qualitative research.

Engineering

Exploring Protein Networks Driving Heart Regeneration in Axolotls

Authors: Sarah Newcomb, Jasmine McTyer, Whitney Stoppel

Axolotls (Ambystoma mexicanum) are a valuable model in regenerative medicine due to their unique ability to regenerate complex tissues and organs with minimal scarring. This regeneration capability is linked, in part, to specific proteins in the extracellular matrix involved in tissue repair and cellular remodeling. Research comparing gene expression after spinal cord injuries in axolotls and mammals has shown that both species express many of the same ECM (extracellular matrix) genes. However, the exact functions of many of these ECM proteins following expression are still poorly understood. Moreover, the differences in how axolotls and mammals recover and remodel injured tissue following injury is a result of the specific dynamic biological mechanisms, which have yet to be elucidated. To shed some light on the regenerative process, we are studying axolotl ECM dynamics to better understand the protein networks that contribute to the regenerative process and their potential applications in human wound healing.

Specifically, we are interested in the heart as axolotls can fully regenerate their heart when injured through driving cellular differentiation and proliferation. Utilizing histological analysis and STRING bioinformatics, we examined protein expression and interaction networks in the axolotl heart. Histological techniques, including hematoxylin and eosin (H&E) staining, were used to visualize tissue architecture in decellularized tissue. Immunohistological staining can be used to identify specific proteins within the tissue architecture. Using publicly available data, we used a protein interaction software called STRING, which maps protein-protein interactions, focusing on proteins critical to ECM remodeling and inflammation regulation. Results aid in identification of ECM and ECM-associated proteins that are important to axolotl regeneration, which can provide insight on the differences between protein networks and dynamic expression in axolotls compared to humans. We expect this work to shed light on future applications for human wound repair.

Engineering

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Tracking Neural Implant Deterioration Over Time in Mice

Authors: Keaton Carlton, Zakariaou Ibrahimou, Sanika Kurahatti, Daniel Perodin, Benjamin Norbom, Dr. Erin Patrick, Dr. Jack Judy

Neural implants are electrodes placed directly into the brain to record neural action potentials. They have applications in fields ranging from prosthetics to deep brain stimulus. However, the use of neural implants is complicated by the body's reaction to the implant. A better understanding of how the neural implants degrade over time is necessary to design better implants. This research seeks to study how the recordings of neural implants in mice change over time to better understand neural implant deterioration.

Engineering

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Assessing Soil and Vegetation Dynamics in Stormwater Control Measures: Implications for Longevity and Design Recommendations

Authors: Andrea Ortiz, Eban Bean

Urbanization significantly alters natural hydrological processes and balances, primarily through the increase of impervious surfaces such as roads and buildings. This expansion raises stormwater runoff, heightening the risks of flooding and pollutant export from developed landscapes. In Florida alone, a recent study identified over 76,000 stormwater ponds, highlighting the critical need for effective management practices. This project investigates the differences in vegetation and soil properties along a transect originating from a stormwater control measure (SCM) inlet, incorporating sites of varying ages to compare how these factors influence the longevity and effectiveness of these measures. Soil samples were collected from five sites positioned at 1, 10, 18, 30, 55, and 100 feet from the inlet, assessing soil bulk density, penetration resistance, and composition. Concurrently, vegetation surveys evaluated species diversity and density. By comparing sites of different ages, this study provides insights into how long SCMs can remain effective over time. These findings are crucial for understanding how soil and vegetation dynamics impact the performance and longevity of SCMs. Ultimately, this research aims to develop practical design guidelines for the construction and maintenance of infiltration basins, ensuring their effectiveness as tools for managing stormwater in urban environments.

Engineering

Cellular Response to Neural Implants in Spiny Mouse

Authors: Sebastian Pena, Malcolm Maden, Janak Gaire

The spiny mouse (Acomys cahirinus) is a unique rodent known for its exceptional regenerative abilities, capable of restoring various tissues including skin, muscle, kidney, and spinal cord with minimal to no scarring. This study investigates whether the Acomys' regenerative capabilities extend to its brain in response to implanted biomaterials, specifically on the brain cortex. To understand the response, we implanted silicon electrodes in Acomys and Mus musculus, a traditional laboratory mouse model that responds to injury with scar formation. Animals were euthanized at 4 and 28 days post-implantation (DPI), and brains were collected. Brain tissue sections were analyzed via immunostaining with specific markers for microglia/macrophages (Iba1), reactive astrocytes (GFAP), and neuronal nuclei (NeuN), followed by imaging with a confocal microscope. A custom Python macro facilitated automated cell quantification, showing strong consistency with manual counts and software like ImageJ. The results of the 28 DPI samples revealed a higher GFAP+ intensity near the implant site in Acomys compared to the Mus. Iba1+ levels were similar within the first 25 μm near the implant site for both species, but the Acomys has reduced Iba1+ intensity as we moved further away from the implant compared to the Mus. We are optimizing the pipeline for neural count for higher accuracy; however, preliminary data show little differences in NeuN+ cells observed between species. Additional investigations are underway to understand the underlying mechanisms of reduced inflammation and identify the genes associated with the reduced FBR observed in Acomys.

Engineering

Artificial Intelligence (AI) in Education: Students' Usage & Perceptions of AI

Authors: Griffin Pitts, Riya Saraf, McKenzie Landrum, and Sanaz Motamedi

As artificial intelligence (AI) becomes increasingly prevalent in society, students now have greater access to AI tools, particularly AI conversational agents like ChatGPT. This study investigates students' usage patterns of AI conversational agents and examines the relationship between usage frequency and trust levels through a Qualtrics survey. Results from undergraduates (n = 76) showed that 68% used AI agents monthly or weekly, with only 12% reporting no usage. Academic purposes dominated usage patterns at 79%, though entertainment and work-related applications were also reported. Notably, the study revealed a significant relationship between usage frequency and trust: frequent users demonstrated moderate trust levels, while less frequent users reported higher overall trust. This finding suggests that increased interaction with AI leads to more calibrated expectations, as users develop what has been termed "appropriate reliance" through direct experience with the technology's capabilities and limitations. In contrast, infrequent users tend to maintain higher trust levels, potentially reflecting broader societal optimism about AI rather than experience-based assessment. These insights into how students engage with AI tools and develop trust through usage provide valuable context for understanding student perspectives on AI in education, which can inform future research on optimizing these tools for student success.

Engineering

CyberGator: A Resilience Assessment Framework for Adaptive Cyber Defense against Advanced Persistent Threats

Authors: Ozlem Polat

The rise in cyber threats targeting critical infrastructure has intensified the need for resilient systems capable of adaptive responses to sophisticated attacks. This research introduces CyberGator, a comprehensive framework for evaluating and enhancing the resilience of complex information systems. CyberGator initially models resilience by integrating system architecture, CVEs, personnel roles, and environmental factors with a Bayesian network and Finite State Machine (FSM) framework to simulate responses under Advanced Persistent Threats (APTs). This approach dynamically scores resilience and assesses recovery pathways, producing actionable insights for system-hardening strategies.

Building on this foundation, the next phase involves developing machine learning (ML) algorithms for continuous cyber resiliency assessment. By leveraging data from simulated attack trees, FSM state transitions, and Bayesian inference, CyberGator aims to integrate ML models capable of predicting resilience degradation patterns and optimizing recovery strategies based on real-time threat intelligence. This enhanced framework aspires to aid in the development of autonomous systems that not only withstand but also evolve in response to emerging cyber threats, contributing to the advancement of resilient cyber defense architectures and automated security interventions.

Engineering

Microgravity-Sensed Regulation of Gene Expression in Different Bacteria

Authors: Wyatt C. Powell, Anya Volter, Hannah I. Roberts, Amor A. Menezes

Microgravity during spaceflight alters bacterial gene expression1. For instance, Hfq, a small ribonucleic acid (sRNA) chaperone that regulates protein expression by sequestering messenger RNA (mRNA), is downregulated in bacterial cells experiencing microgravity 1. Previously, a microgravity sensor that leveraged Hfq downregulation to regulate gene expression was designed and tested in Escherichia coli 2. This sensor can be used to switch on the heterologous bioproduction of essential medicines in bacteria only during space travel, an approach that can save feedstock resources so that useful products are manufactured only as needed. There are numerous candidate bacteria that are being evaluated as host organisms for space biomanufacturing. These include Vibrio natriegens and Pseudomonas putida, and we have previously engineered both organisms to produce □-carotene, a provitamin, in space. To compensate for species-specific effects of microgravity on biomanufacturing, such as variations in Hfq downregulation, we tested the efficacy of the E. coli microgravity sensor in V. natriegens and P. putida under simulated microgravity. We grew microbes transformed with the sensor in slowly rotating 3D cell culture bioreactors known as High Aspect Rotating Vessels (HARVs). Each HARV provides low-shear modeled microgravity to its culture. Our results confirmed that sensor expression is specific based on species, and we obtained insights into future sensor re-design to improve its performance in different space biomanufacturing hosts.

Engineering

Comparison of GRACE and SynthSeg Deep Learning Models for Whole-Head Brain Segmentation

Authors: Jason Chen, Veronica Ramos, Skylar Stolte, Aprinda Indahlastari, Adam Woods, Ruogu Fang

Transcranial direct current stimulation (tDCS) shows promise as a treatment for neurological diseases; however, improvements must be made to improve consistency. One reason for variability is anatomical differences amongst patients, such as variations in skull thickness and brain shape. Whole-head brain segmentation of individuals can be used to plan targeted treatments that optimize the tDCS parameters. Manual or semi-automatic whole-head brain segmentation is work-intensive and time-inefficient, taking 22-30 hours per individual head. Deep learning models can provide fully automated segmentation tasks to counteract this. This work trained two deep learning segmentation pipelines from the GRACE and SynthSeg models using Magnetic Resonance Imaging (MRI) scans of older adults to evaluate their performances. Our analysis reveals that the GRACE model outperforms SynthSeg in terms of alignment with ground truth annotations, as evidenced by a lower average Hausdorff distance and higher average DICE score. However, it is imperative to contextualize these findings within the framework of differing model architectures to attain a more nuanced understanding of the observed disparities. The use of deep learning models for segmentation can allow for more accurate and rapid parameter estimation in tDCS intervention.

Engineering

Developing biopolymer production using Plodia interpunctella as a novel insect platform

Authors: Liam Rodgers, Bryce Shirk, Marisa Pacheco, Jasmine McTyer, Cecilia Rodriguez, Lauren Eccles, Whitney Stoppel

As demand for sustainable alternatives to synthetic polymers rises, silk from Bombyx mori is being explored for applications in drug delivery systems and tissue engineering. Silk fibroins (SFs) offer exceptional mechanical properties, but current methods for functionalizing B. mori-derived SFs post-reconstitution are inefficient, complex, and costly, limiting scalability for medical devices. While synthetic biology holds promise for enhancing silk biopolymers, rational design efforts face challenges such as producing full-length, glycosylated, and repetitive proteins in recombinant systems, along with issues in the genetic engineering of B. mori.

To address these limitations, we developed a CRISPR/Cas9-driven homology-directed repair (HDR) strategy in Plodia interpunctella, an alternative silk source. This globally distributed pest has been extensively reared in laboratories, making it an ideal candidate for scalable and ethical silk production. We successfully generated a stable germline-transformed strain expressing a fusion protein that combines native silk with mNeonGreen. By leveraging P. interpunctella's silk-producing machinery, we aim to preserve the natural silk fibers' complex architecture while introducing beneficial modifications. We also designed a secondary containment unit using Autodesk AutoCAD, featuring arm holes for ease of silk collection and a controlled CO_2 delivery system for efficient egg harvesting. This enhances process efficiency and prevents larvae from escaping, ensuring ethical rearing of the modified insects while improving production conditions. Future work will focus on characterizing the mechanical and biochemical properties of the modified silk fibers to assess their potential for medical and industrial applications. Our approach provides a scalable platform for designing silk-based biopolymers with improved functionality, maintaining silk's inherent advantages while enabling customization for advanced uses.

Engineering

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Modulating Homology Arm Length for Improved Gene Integration Efficiency in IAL-PiD2, a Plodia interpunctella Cell Line

Authors: Cecilia Rodriguez, Bryce Shirk, Jasmine McTyer, Liam Rodgers, Paul Shirk, and Whitney Stoppel

Insect cell lines have demonstrated exceptional potential within applications in vaccine technology, therapeutics, and recombinant protein production. Through genetic modification, insect cells have been engineered to replicate the protein glycosylation patterns of mammalian cells, offering a potentially safer and more cost-effective alternative for glycoprotein production. There are over 100 insect cell lines commercially available, yet few have been assessed for applications in recombinant protein production. IAL-PiD2 cells derived from the wing imaginal disks of Plodia interpunctella, could provide a valuable platform for recombinant technology. Therefore, we aimed to determine the feasibility and efficiency of modifying IAL-PiD2 using tools like CRISPR Homology Directed Repair for precise genomic integrations. We designed constitutive promoter-driven constructs with the mNeonGreen protein insert for our DNA template, in order to attain the desired green fluorescence phenotype. We sought to evaluate the efficiency of two homology arm constructs and quantify their integration efficiencies.3 IAL-PiD2 cells were seeded in triplicate within a 24 well plate at 100,000 cells per well and reached roughly 65% confluency before transfection with the CRISPR/Cas9 complex with the template. This confluence level was chosen to represent a point where the cells were rapidly dividing while allowing space for continued cell growth during the 7 day period we monitor gene expression intensity. We assessed the constructs' transfection efficiencies over time using fluorescence microscopy. To quantify cell expression and fluorescence intensity across many images, we developed a CellProfiler® pipeline to count the total cells in each well and quantify the cells expressing the desired phenotype via intensity limits. We compared the results with flow cytometry data as well. Based on Day 7 data, the 500 base pair homology arm construct was the most efficient by roughly 44%. Future work aims to compare transfection efficiency in Sf9 cells with the results obtained in IAL-PiD2 cells.

Engineering

Effects of Loop Primers on the Detection Of CHIKV Using Loop-Mediated Isothermal Amplification

Authors: Rebecca Rollins, George Adedokun, Z. Hugh Fan

Reverse transcription loop-mediated isothermal amplification (RT-LAMP) assays are vital in the developing field of pathogen detection, particularly for point-of-care diagnostics. While conventional RT-LAMP employs either 4 or 6 primers (two inner, two outer, forwards loop, and backwards loop), this study investigates the efficacy of a five primers system using Chikungunya virus (CHIKV) as a model pathogen. Traditional loop primers are known to accelerate LAMP reactions by providing additional priming sites at stem-loop structures formed during amplification. Our research shows that a single loop primer configuration can achieve amplification efficiency comparable to the standard two loop system and significantly outperforms the basic four-primer system in the primer set studied and likely others with similar features. The two five-primer configurations demonstrated distinct performance patterns; utilizing either forward or backward loop primers independently resulted in differential amplification efficiencies, suggesting position-specific effects on reaction dynamics. These variations between forward and backward loop primers provide valuable insights into primer design optimization. Although the complete six-primer system maintained superior performance, specifically a superior reaction rate, our findings indicate that five-primer configurations offer a viable alternative that balances efficiency with reduced primer design constraints. This study expands our understanding of RT-LAMP primer optimization and demonstrates that single loop primer systems can serve as an effective intermediate solution when resource conservation or sequence limitations make the traditional six-primer design challenging. These insights contribute to the ongoing development of more flexible and efficient molecular diagnostic tools.

Engineering

Evaluating Gene Integration Efficiency in IAL-PiD2, a Plodia interpunctella Cell Line

Authors: Cecilia Z. Rodriguez, Elena Rollins, 1 Bryce D Shirk, 2 Jasmine B McTyer, 1 Liam Rodgers, 1 Paul D Shirk, 3 and Whitney L Stoppel 1,2

Genetically modified insect cell lines have demonstrated exceptional potential within applications of vaccine technology, therapeutics, and recombinant protein production. An example of this are Sf9 cells which were utilized to create the baculovirus expression system, allowing for recombinant protein vaccine production to be faster, highly scalable and cost efficient. Despite over 100 insect cells available commercially, very few have been assessed for use in recombinant protein production. Gene editing pathways include piggyBac-based methods, which integrate genes randomly, and targeted gene editing using CRISPR/Cas9.Targeted methods allow for precise and stable genomic interactions and have expanded the potential for future applications in human therapeutics. While research in genetically manipulating them is lacking, a potential cell line to be used in recombinant technology is IAL-PiD2 cells, attained from the wing imaginal disks of Plodia interpunctella. Therefore, it is aimed to determine the feasibility and efficiency of modifying IAL-PiD2 using tools like CRISPR/Cas9.Constitutive promoter-driven construct sequences were designed with the mNeonGreen protein insert in order to create a template DNA, hypothesizing that these sequences would allow for an easily recognizable phenotypic green fluorescence. IAL-PiD2 cells were seeded in triplicate within a 24 well plate at 100,000 cells per well and reached roughly 65% confluence after 48 hours before transfection with the CRISPR/Cas9 complex and template. Three commercial transfection reagents from Mirus Bio® were selected to compare their efficiency in expressing mNeonGreen phenotype by evaluating the number of transfected cells and fluorescence intensity. A CellProfiler® pipeline was created to count total cells in each well and quantify their fluorescence intensity based on a desired threshold. Over the course of 7 days, transfection efficiency steadily increased, with the highest expression on day 5. The most efficient reagent was TransIT®-Insect, and IAL-PiD2 cells will be compared with Sf9 in future work.

Engineering

Optimization of an Open-Source Bump Emulation System for Human Balance and Gait Research

Authors: Clara Summerford, Jessica Allen

The rehabilitation of stroke survivors as well as the prevention of fall-related injuries in elderly populations are major motivations for recent biomechanics research. Common experimental procedures to investigate the neuromechanical principles behind human locomotion include standing and walking perturbations to simulate a loss of balance. In this project, we will be replicating an open-source bump emulator developed by Stanford University to implement side-to-side perturbations at the hip into our existing experimental capabilities. The system will consist of a rope attached to a harness at the subject's pelvis capable of transmitting perturbations in the transverse plane with forces up to 200N. A closed-loop controller will increase the precision of the system while simultaneously decreasing the rise time of the signal transmitted to avoid having the subjects anticipate and adjust to the oncoming perturbation. This system will be combined with a split-belt treadmill upon which the subjects will stand or walk while attached to a harness, thus increasing the variety and complexity of experiments that can be run here at the University of Florida.

Engineering

Large language modeling predictions of missense variant pathogenicity via 3D protein structure

Authors: Dylan Tan, Xin Li, Xiao Fan

The clinical genetic testing pipeline has become essential in modern healthcare, allowing for the identification of genetic variants that can impact patient diagnosis and treatment. However, a critical bottleneck exists in the pipeline as determining the clinical relevance of these variants, especially variants of uncertain significance (VUS), remains a significant challenge and impediment to the clinical genetic testing pipeline's efficiency. Our project sets out to address the low-throughput variant interpretation bottleneck in the clinical genetic testing pipeline. Our project utilizes ESM2 embeddings and Alphafold2 predicted protein 3D structure as features to train a multi-layer perceptron model to predict the effect of genetic variants. In our project we performed an ablation study between a model with ESM2 embeddings and a model with additional 3D structure data and found little to no difference in the performance on our ClinVar dataset. We were able to achieve an AUROC score of 0.86 with both models.

Engineering

Optimizing the Electrogelation Process for Bombyx mori Silk Solution

Authors: David P. Tran, William L. Gross IV, Gloriana F. Valladares Lima, Zella M. Tavai, and Whitney L. Stoppel

Hydrogels derived from biomaterials have gained significant attention in medical applications due to their biocompatibility, biodegradability, and ability to mimic the native cellular environment. Current applications of hydrogels include tissue scaffolding, wound healing dressings, cell culture systems, and drug delivery systems. Research has explored engineering silk fibroin from the silkworm Bombyx mori to form hydrogels. One method to create silk hydrogels is the application of direct current across the silk solution to decrease the local pH at the anode below the isoelectric point of the silk fibroin solution (approximately 4.2), inducing gelation and forming an e-gel. One drawback of the electrogelation method is the evolution of gas bubbles from water electrolysis. The gas bubbles become entrapped in the silk solution and the resulting hydrogel, leading to defects. In addition, the gas bubbles increase ohmic resistance, slowing gelation, and deforming the resulting e-gel. We investigate the use of an electrolytic cell that allows the gas generated at the electrodes to escape the cell, thereby reducing bubbling and improving the homogeneity of the resulting hydrogel. By improving gas release, we also aim to make the electrogelation process of B. mori silk solution faster and less energy intensive. The success of our cell will be quantified by comparing the rate of gelation to the current method used in literature. We will characterize the mechanical properties of the hydrogels through shear rheology and a uniaxial adhesion test. Unbound leeched protein will be characterized by FTIR, as we also aim to prevent any unwanted cytotoxicity. Ongoing research will evaluate the hydrogels' dynamic crystallization and explore potential applications as a biomaterial.

Engineering

Chemical crosslinking density and linker length tune time-dependent silk fibroin hydrogel mechanical properties

Authors: Travis D Truong, Marisa O Pacheco, Isabelle K Gerzenshtein, Hannah K Bagnis, Whitney L Stoppel

Silk fibroin-based hydrogels, derived from the cocoons of Bombyx mori (Bm), are a promising class of biomaterials used in various biomedical applications. Attributes including tunable crosslinking and degradation rates make silk fibroin a favorable biopolymer for hydrogel formation. Previous work showed that silk hydrogels exhibit time dependent stiffening due to physical crosslinking via the formation of β-sheet crystalline structures in the silk protein. Multiple variables are hypothesized to impact the rate of stiffening, including silk molecular weight and concentration. However, the rates of physical crosslink formation remain difficult to control. We seek to find alternative parameters associated with the initial chemical crosslinking of a silk fibroin network to tune the rate and extent of physical crosslinking and dynamic stiffening in the hydrogel system. We hypothesize that increased chemical crosslinking can reduce the amount of beta-sheet formation of the hydrogels and create a more elastic hydrogel with slower stiffening rates. Multiple chemistries with varying crosslinker lengths can be used to covalently crosslink the silk fibroin protein. These chemistries include horseradish peroxidase (HRP) mediated dityrosine crosslinking, and photocrosslinking following the incorporation of methacrylate or norbornene. Chemical crosslinking density can be modulated by increasing the number of photocrosslinking sites by adding amine groups to silk tyrosine residues. We investigate the impact of chemical crosslinker length, chemical crosslinking density and molecular weight of the silk fibroin on mechanical properties of silk fibroin hydrogels, including storage modulus, elastic modulus, and stress-relaxation half-life, over 2 weeks. We also assess the impact of dynamic hydrogel mechanics on fibroblast phenotype. With this increased understanding and control of the time-dependent properties, silk hydrogels can better serve as in vitro dynamic stiffening disease models.

Engineering

Noise-Optimized Pressure Sensing at Extreme Temperatures: Modeling and Signal Conditioning for Harsh Environments

Authors: Xiya Zhou, Alexander Reilly, Mark Sheplak

Accurate, high-bandwidth pressure sensors capable of enduring extreme temperatures are essential for applications such as hypersonic flight vehicle design, geothermal energy harvesting, and space exploration. This research focuses on addressing the challenges in testing and modeling such devices, which require the integration of electrical, mechanical, and acoustic domains. A major challenge lies in developing an overall noise model, as noise interactions between these domains are complex and difficult to gauge without the methods utilized in this work.

The project employs lumped element modeling to analogize energy storage, dissipation, effort, and flow sources between the electrical and acoustic domains, and unites them into a single overall circuit model. My role involves designing circuits to assist in testing the piezoelectric pressure sensor at extreme temperatures, using MATLAB and LTSpice for noise modeling. Traditional electronics cannot survive the required temperatures (>800°C), necessitating thermal isolation, which introduces parasitics that need to be properly managed in order to maintain a good signal to noise ratio (SNR).

Through circuit topology modeling, I found that while voltage amplifier topologies generally offer a lower noise floor, charge amplifiers are better for this project's application because they maintain stable sensitivity by mitigating the effects of parasitic capacitance. A fabricated PCB using the charge amplifier design demonstrated wide bandwidth, stable gain, and low noise floor. The impact of this work could be very significant for space exploration, where accurate pressure sensors are crucial for extreme environments like Venus. Future work includes monolithically integrating the signal conditioning circuit and the pressure sensor on the same die to further minimize parasitic losses and device noise floor.

Engineering

Ecological Niche Models Reveal Climate Threats to Florida's Hardwood Forest Biodiversity

Authors: Sydney L. Barfus, Cameron J. McMullen, Makenzie E. Mabry, J. T. Miller, Pamela S. Soltis, and Douglas E. Soltis

Florida hardwood forests are important ecosystems that support diverse temperate plant species at their southernmost distributions within the North American Coastal Plain biodiversity hotspot. These forests are increasingly threatened by human activities including deforestation, changes in land use, and the challenges induced by climate change, necessitating the development of ecological niche models to predict the putative distributions of key hardwood forest species in the future and inform conservation strategies. Using occurrence data collected from global biodiversity databases such as GBIF and iDigBio, we compiled, cleaned, and filtered thousands of records for native hardwood forest species. Environmental variables were used to map current suitable niche distributions and then to estimate potential future habitat availability under various predicted climate scenarios. These ecological niche models provide important insights into the potential impacts of climate change on species distributions, enabling a deeper understanding of how the species comprising these hardwood forest ecosystems may shift in the future. Our findings can help guide conservation efforts to protect Florida's hardwood forests, ensuring the preservation of biodiversity and ecosystem function amidst ongoing environmental changes.

Modeling Tomato Wild Relatives Distributions to Uncover Climate-Ready Traits

Authors: Sebastian Fernandez, Makenzie E. Mabry, Tyler Radtke, Tori M. Ford, Jonathan C. Barz, Douglas E. Soltis & Pamela S. Soltis

Densely nutritious and with a near-global popularity, tomatoes (Solanum lycopersicum) stand as a universally appealing vegetable crop with great potential to address the growing demand for food. However, the effects of climate change threaten to upend the production of most tomato varieties. Therefore, prioritizing the development of climate-ready tomato crops is a must. Studying the wild relatives of other crops has already yielded promising results, particularly in cultivating blight-resistant potato varieties. This success emphasizes the importance of evaluating wild species of tomatoes for climate-ready genes that can be introduced into S. lycopersicum. Using environmental niche modeling (ENMs), we predict the responses of wild tomato species to climate change by identifying the factors that influence their habitat suitability. Locality information for 12 different tomato crop wild relatives (CWRs) was sourced from the records of natural history collections. Combining this data with environmental variables (soil pH, carbon, etc.) and 19 layers of the current (1970-2000) bioclimatic variables from the WorldClim v2.0 database yielded ENMs for each of the species. Models were then projected across global croplands to future climate conditions to assess shifts in species' habitat suitability. Future climate projections were based on the ACCESS-CM2 and GISS-E2-1G models for periods 2041-2060 and 2081-2100. Three Shared Socioeconomic Pathways (SSPs) 2-4.5, 3-7.0, and 5-8.5 were employed to capture varying levels of climate change. Species that demonstrated a growth in their habitat suitability indicated climate-ready adaptations.

An Evaluation of the MAWS Model for Marine Image Processing

Authors: Paraman Galipalli, Arthur Porto

Effective monitoring and classification of marine species are essential for assessing ecosystem health, guiding conservation, and supporting sustainable ocean management. This study evaluates the MAWS model, a machine learning model developed by Facebook, originally trained on diverse social media images from their platforms like Instagram, for its adaptability to classifying marine life. Leveraging its unsupervised learning approach, which autonomously identifies patterns without labeled data, MAWS is well-suited to datasets with limited representations per category. Using a curated dataset of underwater images from the Florida Museum of Natural History, covering various marine taxa with sparse examples per species, we assess MAWS in the challenging domain of marine biodiversity. Our findings indicate that while MAWS achieves reasonable accuracy across phyla, it struggles with more precise distinctions within phyla and especially among visually similar taxa. These results indicate that MAWS has potential for specialized applications that require nuanced image classification. With targeted adjustments—such as fine-tuning on domain-specific data —MAWS could enhance its utility for biodiversity research, enabling efficient monitoring with less reliance on extensive labeled datasets. This exploration of MAWS' adaptability underscores the potential for machine learning models in ecological and conservation research, especially in settings with data constraints.

A systematic review of the Memphis acidalia species complex

Authors: Kaylie Johnson and Keith R. Willmott

The genus Memphis (Lepidoptera: Nymphalidae: Charaxinae), encompassing over 60 species, represents a significant component of neotropical butterfly diversity, particularly in canopy habitats across Central and South America. This study investigates the taxonomy of Memphis acidalia and its related taxa, with a focus on clarifying species boundaries and addressing the challenges posed by pronounced sexual dimorphism and intraspecific variation. M. acidalia, distributed east of the Andes and extending into the western Amazon, exhibits notable morphological variability, complicating its taxonomic resolution.

We addressed three primary objectives: (1) to refine the identification of conspecific males and females, (2) to determine species delimitation within the M. acidalia complex, and (3) to establish accurate taxonomic nomenclature. A combined approach of morphological assessment and molecular analyses, including standard DNA barcoding and dissection techniques, was employed. Historical taxonomic literature was also reviewed to resolve ambiguities. Data were gathered through collaboration with the McGuire Center for Lepidoptera and Biodiversity and Universidade Estadual de Londrina, utilizing comprehensive specimen collections, barcodes, and associated metadata.

The findings contribute to a more robust understanding of Memphis systematics, providing essential insights into neotropical butterfly diversity, with implications for species conservation and ecological monitoring programs.

Florida Museum

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Path to Food Security: Investigating the Utility of Feral Populations for Brassica Crop Breeding

Authors: Julia H. Seifer, Makenzie E. Mabry, Alex C. McAlvay, Douglas E. Soltis, and Pamela S. Soltis

Feral plants are valuable, yet underappreciated, genetic resources that could improve the yield of existing crops and increase our understanding of evolutionary processes. Our research works to expand our current knowledge of feral crops through ecological niche modeling (ENM) for Brassica oleracea and Brassica rapa, projecting these onto maps of current and future environmental conditions, enabling us to better understand abiotic limits of species distributions and how this may be impacted by climate change. One challenge in developing ENMs is finding occurrence records that accurately reflect species records. Utilizing artificial intelligence software, we mapped geolocation data based on land use and compared this information with manual categorization findings, ultimately to differentiate between feral, wild, and cultivated collections of Brassica. Niche modeling can point to which feral populations may handle climate change-related stresses (i.e., temperature, salinity, water) best, which can be leveraged for targeted collection of new germplasm. This can then be evaluated for genes associated with pathogen resistance and overall environmental stress tolerance. Overall, we hope our research highlights the pivotal role of digitized natural history collections with georeferenced locality information. These collections, often overlooked, represent an expansive and underutilized reservoir poised to significantly contribute to the development of climate-ready crops.

Florida Museum

Effects of CO2 on Reaction Time

Authors: Isabella Abad, Rachael Seidler

Aboard the International Space Station, carbon dioxide levels can reach to about 5000 ppm which is over 10 times higher than ambient outdoor terrestrial levels. An increased exposure to carbon dioxide has been shown to negatively impact one's health in the form of cognition deficits, headaches, and one's glymphatics system. This negative impact on an astronauts' health becomes even more detrimental when they have to carry out Extra Vehicular Activities which requires fast reaction times that may be affected by elevated CO2 levels. To explore this, 7 participants were studied in two eight-hour sessions, one in which they breathed carbon dioxide and another in which they breathed ambient air. Participants performed the Defense Automated Neurobehavioral Response Assessment (DANA) which measured their reaction time. They also wore a CareTaker device that recorded their physiological responses (heart rate, respiration rate, MAP, systolic and diastolic blood pressure). The vital signs showed changes between the ambient air and CO2 sessions. Furthermore, participants that showed a larger increase in heart rate from their ambient air to their CO2 session had the most slowing in simple reaction time.

Health and Human Performance

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College students' perceptions of the quality, acceptability, and usability of two alcohol tracking mobile applications

Authors: Rory Angelus; Emily Murray; Elena Kalina; Nichole Scaglione

Introduction: Heavy drinking among college students (4+/5+ drinks for women/men) is a national public health concern, and mobile app-based alcohol tracking may be an effective intervention. However, most available alcohol tracking apps on commercial platforms lack empirical testing. College students' perceptions of these apps' quality, acceptability, and usability remain unclear. Using two highly-rated commercially available alcohol tracking apps to pilot test measures of (1) usability and acceptability, (2) quality, and (3) app preference among college students.

Methods: College students (n = 5) compared the 'Alcohol Tracker⁰' (AT) and 'DrinkControl: Alcohol Tracker' (DC) using a Qualtrics survey. Measures included the System Usability Scale (10 items) and the Mobile Application Rating Scale (27 items), which assessed each app's overall quality (i.e., engagement, functionality, aesthetics, and information), subjective quality, and impact, all rated on a 5-point Likert scale.

Results: Most students (75%) preferred DC, with only 25% favoring AT. Quantitative measures indicated DC (M = 73.1, SD = 35.73) was more highly accepted compared to AT (M = 89.2, SD = 3.82). Students also rated DC as having greater overall app quality (i.e., engagement, functionality, aesthetics, and information), subjective quality, and impact scores.

Conclusion: Overall, respondents preferred DC to AT in app quality, acceptability, and usability. Due to the small sample size in this study, further replication is necessary to confirm the findings. Still, results of this study can inform the development and refinement of alcohol tracking apps for college students by providing novel insight into the preferences of college students in app usability, design, and function.

Sepsis Promotes Cellular Senescence in Mouse Skeletal Muscle

Authors: Armina Azam, Franccesco Boeno, Orlando Laitano

Background: Sepsis is a life-threatening condition caused by immune system overreaction that affects 1.7 million adults in the U.S. yearly. Patients experience prolonged periods of bed rest in the intensive care unit (ICU), amplifying skeletal muscle dysfunction and leading to cellular senescence. Senescent cells lose their ability to divide and regenerate, diminishing cellular regeneration capacity. A common marker of these senescent cells is overexpression of protein p53. Sex differences in muscle physiology may influence sepsis progression, highlighting the importance of research in females under septic conditions. In this study, we used hindlimb suspension (HLS) to promote muscle disuse replicating septic patients in ICU. We hypothesize that the combination of sepsis and HLS will result in the highest expression of protein p53. Methods: We conducted experiments in 20 wild-type C57Bl6 female mice. They underwent either cecal ligation and puncture (CLP, n=10) to induce sepsis, or sham surgeries (n=10). Four days post-surgery, animals were assigned to either HLS (CLP- HLS, n=5; Sham HLS, n=5) or normal ambulation (CLP NA, n=5; Sham NA, n=5) for seven days. Terminal experiments were conducted after HLS or NA interventions. Animals' body weights were recorded before surgery and at the terminal experiments. A western blot analysis was performed on gastrocnemius muscle homogenate. The abundance of protein p53 served as a marker for the presence of senescent cells. Results: We observed a body waste of ~9% (-2.1±0.5 g, $p<0.05$) in the CLP HLS groups. When compared to the sham NA group, CLP NA showed an increase of 2.44-fold of change in p53 expression ($p<0.05$), sham HLS showed an increase of 1.14-fold of change, and CLP HLS showed an increase of 2.31-fold of change ($p<0.05$). Conclusion: Sepsis leads to an increased expression of p53 in young female mice, while only the combination of sepsis and HLS exacerbates body waste.

Health and Human Performance

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Postural reminders reduce symptoms associated with mobile phone use

Authors: Jenessa Bailey, John Stauffer, and Paul Borsa

Text Neck Syndrome (TNS) is a modern musculoskeletal condition characterized by neck pain caused by prolonged cervical flexion, often as a result of the extensive use of mobile devices. According to national averages, university-aged individuals report screen time exceeding 8.5 hours daily. As mobile devices continue to function as indispensable tools in today's society for both academic and entertainment purposes among the young-adult population, understanding the relationship between posture and pain has become a worthy scientific inquiry. The purpose of this study was to investigate the efficacy and acceptability of a mobile application which sent "posture check" push notifications to the user's device if the angle of their screen was less than 45° in relation to their head. Such a situation indicating the possibility of poor posture. Thirty-two university students participated in this 14-day trial, completing 2 laboratory visits to the Days 1 and 14. Participants completed a variety of repeated surveys as well as pain pressure threshold testing, range of motion assessments, and postural analysis testing to provide both qualitative and quantitative metrics to indicate the presence of poor cervical posture. Findings indicated that cervical flexion, pain, and disability decreased (p-values ≤ 0.4). Additionally, overall functionality was determined to have increased (p-values ≤ 0.14), demonstrating that the application was effective in increasing postural awareness and thereby promoting better posture. These findings call for further investigation of the relationship between postural awareness and reported musculoskeletal neck pain.

Health and Human Performance

Comparison of finger tapping velocity features between groups of healthy control, iRBD, and Parkinson's Disease using video based analysis

Authors: Carolina Calonge, Gabriela Acevedo, Diego L. Guarin

Parkinson’s disease (PD) is the second most prevalent neurological disorder after Alzheimer’s disease. Many individuals with PD were initially diagnosed with Idiopathic Rapid Eye Movement Sleep Behavior Disorder (iRBD), a condition where dreams are enacted during REM sleep, making iRBD a key precursor to PD. The challenge is identifying when iRBD converts to PD, which could be shortly after diagnosis with iRBD or the conversion to PD may never occur. This poster presents a comparison of movement velocity features among healthy controls (CON), iRBD, and PD groups during a bradykinesia task (finger tapping) using video based analysis. The statistical analysis starts with ANCOVA to detect significant differences across all groups, followed by a Tukey Honest Significance test to compare PD vs. CON, PD vs. iRBD, and iRBD vs. CON. Results align with previous literature, showing significant differences between PD and CON, but no notable difference with iRBD comparisons. However, these results show that video based analysis can be a potential solution to identify when iRBD converts into PD and as an at home analysis tool. A hypothesis suggests that the iRBD population may be split, with some individuals closer to PD symptoms and others to CON. When combined, these subsets show no significant differences. Future research should include disease duration and symptom severity as covariates.

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Examining the ALPS-index as a predictor of mobility changes in older adults

Authors: Regena M. Darbouze, Sophia Larralde, Marina Arnold, Sumire D. Sato, David J. Clark, Daniel P. Ferris, Chris J. Hass, Todd M. Manini, Rachael D. Seidler

The glymphatic system facilitates efficient waste clearance in the brain, supporting neural function. The ALPS-index evaluates cerebrospinal fluid and interstitial fluid (CSF-ISF) exchange by measuring diffusivity along deep medullary veins near the lateral ventricles (ALPS; Taoka et al., 2017. Jpn J Radiology). Glymphatic function declines with age and may contribute to motor impairments. The accumulation of toxins can contribute to neuronal damage, which is seen in various neurodegenerative diseases. Lower ALPS-index may predict declines in walking speed before neurodegenerative symptoms manifest. This study examined whether changes in CSF-ISF exchange are associated with longitudinal change in walking speed in older adults.

Methods: Twenty-one young adults and 85 older adults participated in structural T1 and diffusion-weighted brain MRI scans. CSF-ISF exchange was calculated using the ALPS equation (ALPS index = mean[Dxproj, Dxassoc] / mean[Dyproj, Dzassoc]). Walking mobility was evaluated through a 400-meter walk test. ALPS-index differences between younger and older adults were assessed with an independent t-test. Changes in walking speed were calculated by: Δ = 6-month outcome - baseline outcome, as well as 12- and 24-month outcomes. Spearman's correlation analysis was performed to examine the relationship of ALPS index and longitudinal changes in walking speed.

Results: Young adults exhibited a higher ALPS-index compared to older adults ($t = -8.72$, $p = 0.001$). Among older adults, a higher ALPS-index was significantly associated with increased walking speed over six months (Spearman's rho = 0.36, $p = 0.016$). There were no associations with 12- or 24-month changes. We speculate that the six-month positive association may reflect participants initially increasing their walking activity upon enrolling in the study. These findings suggest that higher CSF-ISF exchange may support motor function in older adults by removing waste products that could impair motor pathways.

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Gender Differences in Weight Status, eHealth literacy, and Lifestyle Management among African Americans: A Cross-Sectional Survey

Authors: Janiyah Joseph, Delores James

The obesity epidemic in the United States presents a significant public health challenge, disproportionately affecting African Americans (AAs), particularly women. Obesity is linked to various health conditions, poor health outcomes, and reduced life expectancy. The study assessed eHealth literacy, obesity status, weight satisfaction, and lifestyle changes needed to improve overall health and wellness among AAs. A convenience sample of AA (n=763) completed a self-administered survey over a 10-month period. Participants were recruited from churches, beauty shops, barbershops, and community events. The sample consisted of 70% females (n=534) and 30% males (n=229), with mean age of 37.0 ±14.70. Women had significantly higher BMI than men (29.89 ± 8.01 vs. 28.26±6.66, p<.01). They also had higher mean eHealth literacy scores than males (30.85 ± 7.67 vs. 29.39 ± 7.85, p<0.01). Most searched online for information on health/wellness (54%) and nutrition/dieting (53%). Of 10 strategies needed to improve health, men were more likely to indicate they needed to lose weight and get more exercise (p <.01, both). In contrast, women were more likely to report they needed to stop smoking and drink less alcohol (p<0.01, both). BMI for men and women were at the high end of the overweight category, indicating opportunities to create gender-specific messages and programs to lose weight and prevent obesity. Additionally, the high rate of eHealth literacy among both genders suggests that credible messages about weight management and healthy lifestyles can be delivered online to this target group.

Core Body Temperature in Different Phases of the Estrous Cycle in Mice

Authors:Yodit Kiros, Carissa Finley, Zhuoxin Li, Gisienne Reis, Michele Moraes, Orlando Laitano

In female mice, the reproductive cycle is termed the estrous cycle, and consists of four stages: proestrus, estrus, metestrus, and diestrus. The estrous cycle is characterized by fluctuations in hormonal activity that drive physiological changes such as varying core body temperature (Tcore). Many factors can affect the Tcore of mice such as stress, environmental temperature, and physical activity. We assessed the Tcore in mice in different phases of the estrous cycle during overnight rest after moving from the vivarium to the laboratory. Female mice arrived at 17 weeks old, telemetry sensors were surgically implanted in the abdominal cavity. After a 30-day interval, the animals were moved from the vivarium to the laboratory. On the experimental day, the animal remained in a room (average temperature 25.1°C) or inside an environmental chamber (set to 24.5°C), and Tcore was continuously registered during the animals' dark cycle (from 7:00 pm to 7:00 am, of 12:12h light/dark cycle). To identify the estrous cycle phases, a sample of vaginal epithelium cells was collected at 7:00 am, stained using Wright-Giemsa, and imaged (20x) using an automated cell imaging system. We analyzed the 1h-mean of 12h-rest Tcore. Considering the short duration of the phases of the estrous cycle, data from the 3 h before sample collection (i.e., between 4:00 and 7:00 am) were also used, and Estrus vs Diestrus phases were compared. Statistical analysis: Two-way ANOVA, $p<0.05$. There was difference throughout the 12-hours rest ($p<0.001$), with the lowest Tcore average values observed between 3:00 and 5:00 am (E: 36.16°C; D: 35.99°C). There were no differences between the phases (E, n=37: 36.46 ± 0.25 °C; D, n=22: 36.32 ± 0.35 °C; $p=0.37$). Moving between environments (from vivarium to laboratory) may induce stress in the animals, altering core body temperature responses; however, basal values were observed during the 12-hours rest.

Acknowledgements

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Health and Human Performance

DO THE EATING BEHAVIORS OF PRESCHOOL-AGE CHILDREN DIFFER BY FOOD INSECURITY STATUS?

Authors: Gabrielle Lerner, Layton Reesor-Oyer

Background: Approximately 17% of US households with children experience food insecurity (FI), the inability to access enough food to support a healthy lifestyle. In households experiencing FI, parents may restrict food when resources are low and pressure children to overeat when food is available, disrupting self-regulation and leading to problematic eating behaviors. We aim to evaluate if child eating behaviors differ by FI status.

Methods: Parents (n=25; Xage=35 years) of preschool age (2-5 years) children (Xage= 3.6 years; 48% non-Hispanic White, 20% Hispanic, 20% non-Hispanic Black, 12% other) completed electronic surveys Spring 2024. Surveys included The USDA 18-item Household Food Security Survey (HFSS) and The Children's Eating Behavior Questionnaire (CEBQ). Households were classified as FI if 3+HFSS items were affirmed; ≤2 items were considered food secure (FS). Due to small sample size, descriptive statistics and effect sizes are presented.

Results: The majority of the sample was classified as FI (56%). Parents reported greater food fussiness [FI 3.2 (0.7); FS 2.7 (0.7); cohen's d 0.7], lower enjoyment of food [FI 3.5 (0.6); FS 4.0 (0.7); cohen's d 0.8], higher satiety responsiveness [FI 3.2 (0.6); FS 2.9 (0.6); cohen's d 0.5], and faster eating [FI 2.7 (0.7); FS 3.1 (0.9); cohen's d 0.4] among children living in FI households compared to their FS counterparts.

Conclusion: Preliminary findings indicate that children living in households experiencing FI may exhibit more unhealthy eating behaviors. Addressing FI may promote healthier eating behaviors among preschoolers.

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Investigating the Differences of Parental Feeding Practices Between Food Insecure and Food Secure Households

Authors: Jhanelle Napier, Maria Ramon, Gabrielle Lerner, Jhada Sims and Layton Reesor-Oyer

Background: Food Insecurity (FI) refers to lack of access to adequate food to support a healthy lifestyle. Parents living in households experiencing FI may restrict children's food intake when resources are low and pressure children to eat when food is available. Such maladaptive feeding practices place children at increased risk of overweight/obesity. We evaluated whether parent feeding practices differed by FI status.

Methods: Data was collected as part of a needs assessment for a program to increase fruit and vegetable consumption among preschool-age (2-5 years) children at risk of experiencing FI. Parents-child dyads (n=25; Xage= 3.5 years; 46% non-Hispanic White, 29% Hispanic, 18% non-Hispanic Black, 7% other) were recruited from 3 childcare centers in Orlando, FL. Parents completed an electronic survey that included the USDA 18-item Household Food Security Survey (HFSS) and Child Feeding Questionnaire. Those who responded "yes" to 3+ HFSS questions were categorized as living in a household experiencing FI; 0-2 Food Secure (FS). Parents answered questions on the extent they engaged in the following feeding practices: 1) monitoring their child's food intake, 2) restriction of their child's food intake, and 3) pressuring their child to eat. Due to small sample size, descriptive statistics and effect sizes are presented.

Results: The majority (52%) of the sample was classified as living in a household experiencing FI. Parents living in households experiencing FI reported greater restriction [FI:3.5 (1.0); FS:3.0 (0.8); Cohen's d=0.5], and pressure to eat [FI:3.0 (0.7); FS:2.6 (0.8); Cohen's d=0.6] compared to those in FS households. However, parents indicated similar levels of monitoring [FI:3.7 (1.2); FS:3.5 (1.1); Cohen's d=0.2] regardless of FI status.

Discussion: Preliminary findings suggest that parent feeding practices may be impacted by FI. Future studies which simultaneously address FI and provide parents with education on evidence-based feeding practices are needed.

Health and Human Performance

A preliminary examination of gender differences in undergraduate students' extra-pair partner regretted sex.

Authors: Natasha Paredes, Abigail P. Masterson, Taylor K. Rohleen, Liana S.E. Hone

Romantic infidelity is a commonly regretted experience among both men and women—18% of men and 23% of women reporting cheating to be one of their most regretted choices. However, gender differences in cheating-related regretted sex remain understudied. Here, we assess gender differences in cheating-related regretted sex among undergraduate students at a large midwestern public university. One-hundred eighteen women and 41 men (Mage = 19.18; SD = 2.13) who had experienced regretted sex were asked to think about the last time they got into a sexual situation which they later regretted. Of the n = 91 students who reported that their last sexual situation was regretted because they had sex with someone they wouldn't ordinarily have sex with, n = 55 reported, "The person I had sex with was not my current boyfriend/girlfriend," and n = 16 reported, "The person I had sex with was in a relationship with someone else." Due to low sample sizes, we conducted an independent samples t-test using data from the first question only. We hypothesized women would report cheating-related regretted sex more than men. Contrary to hypotheses, men (M=.44; SD=.50) and women (M=.40; SD=.49) did not differ in their reports regretting sex because the person was not their current boyfriend/girlfriend. Data collection is ongoing, and a fully powered study may yield significant gender differences. In addition to gender differences, individual differences in traits like age, year in school, sexual orientation, substance use, and sociosexuality (i.e., desire for casual sex) may be important predictors of attitudes toward cheating-related regretted sex. This may have important implications for identifying students for targeted interventions to reduce regretted sex, which can have negative impacts on student mental health and school performance.

Review of Digital Interventions for Sexual Risk Behavior Reduction: Analyzing the Comparative Effectiveness of SRB + Alcohol vs SRB-Only Approaches

Authors: Emelie Perez, Claire Wilhelm, and Liana Hone

Substance use and sexual risk behavior are closely linked among college students, often leading to poor academic outcomes and Substance/Alcohol Use Disorders (SUD/AUD). Despite these risks, there is no universally accepted intervention addressing both substance use and sexual risk behaviors. This research seeks to identify which interventions are most effective in reducing sexual risk behaviors (SRB) by comparing interventions targeting both alcohol and sexual risk behaviors with those focusing solely on sexual risk behaviors.

A systematic narrative synthesis approach was used to evaluate existing interventions. Studies were selected based on criteria that included targeting adolescents and young adults (ages 16-26) in higher education institutions, such as community colleges and universities, and utilizing digital platforms for interventions, including mobile apps, SMS, and websites. Key outcomes assessed included sexual risk behaviors, and related negative outcomes.

Thirty-three studies were included in the synthesis: 9 interventions targeted both SRB and Alcohol, while 24 focused solely on SRB. Among the SRB + Alcohol interventions, 4 of 9 (44.4%) were effective, with sample sizes from 146 to 3,098 participants. Of these, 3 reduced alcohol use quantity, frequency, and alcohol-related consequences, and 1 improved condom-use assertiveness. Among SRB-only interventions, 18 of 24 (75%) were effective, with sample sizes ranging from 5 to 167,424 participants. Of these, 9 improved sexual health knowledge, 10 promoted safer sex practices, and 3 enhanced empathy/bystander behaviors.

SRB-only interventions appear more consistently effective at enhancing sexual health knowledge, safer sex practices, and empathy/bystander behaviors, while SRB + Alcohol interventions primarily reduce sexual risk behaviors indirectly through reducing alcohol use quantity and frequency and addressing factors like condom-use assertiveness. This wider focus on specific protective and knowledge-based outcomes in SRB-only interventions may explain their higher effectiveness rate.

Health and Human Performance

Biomechanical Properties of Rotator Cuff Tendons

Authors: Olaia Rackauskas, Mason Garcia, David Manoukian, Ara Nazarian

Rotator cuff injuries are common in adults, and the mechanical properties of rotator cuff tendons are essential for shoulder movement and stability. This study investigates the mechanical properties of the infraspinatus (ISP) tendon, including linear modulus, failure strain, and failure stress, acquired through direct experimental testing, and compares these findings with published data on the supraspinatus (SSP) tendon.

ISP tendons were harvested from seven cadaveric shoulders (3 male, 4 female) with a mean age of 73.5 ± 18.7 years (range 47-90). Each tendon was split, shaped into uniformly sized dog bones, and tested under uniaxial tension. Tendons were stained with hematoxylin and digital image correlation was used to measure strain. Material properties (linear modulus, failure stress, and failure strain) were calculated and compared to published SSP data.

Mechanical testing revealed that the ISP tendon had a linear modulus of 18.6 ± 8.4 MPa, similar to SSP regions. ISP failure stress was 2.7 ± 1.3 MPa, which was significantly lower than the SSP's reported failure stress (13.4 ± 4.8 MPa, p= 0.002). Matsuhasi et al. observed regional differences in the SSP, with the anterior region showing a significantly higher failure stress of 22.1 ± 5.4 MPa, compared to 11.6 ± 5.3 MPa in the posterior region (p=0.002). No significant difference in failure strain was observed between ISP (26.2 ± 1.32%) and SSP (16.3 ± 6.6%).

These findings indicate that the ISP tendon has similar lesser material properties than the posterior SSP. The posterior rotator cuff (ISP and posterior SSP) is mechanically weaker than the anterior rotator cuff. The ISP tendon's lower failure stress at the ISP-SSP junction, may contribute to the biomechanical weakness and injury susceptibility of the posterior rotator cuff.

Health and Human Performance

Age and Sex Related Differences in Finger Tapping via Marker-less Motion Capture Analysis

Authors: Jackson Wolfe, Diego Guarin Ph.D.

This study investigates the relationship between age, sex, and fine motor performance as measured by finger tapping in a cohort of 72 healthy control participant videos. Research has shown that Parkinson's Disease and aging result in neurodegeneration of the basal ganglia circuitry, causing motor symptoms. We aimed to look at two of the motor symptoms commonly experienced in Parkinson's Disease: bradykinesia (slowness of movement) and hypokinesia (decreased amplitude of movement). We used an iPhone 12 to record videos of healthy control participants performing the finger tapping task. We utilized VisionMD marker-less motion capture software to quantify bradykinesia and hypokinesia metrics. The bradykinesia measures include mean speed and coefficient of variation (CV) in speed, and the hypokinesia measures include mean amplitude and CV in amplitude. We quantified the Pearson correlation coefficient between age and the computed metrics. We analyzed the data in a group and separately by sex. Results indicated a general trend of declining bradykinesia and hypokinesia with age; however, statistical significance was achieved only for female participants. These findings contribute to the understanding of motor function decline and aging, highlighting the importance of considering sex differences in future studies of motor performance. Further research is warranted to expand our sample size and to continue improvement on our VisionMD software.

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Social Media and Friends

Authors: Benjamin Johnson, Aleksandra Masiulis, and Daniel Leverette

Social media provide countless opportunities for individuals to compare themselves to other users. A large body of research into social media-induced social comparison has largely focused on the negative impacts of comparisons, especially with regard to young adults, identity development, or fear of missing out (FOMO). There is less research into the mix of positive and negative effects that come from social media-induced social comparison, and even less investigation into the facets that people compare on, from appearance to conspicuous consumption to social activities. These facets of comparison are nuanced and are likely to differ between platforms. To that end, we conduct a study of N =165 American adults to examine their social comparison activities on three distinct and popular social media platforms: Facebook, Instagram, and LinkedIn. Our study design maximizes realism by having participants first answer questions about their usual social media use and newsfeed, then browse their social media during the study and report back their experiences and feelings.

The Impact of Emerging Technologies and Trends on Public Relations Crisis Management: A Study of Public Perception

Authors: Tiffany Steinke (mentor: Jay Hmielowski)

This research explores how transparency in artificial intelligence (AI) applications influences public trust, especially in crisis situations. As companies increasingly utilize AI to enhance crisis response, they often face scrutiny over data confidentiality and ethical practices. This study examines the factors that impact public confidence in AI-driven crisis management, including transparency, timeliness, and the clarity of AI usage.

Preliminary findings reveal three key insights. First, public confidence in AI applications varies significantly with perceived ethical use and transparency. Survey results indicate higher confidence when respondents believe AI is deployed responsibly, especially in areas like emergency response and public communication. Second, case study analysis shows that AI-supported crisis responses often yield faster containment times than traditional methods, underscoring AI's potential to enhance response speed and efficiency. Third, sentiment analysis on social media reveals mixed responses; while timely updates delivered by AI are well-received, negative sentiment spikes when confidentiality or data use practices are questioned.

Ongoing research aims to deepen understanding of these dynamics by analyzing additional case studies and interviewing technology developers to assess ethical challenges in AI-driven crisis management. Future investigations will explore the ethical boundaries of technology in crisis response, examining how demographic differences may influence public trust. Additionally, emerging technologies, such as augmented reality, will be studied for their potential to enhance crisis communication. Findings from this research are expected to inform best practices for maintaining public trust in AI applications during crises, helping companies avoid the loss of key stakeholders by prioritizing transparency and ethical AI use.

Journalism and Communications

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South Asian Immigrants' Experience Identity Development

Authors: Sadia Barua, Roberto Abreu

Appropriated oppression, known commonly as internalized racism, is defined as minorities' internalization of racial oppression and stereotypes about their group. Appropriated oppression has a negative impact on self-esteem and psychological distress on minoritized people. Ethnic Identity is a protective factor against experiences such as self-blame resulting from racial microaggressions. Ethnic Identity is defined as culturally informed beliefs, thoughts, and self-perceptions about one's ethnicity's meaning, and significance. For example, first generation South Asian women use ethnic identity to cope with stressors compared to second generation. In this study, 13 participants were interviewed and phenomenological qualitative methodology is utilized to explore the impact of ethnic identity and appropriated oppression on South Asian Immigrants identity development. The interview data is currently being coded and initial themes and sub-themes are surfacing surrounding experiences such as internalization, messaging, community and more. This rudimentary study will bridge areas of research in identity development of immigrants: appropriated oppression and ethnic identity for under-studied population of South Asian immigrants.

Investigating the Properties of Star Cluster NGC 2264

Authors: Zeina Benton, Elizabeth Lada

NGC 2264, a star forming region in the Monoceros constellation, features two well-known concentrated stellar regions in the North and South. Made of gas and dust, these stellar regions are sites of interest for their consistent ongoing star formation. This research aims to investigate the physical properties of NGC 2264 with a focus on comparing the Northern and Southern star-forming regions. By using Gaia, a spacecraft that monitors the movements of celestial objects, we can determine and analyze the distances of the stars towards the northern and southern regions of NGC2264. Parallax, the measurement of apparent shifting in position of an object due to the observer's perspective, is measured using the optically visible stars observed by Gaia. This parallax data is processed with a Python code that extracts parallax measurements and converts them into absolute distances, which are then compiled within the existing Gaia data. The distance distribution of sources within the star-forming regions is analyzed to assess whether the sources are clustered in space or spread out, helping to reveal the structure of these regions. Determining these distances is important for understanding the membership, structure, and brightness of the stars that will reveal the differences of the North and South regions.

Electrophysiological Signatures of Novel Language Learning in the Earliest Stages

Authors: Corey Broersma, Megan Nakamura, Eleonora Rossi

Previous research has examined the ways in which the learning of a second language in adulthood can promote cognitive and neural changes. However, little is known about the earliest stages of novel language learning in adults and how it may impact neurobehavioral signatures of language and cognition. This study aimed to investigate how the earliest neural signatures of novel language learning may be impacted by variables such as Age of Acquisition (AoA), proficiency in the second language, and general cognitive measures such as working memory and inhibitory control. Spanish-English bilinguals (n=37) participated in a 10-day mini-longitudinal study in which they completed Dutch lessons through Rosetta Stone. Event Related Potentials (ERPs) were examined at pre and post-test to investigate neural changes of Dutch language encoding using a Semantic Categorization Task (SCT). The results show a reduced N400 across learned vocabulary at post-test, indicating rapid neural adaptation. Both bilingualism factors and inhibitory control were shown to have an impact on the N400, with higher bilingual experience leading to reduced N400s for cognates, and better inhibitory control leading to smaller N400s for cognates and larger N400s for non-cognates. Working memory did not significantly affect N400 amplitude. These results suggest that bilingualism may aid in the lexicalization of similar words across languages, while higher inhibitory control can prevent cross-linguistic interference from cognates. This study demonstrates the ways in which individual differences can modulate the earliest signs of language learning and expands current literature on the neuroadaptation that occurs alongside language learning.

Liberal Arts and Sciences

Exploiting Nanoconfinement to Enhance Depolymerization of Polymethacrylates

Authors: Cabell B. Eades, Seungyoon Han, Danyella Cabrera, Micayla Vereb, Brent Sumerlin

We report progress towards the aqueous photoassisted radical depolymerization (PRD) of the hydrophobic polymethacrylate blocks of core-shell polymer nanoparticles. Being comprised of poly(ethylene glycol)-b-poly(2-hydroxypropyl methacrylate) (PEG-b-PHPMA) amphiphilic diblock copolymers, these nanoparticles were synthesized by polymerization-induced self-assembly (PISA). First, a thiocarbonylthio-bearing iniferter molecule was coupled to PEG monomethyl ether (PEG macroinitiator, PEG-MI) with Mn = 2000 g/mol. We used UV light-mediated photoiniferter PISA to chain-extend the PEG-MI with HPMA in water at 10% w/w solids content. Because PHPMA is not water soluble, even though its monomer is water miscible, the PHPMA blocks coalesce once they reach a critical degree of polymerization, nucleating the PEG-b¬-PHPMA nanoparticles. HPMA diffusion from the surrounding solution into the nanoparticle cores permits further growth of the PHPMA blocks after self-assembly has occurred. Once formed, these nanoparticle dispersions can be diluted with water and subjected to blue light-mediated PRD at 99 °C. During PRD, the photoactive chain ends are confined in the nanoparticle cores, and monomer produced during depolymerization diffuses out of the cores into the surrounding solution, effectively keeping the HPMA concentration near the depropagating chain ends sufficiently low to facilitate depolymerization. We hypothesize that this method will allow us to overcome the challenges of PRD typically being limited to highly dilute conditions by allowing depolymerization to occur with significantly lower amounts of solvent.

Liberal Arts and Sciences

How Gender Identity Shapes Body Image: An Analysis of Body Dissatisfaction Among Undergraduate Students

Authors: Cristina Calibeo, Dr. Marina Klimenko

Distorted body image and unhealthy weight related behaviors are prevalent during both adolescence and adulthood, with studies indicating these issues can begin as early as elementary school (Collins, 1990). Various factors have been proposed to influence body satisfaction, including puberty, and the school environment (Blyth et al., 1985). Additionally, there are significant gender differences. Some propose specific eating disorders may be physical manifestations of rejection (anorexia) or hyperconformity (bulimia) to traditional femininity (Lodahl, 1976). Given that there are still many gaps in the understanding of the causes of body dissatisfaction, the aim of our study was to address potential links between body image and self-ascribed masculinity and femininity, as part of a larger research project on body image. To achieve this, we conducted a survey with 185 consenting college students, who were enrolled in a course during Fall 2024 at the University of Florida. Among the participants, 17.3% identified as Asian, 10.3% as Black/African American, 20% as Hispanic, and 52.4% as White. Preliminary results revealed a positive correlation between perceiving one-self as more feminine and higher body dissatisfaction ($r = 0.184$, $p < 0.001$) and a negative correlation between masculinity and body dissatisfaction ($r = -0.275$, $p < 0.001$). Our findings suggest that higher levels of femininity and lower levels of masculinity are both associated with increased body dissatisfaction among adolescents. We will discuss the implications of these findings for future research.

Liberal Arts and Sciences

The Effects of Stress on Memory Performance in Latinx Populations

Authors: Angie M. Cordova, Fernanda Morales-Calva, Aditi Velgekar, Michele Medina, and Stephanie L. Leal

Objective

Episodic memory is formed by features of personal experiences. In order for this to be successful, we need pattern separation. This is the ability to discriminate representations of overlapping stimuli to limit interferences between similar memory traces. Mnemonic Discrimination Tasks (MDT) can behaviorally tap into pattern separation. However, a key limitation to past studies using this task is that much of this research has been done in predominantly non-Latinx White populations. It is important to consider how ethnicity may impact our memory, such as in Latinx, as this population faces heightened levels of anxiety and adverse metal health outcomes due to unique minority identity-related stressors. In the current study, we aimed to investigate how ethnicity and culturally relevant risk factors such as stress impact memory performance on a MDT.

Participants and Methods

We collected data from a total of 73 participants (ages 18-35), including foreign-born Latinx (20), US-born Latinx (26), non-Latinx (27). Participants completed a novel MDT and measured target recognition (d') and lure discrimination index (LDI), a detailed memory measure and behavioral correlate of pattern separation. We measured stress through hair cortisol levels, and responses on the Stressful Life Experience Scale (SLES), the Perceived Stress Scale (PSS), and the Depression Anxiety Stress Scale (DASS-42).

Results

We found that Latinx participants showed worse memory (d' and LDI) compared to non-Latinx participants. Latinx showed higher levels of subjective stress across measurements (SLES, PSS, DASS-42). In all participants, we found that higher stress predicted worse memory (d' and LDI).

Conclusion

These findings are important for future cognitive research, since this highlights the novelty of the MDT as a diagnostic tool for risk of neurodegenerative diseases impacting episodic memory such as Alzheimer's disease. Also, aids in addressing health disparities and increasing awareness of cross-cultural differences in early intervention and diagnostic treatment.

Liberal Arts and Sciences

Gender and Generational Patterns of Self-Disclosure in Dyadic Friend Interactions: A Content Analysis of American Sitcoms

Authors: Sydney Dick, Marina Klimenko

This study investigates gender and generational differences in emotional self-disclosure and responses within American television sitcoms. Intimacy, characterized by the sharing of personal information, varies across friendships and is influenced by gender and generational factors. Women generally exhibit more emotional intimacy in their friendships compared to men, often using discussion and self-disclosure as tools for connection, whereas men tend to build intimacy through shared activities. Generationally, the rise of digital communication has led to more casual interaction styles across all relationships. Using a content analysis approach, this research applies the Emotional Self-Disclosure Scale (ESDS) to analyze dyadic interactions in TV series such as Living Single, Friends, How I Met Your Mother, Big Bang Theory, and New Girl. Emotional self-disclosure instances are categorized by type (depression, happiness, jealousy, anxiety, anger, calmness, apathy, fear, or other) and the subsequent responses (empathy, advice/perspective taking, or criticism) are examined. Through this analysis, the research aims to identify patterns of communication and emotional exchange between friends, highlighting how these interactions may vary across gender and generations within the context of popular American TV shows.

Liberal Arts and Sciences

Modeling Respiratory Mechanics and Pressure Differences: An Improved Lung Balloon Teaching Model

Authors: Malena Diez, Julianna Gonzalez, Catalina Diez, Kaitlyn McCarty, Izabela Zmirska, David Julian

Simulation plays a key role in research, medical training, and student education. One mechanism that academics aim to simulate is the differences in pressure between the lungs and chest cavity during respiration. The Lung Balloon Model (LBM) is one example that serves as a visual representation of this mechanism. Traditionally, it has been fashioned from a water bottle and balloon, yet a drawback lies in its inability to reflect the actual pressure differences within the bottle or balloon, merely portraying respiratory mechanics. In our improved design, we utilize a large syringe and balloon to alter pressure through manipulation of the syringe plunger. This models the mechanical properties of lung tissue, replicating key respiratory parameters such as pressure, volume, resistance, and compliance. It also incorporates Arduino pressure sensors within the balloon and syringe, relaying continuous pressure values to a computer or display. Currently being used as an instructional tool in an undergraduate physiology course, this updated model aims for enhanced representation and long-term scalability. The model's simplicity and affordability make it easily accessible to educational institutions, medical training centers, and respiratory research organizations. Future validation and refinement of the model could lead to broader applications in medical education and clinical settings.

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The Association Between Mental Disengagement and Physical Illness, and the Moderating Role of Mental Health

Authors: Tyler Favier, Gianna Degracia, Maya Goldman, Joana Padron, Cajun Weisheimer, Yali Philipson, and Lindsey Rodriguez

Mental disengagement is a form of avoidant coping, in which people escape from their stressors through distraction. There is a distinct lack of research on whether the association between mental disengagement and physical illness varies based on mental health status. We hypothesized that mental disengagement would be associated with more symptoms of physical illness, and that mental health would moderate this relationship. Undergraduate students (N=92) completed a web-based survey that included the COPE Inventory, a self-reported physical symptoms questionnaire, and the Brief Symptoms Inventory (BSI). Regression models revealed that mental disengagement was positively associated with physical symptoms (p=.010). Moderation models demonstrated that this association was exacerbated when participants experienced more depression and anxiety (ps<.001), and became nonsignificant when participants experienced low depression and anxiety (ps>.50). These results indicate that mental health status may dictate the susceptibility of physical illness in those who cope through mental disengagement.

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Intraspecific Variation in Functional Traits of Coereba flaveola in the Context of Ecological Release

Authors: Brynn Fricke, Mia Keriazes, Orlando Acevedo-Charry, Scott K. Robinson

Ecological release is the process where functional trait spaces can shift as species move to new ranges, and predation and intra- and interspecific competition may be lessened in these new habitats. This phenomenon often occurs as species colonize islands, for example. Island populations of species, especially birds, are important to study and understand because they undergo many threats, including invasive species, introduced diseases, and amplified effects of climate change. Furthermore, ecological release is often studied on an interspecific scale. Therefore, we are studying ecological release in a Caribbean species of bird, Coereba flaveola, by comparing the means of the functional traits of different archipelago groups with the mainland using measurements of specimens at the Florida Museum of Natural History. Because Coereba flaveola occupies many islands in the Caribbean, we expect greater variation in the traits as distance from the mainland increases. After conducting a power analysis, it was found that many of the functional traits lacked sufficient statistical power due to a lack of sample size. However, the Lucayan group had statistically significant differences with the mainland in the mean hand-wing index, tarsus length, and bill depth. This may indicate the presence of ecological release, as the Lucayan group is one of the furthest groups from the mainland that showed the greatest difference from the mainland mean functional traits. Future research will focus on intraspecific variations within other species in the Caribbean to see broader patterns of island biogeography and ecological release within the different regions.

Speciation Patterns in Northeast Pacific Polychaetes

Authors: Lily Frierson, Gustav Paulay

The biodiversity of marine organisms, particularly marine invertebrates, is less studied than that of terrestrial organisms. A critical aspect of understanding biodiversity of organisms is the understanding of the process of speciation. Here, we are attempting to understand patterns of speciation of marine invertebrates, by focusing on assessing the biodiversity of marine polychaetes in the northeast Pacific Ocean region and looking for evidence of speciation along a geographic gradient. Polychaeta are a diverse group of marine worms exhibiting various lifestyles, symbiotic relationships, and reproductive behaviors. Since polychaetes are typically benthic, the potential for geographic differentiation is high. Using sequences and samples available from the Florida Museum of Natural History and the Los Angeles County Museum, a set of approximately 350 taxa were used in the primary phylogenetic analysis. COI sequences from the FLMNH and LACM were compiled with name matches from BOLD (Barcode of Life Data System) and neighbor joining phylogenetic trees were constructed using MEGA software Our analysis aimed to confirm the hypothesis that geographic differentiation in polychaetes occurs on an ecological basis, driven by temperature differences. With a focus on finding instances of allopatric speciation among sister species, analysis has revealed instances of latitudinal stratification across 20 families. Moving forward, this project will incorporate relevant BOLD bin matches to ensure that specimens with lower levels of identification or misidentifications are included in the dataset, as well as supplementary sequencing.

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Nanoencapsulation of Oxalate Decarboxylase for Improved Temperature Stability

Authors: Finnley Gibbons, Megan Wisniewski, Zain Becerra, and Alexander Angerhofer

Oxalate decarboxylase (OxDC) is an enzyme found in Bacillus subtilis, a soil bacterium, that catalyzes the breakdown of oxalate into carbon dioxide and formate. Largely thought of as a biological response to raise the pH of its environment, OxDC has optimal activity in acidic conditions around pH 4. OxDC has a wide variety of possible applications, but one notable possible use is its potential as a descaler in the pulp and paper industry. Given its affinity for acidic conditions and an optimum temperature of 35 ºC as well as its tendency to aggregate and denature in solution, OxDC was encapsulated in a polymer shell in an attempt to overcome these limitations and ultimately to increase its activity and stability under industrial conditions. In this experiment, nanocapsules of OxDC (nOxDC) were successfully synthesized and characterized in terms of mass, charge, and size. In addition, the enzymatic activity of the nanocapsules was tested and compared to that of the native protein. At pH 4, the nanocapsules demonstrate significant activity, and their catalytic efficiency is higher than that of the pure protein. At pH 7, both the native protein and the nanocapsules demonstrate a dramatic decrease in activity. Importantly, nOxDC also shows an improvement in its thermal stability and activity under acidic conditions resulting in higher activity compared to native protein at higher temperatures up to 55ºC.

Decolonizing Art History A Problem-Posing Approach to Globalizing Art Education

Authors: Gonzalez-Maldonado

This project investigates the use of problem-posing education to address the shortcomings of post-secondary Art History curricula shaped by Western-centric models. As universities across the nation work to decenter Eurocentric perspectives, this initiative seeks to globalize Art History education by focusing on critical issues: the prevalence of Eurocentrism, limited course diversity, insufficient specialized docents in Non-Western art, language barriers, and outdated pedagogical approaches. Drawing on Paulo Freire's problem-posing education framework, which promotes critical inquiry and active student engagement, the study employs a comprehensive methodology. This includes a review of the Art History curricula within the State University System of Florida (SUSF), focus group discussions with the Art History Association (AHA), and expert interviews with faculty from the University of Florida and Santa Fe College to identify existing gaps. A literature review further explores relevant scholarship on Art History education, problem-posing methodologies, and the impacts of Western dominance in the field. By integrating theoretical frameworks with practical examples, this project aims to propose a more inclusive and diverse Art History curriculum that reflects global perspectives and engages students in meaningful ways. Ultimately, this research aspires to contribute to the ongoing transformation of Art History education, fostering a more equitable representation of art from various cultural contexts.

Absolute quantification of endogenous lipids in mouse tissue utilizing multiple standard addition and imaging mass spectrometry

Authors: Danielle O. Haddad, Ariana E. Stratton, Katherine Gegoutchadze, Julia R. Bonney, Boone M. Prentice

Matrix-assisted laser desorption/ionization (MALDI) imaging mass spectrometry (IMS) is a label-free analytical technique that can map a wide range of biomolecules in thin tissue sections; however, absolute quantification using this technique remains challenging. Current approaches to quantification in IMS rely on the construction of calibration curves using mimetic tissue models and precise application of internal standards, which require extensive sample preparation. Conversely, standard addition is widely utilized in analytical chemistry due to its ability to enable quantification in complex mixtures without the use of internal standards. This process involves adding known quantities of target analyte to the sample. In this study, we implement standard addition in IMS for the absolute quantification of four phosphatidylethanolamine (PE) lipids in mouse tissue. Fresh-frozen mouse organs were serially sectioned onto an indium tin oxide-coated slide and a standard mixture of PE 36:1, PE 36:4, PE 38:4, and PE 40:6 at concentrations of 200 μM was spotted onto the tissue using a micropipette. A 1,5-diaminonaphthalene MALDI matrix layer was applied to the tissue and IMS was performed using a 7T solariX Fourier transform ion cyclotron resonance (FT-ICR) mass spectrometer (Bruker Daltonics). The intensities of each lipid were plotted as a heat map across the tissue using flexImaging (Bruker Daltonics). Absolute endogenous concentrations of all four PE lipids spotted were calculated via linear regression.

Defining the Western canon in higher education humanities at UF

Authors: Harris, Peyton

The humanities are a broad set of ideas and disciplines, subject to many different interpretations. However, their overlying purpose is to provide insights about diverse human experiences and to teach students critical thinking skills so that "you can see the underlying supplemental messages that are like being sent through different forms of rhetoric," as one first-year student I interviewed said. Within the humanities, the Western canon is broadly defined as a set of works and ideas that contribute to Western culture and philosophy. As a part of Florida Senate Bill 266, updated Florida statutes, specifically provisions 1007.25 and .55, dictate that general education humanities courses "must include selections from the Western canon" and "Whenever applicable, provide instruction on the historical background and philosophical foundation of Western civilization and this nation's historical documents." This paper examines the meaning and definition of the "Western canon" and the ways it influences higher education in the humanities at UF. Through a qualitative and quantitative analysis, this study explores varying interpretations of the Western canon and its influence in the classroom, the importance of global perspectives in the humanities, the value of the collegiate humanities, and the impacts of Florida general education legislation at UF.

Still Undecided

Authors: Jacob Hefty, Andrew Katz, Sofia Levy, Valeria Molina Alfonzo, Nandini Patel, Marina Klimenko, PhD

This study examines gender and generational differences in self-disclosure as portrayed in three popular sitcoms: "Friends," "How I Met Your Mother," and "Seinfeld." By analyzing dyadic interactions between characters, we aim to uncover how frequently personal beliefs, relationships, interests, and intimate feelings are disclosed and whether there are discernible patterns based on gender or generation in how characters share their personal feelings. Using a coding scheme that categorizes verbal exchanges and characters' demographics, the study provides insight into the types of self-disclosure most frequently depicted and how these patterns may reflect changing societal norms regarding friendship. Additionally, we investigate whether the intent behind characters' self-disclosure can be reliably recognized by the audience and explore the implications of speech acts in understanding the evolving nature of self-disclosure in media, particularly concerning gender roles and generational shifts. The findings contribute to a deeper understanding of the dynamics of friendship as represented in contemporary television.

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Exploring the Parameter Space of the Global 21cm Signal

Authors: Amilqar Karam, Oscar Hernandez

In 2018, the Experiment to Detect the Global Epoch of Reionization Signature (EDGES) detected an unexpectedly strong absorption feature in the global 21-cm signal, which originates from the transition between two ground states of hydrogen. This anomalous absorption has raised the possibility of new physics, such as cosmic string wakes. However, distinguishing between signs of new physics and standard physics within an unexplored region of parameter space remains a challenge. To investigate this, we employed the Accelerated Reionization Era Simulations (ARES) code to simulate the global 21-cm signal over redshifts 5 to 30. Our goal is to heuristically identify a region of standard parameter space that can reproduce the EDGES signal, with the consequential aim of training an emulator for the signal using this data. An emulator would enable a comprehensive survey of parameter space, providing insight into whether the EDGES signal indicates new physics. As a preliminary step, we identified physically motivated parameter sets and ranges from each codebase to run simulations. We then assessed the accuracy of each simulated signal (parameter set) by calculating the average root mean squared difference from the EDGES signal. This step lays the foundation for training a neural network, which will significantly enhance our ability to explore the parameter space and evaluate the implications of the EDGES signal.

Interspecific Variation in Functional Traits of Euphonia in the Context of Ecological Release

Authors: Mia Keriazes, Brynn Fricke, Orlando Acevado-Charry, Scott K. Robinson

Changes in niche dimensions are known as ecological release, and this can occur due to a variety of reasons, including reductions or releases of negative interactions across gradients. Currently, there is a gap in the literature relating to the concepts of ecological release with intra-specific measurements per species with their morphological differences. Therefore, we compared closely related sister species of the Caribbean in the genus Euphonia. When examining species like Euphonia violacea on Continental islands and E. jamaica on the Greater Antilles, where predation and competition pressures are often reduced, there should be broader ranges and shifts in their functional trait values in comparison to E. laniirostris, E. hirundine, E. affinis, and E. chlorotica, which are mainland counterparts. This will be executed through measuring the functional traits of these birds (hand-wing index, tail length, bill length, bill depth, bill width, tarsus length) with multiple museum specimens at the Florida Museum of Natural History. After completing a power analysis in R, no significant differences for the continental island and the two mainland species were found, but this could be due to lack of a large enough sample size. However, E. jamaica in the Greater Antilles had statistically significant differences in functional traits with their tail, tarsus, and bill depths in comparison to mainland species (E. affinis). This could imply that there is variation across sister species in relation to island and mainland populations. There is still need for future research with intraspecific variations with birds in Caribbean and their patterns with changes in niche dimensions.

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The recent expansion of militias in West Africa

Authors: Peter Kostantinov, Olivier Walther

This paper investigates the geographic expansion of armed conflicts in West Africa since the early 2010s. We are particularly interested in understanding which violent actors are driving the recent diffusion of political motivated violence from the West African Sahel to the north of coastal countries. Prior literature suggests that non-state actors, specifically militias, drive this violence. To test this, we examine more than 6500 violent events involving political and identity militias recorded by the Armed Conflict Location & Event Data (ACLED) project from January 2011 to June 2024. Political militias are motivated to further their political objectives through violent means, while identity militias are organized around community, ethnicity, region, religion or livelihood. This research assesses: (1) changes in the intensity of violent events, (2) shifts in the spatial concentration of these events, and (3) differences in spatial patterns between political and identity militias over time. The analysis concentrates on seven countries where armed conflict has significantly escalated from the Central Sahel (Burkina Faso, Mali, and Niger) to the Gulf of Guinea (Benin, Togo, Ghana, and Côte d'Ivoire). Intensity measures reveal whether these conflicts have escalated in frequency or lethality, while spatial analyses assess whether violence has become more geographically clustered or dispersed within and between countries. Spatial patterns over time are examined for both militia types to identify divergent or convergent trends. The findings in this paper offer insights into the dynamic behavior of militia violence, exploring how these violent actors may be adapting their geographic footprint and levels of violence. By evaluating the evolving intensity, concentration, and patterns of militia activity, this research provides a critical understanding of how non-state actors influence the regional security landscape in West Africa.

New Vector Portal Light Dark Matter Searches in SBND

Authors: Nicholas Kozenieski, Heather Ray

SBND is one of three liquid argon neutrino detectors sitting along the booster neutrino beam (BNB) of Fermilab's Short-Baseline Neutrino (SBN) program. It is a 112-ton Liquid Argon Time Projection Chamber (LArTPC) situated 110 meters from the beam and has just started taking data that will provide unprecedented statistics on neutrino-argon cross sections and neutrino flavor oscillations. In addition, SBND's proximity to the BNB target provides sensitivity to probe a plethora of Beyond Standard Model (BSM) scenarios, such as several classes of dark matter (DM) models. One model of interest to SBND is vector portal light dark matter, which involves a hypothetical force-carrying gauge boson in the dark sector, the dark photon, coupling to the standard model (SM) photon. This coupling, combined with the high performance of LArTPC technology in reconstructing photon, electron, and nucleon signals, make SBND an ideal experiment to probe newly accessible parameter space of this DM model. In this talk, we will first introduce the SBN program, SBND, and LArTPC detection technology in particle physics. Then, we will look at phenomenological aspects of this light DM model useful for detection. Lastly, we will present new expected exclusion limits to this model's parameter space for certain proposed production and signal channels, namely $\pi 0$ decay in flight ($\pi 0 \rightarrow \gamma + \chi + \chi^{\dagger}$) and elastic neutral current (NC)-like nucleon scattering ($N + \chi \rightarrow N + \chi$).

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Tricked by grammar? Language processing in learners of Spanish

Authors: Claire Kuntz, Grace deMeurisse, Edith Kaan

Grammatical illusions occur when an ungrammatical sentence is passingly deemed grammatical due to an interfering "attractor" occurring between syntactically agreeing structures. "The key to the cabinets are rusty" demonstrates this through English noun/verb agreement. The singular "key" should agree with the verb form "is", but instead the plural noun "cabinets" incorrectly agrees with the verb in the form "are". In Spanish, nouns and adjectives have grammatical gender which can create illusions if a prepositional phrase with an attractor noun occurs between the head noun and the adjective. Consider 1a. below: the adjective "podrida" should match the masculine head noun "plátano", but instead erroneously matches the feminine attractor "naranja". 1a. *El plátanoMasc bajo lxa naranjaFem estaba tan podridaFem que … *The bananaMasc under the orangeFem was so rottenFem that … 1b. *El plátanoMasc bajo el mangoMasc estaba tan podridaFem que … *The bananaMasc under the mangoMasc was so rottenFem that … While these grammatical illusions have been indicated for native (L1) speakers (Gonzalez Alonso et al., 2021), second language (L2) speakers of Spanish have yet to be studied in this area. The current project examines L1 English L2 Spanish speakers through self-paced reading, a methodology tracking participants' reading time (RT) in milliseconds. Longer RTs are indicative of processing costs, predicted to be greatest for ungrammatical attractor mismatch sentences (1b) where neither noun agrees in gender with the adjective. If RTs are shorter for ungrammatical attractor match sentences (1a) than for attractor mismatch sentences (1b), it suggests that L2 speakers are susceptible to illusions. If RTs are similar for (1a) and (1b), L2 speakers might be less susceptible to grammatical illusions through exercising more cognitive control (Lee and Phillips, 2023). This could inform more effective classroom instruction and increased depth of reading for language learners.

Using Directed Evolution to Improve the Optimum pH of Oxalate Decarboxylase from Bacillus subtilis

Authors: Al-Takrouri Rahaf, Becerra Zain, Ebo Christian, Lopez Jenny, McNally Nicholas, and Angerhofer Alexander

Oxalate decarboxylase (OxDC) is an enzyme commonly found in Bacillus subtilis, which catalyzes the decomposition of oxalate, a molecule commonly found in kidney stones. OxDC has an optimum pH at around 4.0, which limits its use under physiological conditions. An optimized OxDC that is functional at a neutral pH would be active in the human body and may perhaps be utilized to break down or prevent kidney stones in a non-invasive manner. In this study, we used a directed evolution approach to alter the enzyme's optimum pH. Directed evolution is a method of steering protein function towards a desired new or optimized function. It mimics the process of natural selection to slowly refine phenotypes by inducing mutations until the protein exhibits the target characteristics. Initially, a gene library was created by generating small changes to the original DNA sequence for OxDC. We used two methods: error-prone PCR and saturated mutagenesis. Presently, we have identified protein variants from both methods, specifically mutations at positions M84 and F155, that showed improved catalytic activity at a higher pH. These genes are currently being sequenced and their proteins characterized and will serve as the starting point of future rounds of directed evolution.

Loneliness-Moderated Effects of Chronic Pain on Analytical Reasoning

Authors: Piper Lyons, Dalia El-Shafie, Marilyn Horta, Tian Lin, Natalie Ebner

Chronic pain can impact various domains of cognitive and socioemotional functioning in addition to causing well-known physical detriments. Recent research has specifically shown that, as intensity increases, chronic pain hinders executive functioning (Berryman et al., 2016), as well as emotional decision-making (Apkarian et al., 2003) and the creation and maintenance of social relationships (Closs et al., 2009). However, there is limited evidence of the effects of chronic pain on analytical reasoning, crucial for situational analysis and decision making, and how this may be impacted by social factors common among individuals with chronic pain, such as loneliness (Loeffler, 2021). While existing research observes the impact of chronic pain on cognition and socioemotional functioning separately, a lack of literature regarding both processes together makes it crucial to examine their joint relationship. In the present study, 2 hypotheses were explored: 1) it is expected that increased ratings of chronic pain intensity are associated with decreased performance on analytical reasoning, and 2) some level of a moderation effect of loneliness on the relationship between pain intensity and analytical reasoning is expected. The self-reported measures used to test these hypotheses include the pain intensity subscale of the Chronic Pain Grade Questionnaire (CPGQ), the Cognitive Reflection Test (CRT), and the UCLA Loneliness questionnaire. A sample size of 77 adults (age range: 18 to 86 years) was used. SPSS was employed to conduct Pearson correlation and moderated linear regression analyses. The results affirm both hypotheses, showing significant association between higher levels of pain intensity and lower scores on analytical reasoning ($r = -0.275$, $p < 0.05$), especially when loneliness is a moderating variable ($b = -0.003$, $SE = 0.001$, $p < 0.01$). This research suggests that chronic pain impairs cognition, exacerbated by decreased social interaction, which emphasizes the importance of interventions for this vulnerable population.

Tandem Degradation-Depolymerization of Bio-derived Comb Copolymer

Authors: Megan E. Lott, Lucas M. Aburaya, Rhys W. Hughes, Lauren E. Mann, James B. Young, Cabell B. Eades, Florencia Merlino, Claire Su, Brent S. Sumerlin

In this study, we synthesized poly(methyl methacrylate-co-2-hydroxyethyl methacrylate-co-N-(methacryloxy)phthalimide methacrylate) (P(MMA-co-HEMA-co-PhthMA)-based comb copolymers, with poly(lactic acid) (PLA) grafted from the HEMA units. The comb architecture was targeted to impart unique thermal properties compared to that of the conventional linear analogs. Further, our design strategically expands polymer deconstruction methodologies to more complex macromolecular systems and promotes resource-efficient production. The PhthMA units facilitated depolymerization of the polymethacrylate backbone via pendent group activation, with simultaneous PLA sidechain degradation, both triggered by heat. This dual degradation-depolymerization process not only enhances the overall sustainability of lactide/vinyl-based copolymers but also demonstrates the synergistic potential of integrating multiple deconstruction pathways into a single system. Our reports expand the avenues for designing advanced, degradable copolymers with tailored lifespans, contributing to the development of sustainable polymer materials.

Modified Hydrogel Tissue Expansion Protocol to Enable High Spatial Resolution Lipid Imaging Mass Spectrometry

Authors: Sarah J. Murphy, Jacob M. Samuel, Boone M. Prentice

Matrix-assisted laser desorption/ionization (MALDI) imaging mass spectrometry (IMS) is a label-free technique that enables the mapping of a variety of biomolecules in tissues with high spatial fidelity. The spatial resolution of commercial IMS systems is limited to approximately 10 µm. Efforts to improve spatial resolution largely involve extensive and expensive hardware modifications. We instead aim to physically expand the tissue substrate using a swellable hydrogel network, a principle established in the field of fluorescence expansion microscopy. However, our preliminary data show consistent lipid delocalization when compared to lipid spatial distributions in unexpanded samples. By adjusting the monomer composition of our existing hydrogel formulation, we propose to resolve this lipid delocalization and increase the linear expansion factor (i.e., spatial resolution). This workflow proceeds via tissue sectioning, tissue fixing via 4% paraformaldehyde, incubation with acryloyl-X, hydrogel polymerization throughout the tissue, digestion with proteinase K to homogenize mechanical properties, and finally submersion in water to effect isotropic expansion. The expanded hydrogel tissues then undergo desiccation and MALDI matrix application for downstream lipid IMS analysis using a Fourier transform ion cyclotron resonance (FT-ICR) mass spectrometer (solariX, Bruker Daltonics). In comparison with previous monomer solutions, we have increased the concentration of the sodium acrylate monomer by ten-fold, increasing osmotic swelling pressure, and decreased the crosslinker, allowing for a more elastic crosslinking network. New data show that this modification strategy is promising for improving spatial resolution but has not been fully characterized for lipid distribution fidelity, which we intend to do here.

Kinematic Annotation for Semi-Supervised Machine Learning Classification of Ketamine-Induced ‘Wag' Movements

Authors: Emily Nodarse, Ashley Correa, Jose David Puell Jr., Victoria Manzato, Logan Dapp, Ryan Mears

Sub-anesthetic ketamine has emerged as a rapid and effective treatment for depression, with dissociative side effects that may play a role in its therapeutic action. This study focuses on an upper body and head movement observed in 4 ketamine-treated Sprague Dawley rats, termed the “wag” or “head-bob”, which are stereotypic movements of ketamine-induced dissociative behavior. Our primary aim is to establish a structured approach for detecting and analyzing WAGs in freely moving animals through semi-supervised machine learning. We captured and annotated video recordings of ketamine-administered rats, labeling frames with a binary “1” (WAG observed) or “0” (no WAG). Videos were processed in DeepLabCut to track 10 body points, where iterative refinement addressed tracking inaccuracies. To build a robust training dataset, each frame or sequence was consistently labeled as feature-present or feature-absent, ensuring balanced class distribution. Following tracking, SimBA was used to compose custom feature extraction classes in order to extract features such as angles, velocities, and distances, which informed the training of classifiers. These features—amounting to hundreds per individual video frame—can be used to train supervised machine learning classifiers or fed into trained classifiers to generate frame-by-frame predictions of the probability of a target behavior occurring. We evaluated the classifier's performance using metrics like accuracy, precision, recall, and F1-score on validation data, achieving high precision and recall.In the final classification stages, SHAP analysis highlighted key movement features contributing to accurate WAG predictions, enhancing interpretability.

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Enzymatic Synthesis of 1,2 Amino Alcohols

Authors: Panja Suleiman, Pasternak Zak, Stewart Jon

The 1,2-amino alcohol unit is a common functional group found in nature and many pharmaceutical compounds. One molecule that exhibits this structure is dihydrosphinganine, which is a precursor to sphingosine and therefore a sphingolipid. It is a biological molecule that is essential in cell function and exhibits tumor suppressor properties. Organic molecules similar to dihydrosphinganine have been manufactured using biocatalysis, which is the use of enzymes to propagate a reaction. It is theorized that dihydrosphinganine analogs, along with other molecules that contain the 1,2-amino alcohol functional group can be synthesized from amino ketones using a ketoreductase. The purpose of this investigation is to determine which ketoreductases are viable catalysts for dihydrosphinganine analogue synthesis. The generation of the substrate is carried out by using organic chemistry techniques, and the products are verified using analytical methods such as NMR and chromatography. The ketoreductases are purified using a GST column and screened against a library of amino ketone substrates to identify active catalysts. The ability to manufacture bioactive molecules such as dihydrosphinganine from relatively simple enzymes could potentially revolutionize the field of synthetic chemistry. It would make production of essential molecules cheap and therefore easily accessible to those who need it, and it would open the door for new advancements in organic and medical synthesis.

Neutral Current Event Threshold in SBND

Authors: Ishan Patel, Heather Ray

The Short-Baseline Near Detector (SBND) is one of three detectors located at Fermilab for use in the Short-Baseline Neutrino (SBN) program. One goal of SBND is to use Liquid Argon Time Projection Chamber (LArTPC) technology to understand neutrino interactions. The photon detection system (PDS) of the experiment consists primarily of 120 cryogenic photomultiplier tubes (PMTs), 192 X-ARAPUCAs, which work together with the LArTPC wire grids to identify interaction tracks. Scintillation light produced within the fiducial volume is used to find a correlation with the final state particles from a neutrino interaction. With minimal energy deposition and the absence of charged lepton production, identifying neutral current (NC) events remains a difficult task. In this talk, we investigate a set of kinematic cuts that minimize external noise while ensuring high identification efficiency for NC events. Further analysis using a weighted sum of light intensity (centroid) to obtain approximate interaction vertices of events within the LArTPC

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Feminist Threads: The Complex Interplay of Gender, Poverty and Exploitation in South Asia’s Sweatshops

Authors: Aayushi Pate

This research paper addresses the issue of gender, poverty, and exploitation in South Asia's sweatshops, focusing on the predominantly female workforce. The problem arises from the exploitative labor practices of multinational corporations and local subcontractors, leading to poor working conditions, low wages, and lack of labor rights for women. Utilizing a comprehensive literature review and qualitative analysis of existing discourse, protests, and case studies, this research delves into the historical and socio-economic context of the sweatshop industry and its impact on female workers. The findings highlight the significant effects of the feminization of poverty, with women earning less and enduring harsher conditions than men within a capitalist-patriarchal framework that increases their vulnerability to violence, harassment, and health risks. Despite their crucial contributions, female workers face the dual burden of labor and domestic responsibilities. This paper calls for meaningful reforms prioritizing the dignity and rights of all workers, advocating for greater accountability from governments and multinational corporations to disrupt the cycle of poverty and exploitation, and emphasizing the need for a nuanced approach that addresses the lived experiences and aspirations of female workers in South Asia's sweatshop industry.

Political Affiliations and Beliefs: Exploring the Gender Divide

Authors: Asha Patel, Autumn McClellan

This study investigates the relationship between political affiliations and beliefs on contemporary political topics, particularly focusing on how gender influences these dynamics. As the United States approaches the pivotal 2024 elections, understanding the interplay between ideology and belief systems becomes crucial. Utilizing a non-representative quota sample (n=400, evenly split by gender) collected through Prolific in the spring of 2024, this research explores key contemporary political issues. The survey includes both self-reported political ideologies and responses validated against a Pew Ideology scale, enabling an examination of the alignment between individuals' self-perceptions and their ideological standings. Employing STATA for data analysis, this secondary data analysis aims to uncover significant correlations and partial correlations between political affiliation and beliefs, with a particular emphasis on gender as a confounding variable. By analyzing demographic trends, this study seeks to answer critical questions about how gender affects political ideology and beliefs on contemporary topics. The findings are expected to corroborate existing literature on ideology and belief systems while providing key insights into the implications of gender in political discourse. Ultimately, this research aims to contribute to a deeper understanding of the sociopolitical landscape, informing future studies and potential policy implications in an increasingly polarized political environment.

It’s Quiet at the Top: Differential Acoustic Activity of the Common Coqui Frog (Eleutherodactylus coqui) Across an Elevational Gradient

Authors: Emilio Pedroza Lopez, Zuania Colón-Piñeiro, Orlando Acevedo-Charry, Junángel Alemán-Ríos, Arik Hartmann, Ana V. Longo

Acoustic signaling is essential for anuran intraspecific communication. Signalers compete with environmental acoustic factors to convey messages to recipients, which can lead to variation in the timing and frequency of calls across different environments. Particularly, frog acoustic activity varies with environmental conditions due to differences in individual physical condition. For instance, larger individuals at higher elevations tend to call at lower frequencies. We analyzed the calling activity patterns of the common coqui (Eleutherodactylus coqui), a frog species inhabiting El Yunque National Forest in Puerto Rico, across an elevational gradient. In this context, factors such as coqui population density, frog community composition, relative humidity, temperature, and a pathogen prevalence of infection could influence the patterns of variation in E. coqui acoustic activity periods and their pitch (acoustic frequency). Using the ARBIMON web-platform, we analyzed passive acoustic recordings from five different elevations (200, 400, 600, 800, and 1000 m) along three seasons of sampling , a dataset of 19,189 recordings. Our findings revealed that frogs at lower elevations had longer activity periods, covering a larger portion of the day and displaying increased calling rates than those at higher elevations. Generalized linear models comparing elevation and seasonality to different environmental conditions – temperature and relative humidity – revealed significant differences across the elevation gradient and across seasons. We are conducting further analyses to investigate how calling activity, amphibian community composition, and infection prevalence relate to elevation and seasonality. These analyses aim to provide a comprehensive understanding of the factors contributing to changes in acoustic activity across the elevation gradient, enhancing our knowledge of the biology and behavior of E. coqui in response to changing physical and acoustic environments.

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Priming Code-switching: Effect of Types of Code-switching on Cognitive Control

Authors: Samantha J. Perez, Dr. Souad Kheder, Dr. Edith Kaan

According to Adler et al. (2020), comprehension of a code-switch may lead to increased engagement of cognitive control mechanisms. We investigated whether this effect extends to code-switch production, as well as whether there is a difference in cognitive control between dense and insertional code-switches. In the experiment, Spanish-English heritage speakers completed a task of alternating Flanker trials (congruent <<<<<, incongruent <<><<) with preceding picture verification trials (comprehension) and picture description trials (production). We tested four language conditions: English, Spanish, dense, and insertional Spanish-English code-switches. An example of an English sentence is “In the picture, the pills are in between the zoo and the bed"; Its Spanish equivalent is “En la foto, las pastillas están entre el zoológico y la cama”; In insertional code-switching, one word is in English: “En la foto, las pastillas están entre el zoo y la cama”; Dense code-switched sentences have multiple switches: “En la foto, las pastillas están in between el zoológico and the bed.” We predicted that the priming received from hearing or producing a code-switch triggers the engagement of cognitive control mechanisms that induce higher performance on a following Flanker trial. Preliminary results (analyzed at N = 46) for Flankers following both comprehension and production trials show that regardless of language condition, participants answered faster and more accurately to congruent Flankers than incongruent Flankers. Furthermore, reaction times across language conditions did not differ significantly. This suggests that the type of code-switch, or a code-switch in general, does not affect cognitive control–although the running of final participants to augment subject numbers, and subsequent analysis, is in progress to fully determine.

Projecting the future distribution of wild relatives of the domesticated pepper, Capsicum annuum, using ecological niche models

Authors: Tyler Radtke, Makenzie E. Mabry, Sebastian Fernandez, Tori M. Ford, Jonathan C. Barz, Douglas E. Soltis & Pamela S. Soltis

As climate change worsens in the coming decades, agricultural systems will be put under immense pressure, and crops will need to be more resilient to withstand the rapid changes to weather patterns. This project aims to identify which wild relatives of Capsicum annuum, the domesticated pepper, may be likely to withstand the threat of climate change and become target species to engineer hardier varieties. Occurrence records from natural history collections were downloaded from online repositories and cleaned to ensure high-quality data points were used. From there, a subset of environmental variables were utilized to create ecological niche models (ENMs). ENMs, a machine learning algorithm, are trained on known occurrence points of a species to create correlative models of the environmental conditions that meet a species' ecological requirements and predict the relative suitability of habitat. These models are then projected to various maps to assess the areas in which a species is most likely to occur. Additionally, we combined our ENMs with future climate projections to predict how these species' distributions may shift in the future. Understanding how climate instability and rising temperatures will impact economically important crop families will be critical in managing the response to climate change.

Liberal Arts and Sciences

Peptide and Protein Interactions in BET Proteins – LANA, JMJD6, NSD3

Authors: Alexandra E. Ramirez, Bhumika Singh, Alberto Perez

Bromodomain and extra terminal domain (BET) proteins are epigenetic readers that are crucial for gene expression and regulation. They can recognize and bind to acetylated lysine residues on histone tails. This is an epigenetic modification that influences chromatin accessibility and gene activity. In this study, sequences from BRD3 and BRD4 BET proteins are examined. BRD3 and BRD4 are important to study as they are involved in regulating cell cycle and overexpression of these BET proteins been shown to be related to cancer. The overexpression of these proteins are also linked to autoimmune diseases and inflammatory processes. In this research the BRD4 proteins are LANA and JMJD6, NSD3 is the BRD3 protein.

Molecular Manipulations of Energy-absorbing Polymer Networks

Authors: Nicholas Rodriguez, Alex Kim, Daniel Savin

This research project aims to form biocompatible, energy-absorbing materials that can serve as enhanced alternatives to existing personal protective equipment (PPE) including mouthguards, multi-impact helmets, and as replacements for cartilage or intervertebral disks. The energy absorbing properties of the materials stem from the formation of thiol-ene thermoset networks (TENs) that are tunable through molecular modifications. TENs form through a free-radical, step-growth process, forming a crosslinked polymer network that is characterized by a narrow glass transition region, reflecting homogeneity within the network. The Savin Group has demonstrated that TEN thermosets reduce the peak force transmitted through thick (4 mm) mouthguards compared to the commercial materials including poly(ethylene-co-vinylacetate) (EVA) used in so-called "boil and bite" mouthguards. However, the homogeneity in the network results in a very low strain at break for the material. The incorporation of sacrificial linkages that can break and reform upon subsequent impact has been shown to increase the toughness of TENs. In this project, we incorporate azobenzene moieties into a base TEN at different ratios and measure properties relaying the behaviors of the material over a wide temperature range. We hypothesize that the azobenzenes form liquid crystal phases within the network which will serve as a sacrificial linkage, similar to a shape-memory polymer. In addition, azobenzenes are photoresponsive, allowing control over the local mobility of polymers within the network.

Liberal Arts and Sciences

Effects of Emotional Regulation Difficulties on Attachment Orientations in Dyads

Authors: Julianna Ross, Tyler Favier, Yali Philipson, Cassidy Jones-Goucher, and Dr. Lindsey Rodriguez

Emotional regulation can be defined as one's awareness, understanding, and acceptance of their own emotions, as well as the ability to behave appropriately despite negative emotions through the use of emotional regulation strategies (DERS; Gratz & Roemer, 2003). Attachment styles are long-term relationship patterns formed during early development, such as anxious attachment and avoidant attachment. The current study explores the relationship between difficulties in emotional regulation and attachment styles among romantic partners. Emotional regulation was assessed using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2003), which consists of six subscales: nonacceptance, goals, impulse, awareness, strategies, and clarity. Attachment orientations were assessed through measures of anxious and avoidant attachment within a dyadic study between romantic partners. We hypothesize that greater emotional dysregulation, across all subscales, will be associated with anxious attachment in relationships, and the opposite will be true for avoidant attachment. Our findings suggest that one's own lack of emotional regulation strategies was related to greater attachment anxiety. Partner nonacceptance, however, correlated with lower attachment anxiety. For avoidant attachment, one's own lack of emotional regulation strategies were also related to greater avoidant attachment. Partner's lack of emotional regulation strategies was also found to be related to greater avoidant attachment. These findings highlight the importance of the interrelatedness of individual emotional regulation skills on relationship behavior, suggesting the importance of promoting emotional regulation skills in both partners to strengthen relationship outcomes.

Features of Dying Days Memories as Predictors of Depression in Older Widowed Adults

Authors: Hope Schroeder, Kiana Cogdill-Richardson, Gavin Hart, Emily L. Mroz, Susan Bluck

Most therapeutic interventions focus on the first two years after spousal loss. On average, however, adults live an additional twenty years beyond that initial loss period. During these years, memories of the life lived together but importantly memories of the spouse's dying days also remain salient: such memories may become part of the widowed adult's ongoing life story. There are, however, a variety of differences in how loss memories are recalled. This includes variation in ability to coherently fit loss memories into one's broader life story, use memories to reinforce continuity of oneself post-loss, and affirm positive moments from the final dying days. Such variations may influence the potential of memories to foster psychosocial adaptation, particularly feelings of depression. This study investigated characteristics of older adults' (N = 54, Mage = 81, 62.3% female) memories of their spouses' dying days using narrative interview methodology. Three to twelve years post-loss, the study aimed to investigate whether widowed adults' current depression (i.e., Geriatric Depression Scale) was predicted by greater: (1) extent of integration of dying days memories into one's life story (i.e., Integration of Stressful Life Experiences Scale), (2) use of dying days memories to maintain sense of self (i.e., Self-Continuity Function Scale), and (3) extent of positive tone in dying days memories (i.e., loss memories content-analyzed for positive sentiment). Hierarchical regression $F(3, 50) = 11.60$, $p < .05$, revealed greater integration, $\beta = -.557$, $p < 0.5$, greater use of memories to preserve self-continuity ($\beta = -0.241$) and more positive sentiment ($\beta = -0.316$) were all associated with lower current depression. Findings highlight the central role of loss memories in older widowed adults' ongoing life story. This research identifies specific characteristics of spousal loss memories that may continue to be linked to depression up to a decade after such a loss.

Post COVID-19 Mask Wearing Decisions Among College Students: A Comparison of the Internal or External Rationales

Authors: Kaden Seeks, Elisa Perez-Mena, Mathew Finkelstein, Emily Scoufis, Feihong Wang

Mask-wearing behaviors are influenced by various factors. During the pandemic, mask-wearing was effective in reducing the spread of the COVID-19 (Wang et al, 2020). Current research shows that university students are predominantly not wearing masks anymore post-pandemic due to negligence and normalization of non-mask wearing (Finkelstein et al, 2024). Information on university students' mask-wearing behaviors is limited (Rosenblum et al, 2022). Internal factors may guide decision making when external criteria are not sufficient (Nakao et al, 2012). The aim of this study is to examine 1) what the internal and external factors are in mask wearing/ non-wearing, 2) which factors are greater motivators for mask-wearing and non-mask wearing and 3) whether there are differences in rationale use between university students of different years in a post-pandemic era. A survey was administered to undergraduates (n=341) in a general psychology program in 2023. The survey assessed various items, including "How frequently in percentage do you wear a mask when you go out in the past two weeks and why?". Data was coded following the protocol by Wang et al. (2022) and analyzed with both qualitative content analysis and quantitative nonparametric analysis. Thematic Analysis of code frequencies found 21 internal codes (such as, "No covid concern in general") and 22 external codes (such as, "No mandate"). External reasonings were more commonly used for justifying mask-wearing behaviors. Internal reasoning was more commonly used for justifying non-mask wearing behaviors. Wilcoxon analysis showed a significant difference between internal and external rationales for mask-wearing at $\alpha=0.10$ ($P=0.0597$). Mann-Whitney analysis showed no significant difference ($P=0.355$, internal, $P=0.628$, external) for external or internal rationales between college years. Mask-wearing behaviors are influenced more by external rationales like mandates, while non-mask wearing is influenced by both internal and external rationales across college years. Implications of the findings will be discussed.

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PEIZO Mutations

Authors: Carly Serlenga, Mila Rincon Paz, Xiaofei Bai

Single gene mutations are known to cause over 10,000 rare diseases, most of which lack any effective treatments. Mutations of the PIEZO genes disrupt ion channels crucial for responding to physical stimuli, and have been linked to a long list of disorders, including distal arthrogryposis type 5 (DA5, a condition affecting limb and joint movement). In order to better understand PIEZO channels, we used Caenorhabditis elegans (C. elegans) as a model. This species shares many of its genes with humans, including a PIEZO homolog (pezo-1). This can allow us to study the effects of PIEZO mutations in a simpler organism, and even gain insights on potential treatments for similar human diseases. C. elegans worms with PIEZO mutations were crossed with worms carrying fluorescent markers, and imaging techniques allowed us to see some of the effects of PIEZO on reproductive tissues. Genetic screening and targeted protein degradation were also used to identify genes or pathways that might reduce the negative effects of these mutations. PIEZO mutations led to significant reproductive issues in C. elegans, including reduced brood size, oocyte crushing, and impaired sperm guidance. The mutations prevented oocytes from reaching the site of fertilization, and sperm often failed to navigate back to the spermatheca correctly. Genetic suppression screening revealed potential modifier genes that partially alleviated these defects, indicating pathways that could compensate for the PIEZO mutation. This study demonstrates that PIEZO mutations lead to substantial reproductive dysfunction in C. elegans, primarily due to disruptions in oocyte and sperm navigation processes. By using C. elegans as a model, we were able to better understand the molecular basis of PIEZO-related disorders, and thus gain insight on possible treatments.

Liberal Arts and Sciences

EEGs use in detecting onset of stutter

Authors: Brian Shirley, Dhruv Patel, Dr. Eleonora Rossi

The purpose of this research project is to determine the extent to which electroencephalography (EEG) can be used to assist in reducing or completely eliminating a stutter in individuals who have been medically diagnosed with a stutter. For the context of this study, a stutter will be defined as a repetition or longer duration of sounds, syllables, and words. Essentially, it causes a disruption in the flow of speech. Although everyone experiences some form of disfluency, those with speech disabilities, such as stuttering, experience a different form of disfluency as their flow of speech is interfered with. EEGs are predominantly used to gather data on brainwaves, along with which area of the brain produces each respective signal. Our research seeks to analyze the brain waves of individuals who have a stutter, with the intention of proposing a muscle intervention mechanism in which an electrode on the surface of the scalp is used to identify signals of a stutter right before it's about to occur, releasing a counteracting electrical signal to a muscle stimulating electrode located near the jaw to potentially mitigate or completely counteract the spasms that would have been caused by the initial stutter. We have determined that there exists a gap in knowledge regarding the ability of an EEG analysis to successfully determine the source of a stutter, and as such, this is the primary goal of our testing. Ultimately, we aim to provide a plausible solution to stuttering, which affects roughly 80 million individuals worldwide.

Unveiling the Hidden Threat: the Impact of Sub-Optimum Treatment on Acquired Immunity, Asymptomatic Cases, Malaria Dynamics

Authors: Hemaho Taboe, Megan Sin, Madison Pratt, Olivia Prosper, Ruijun Zhao, Charles Mbogo, and Calistus Ngonghala

Malaria remains a persistent global health issue despite ongoing control efforts such as anti-malarial drugs and insecticide-treated bed-nets, indoor residual spraying, etc.. The greatest impact of malaria, a mosquito-borne illness, is felt in Africa. This study develops a compartmental mathematical model focusing on the impact of sub-optimal treatment and asymptomatic carriers on malaria transmission. The model is parametrized with malaria data from Kenya. Further, simulations involving these parameters assess various options of addressing malaria. Results of the simulations show key model parameters, including mosquito biting rates and treatment-seeking behavior, significantly affect disease control. Global Sensitivity analysis highlighted the critical impact of successful identification and treatment of individuals who received sub-optimal care. A DALYs analysis from 2002-2020 revealed that symptomatic individuals initially dominated the disease burden, but by 2020, asymptomatic individuals contributed equally and eventually contributed more. This shift underscores the growing importance of addressing asymptomatic carriers in malaria control strategies. The findings align with observed policy changes in Kenya over the study period. The study highlights the critical need for targeting both symptomatic and asymptomatic individuals in malaria control efforts, emphasizing the importance of early treatment-seeking behavior and vector management for long-term disease reduction.

Characterizing Organic Molecules and Contamination in Precambrian Age Rocks Using Space-flight-like Techniques

Authors: Emersyn Slaughter, Amy Williams

Organics detection is an integral part of the search for life beyond Earth. Natural terrestrial rock samples often serve as important analogs to test detection methods that will be applied to other worlds, like Mars. In a previous study, thirteen Precambrian cratonic rock samples from the Canadian, South African, and Australian cratons (ranging from 3.4 to 1.1 billion years old (Gy)) were exposed to tetramethylammonium hydroxide (TMAH) thermochemolysis to liberate polar molecules from macromolecules and make them sufficiently volatile for GC-MS detection (a method available on the NASA Mars Curiosity and ESA ExoMars rovers). Many of these ancient cratonic rocks yielded fatty acid methyl esters (FAMEs) above the level in the Si blank background. Samples consisting of chert and shale showed to yield more and higher abundance FAMEs than sandstone samples, which is a puzzling result, as rocks of these ancient ages are not expected to preserve primary FAMEs. Here, we investigate FAME abundances by analyzing organics that were solvent washed from the exterior of these ancient cratonic rocks. Specifically, the solvent rinsate used to clean the sample exteriors of the rocks are directly compared to already existing GC-MS data from the TMAH pyrolysis experiments. Results indicate that FAMEs within the rinsate range from C16 to C23, generally larger than the FAMEs identified within the rock interiors. Rinsate abundances range from within error to greatly exceeding those in the rock abundances, as anticipated. With this comparison, we seek to illuminate the sources of modern contamination to the ancient samples. Comparing solvent and sample data improves the ability to determine which specific organic molecules can be liberated from ancient cratonic rocks on Earth with the TMAH technique, assisting with the interpretation of data from similar-age rocks on Mars using the TMAH technique that is available on the respective Mars rovers.

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Exercise to Excess: How Compulsive Workout Habits Relate to Dieting and Disordered Eating in College StudentsExercise to Excess: How Compulsive Workout Habits Relate to Dieting and Disordered Eating in College Students

Authors: Valuta Michael, Favier Tyler, Degracia Gianna, Rodriguez Lindsey.

This study investigates whether college students who compulsively exercise experience restrictive dieting and disordered eating behaviors. Additionally, the study examines whether gender moderates this relationship. Data was collected from a sample of college students (N = 608), predominantly female (84%), through a Qualtrics Survey. We hypothesized that college students who strongly engage in compulsive exercise will have significantly more restrictive dieting and disordered eating behaviors. We also expected this association to be stronger among females. The results show that compulsive exercising was significantly associated with maladaptive eating attitudes (p = 0.024) and marginally significantly associated with disordered eating (p = 0.056). Moreover, these associations are stronger among women. Overall, this study considers how high levels of exercise may correlate with unhealthy dieting and eating patterns, which have implications for body dysmorphia.

Ultrahigh Molecular Weight Polymer Synthesis via Aqueous Dispersion Polymerization

Authors: Micayla K. Vereb, Cabell B. Eades, Megan E. Lott, Kaden C. Stevens, Danyella Cabrera, Jared I. Bowman, Brent S. Sumerlin

We report the synthesis of ultrahigh-molecular-weight (UHMW) double-hydrophilic block copolymers (DHBCs) via polymerization-induced self-assembly (PISA) to obtain a concentrated, but free-flowing, dispersion of UHMW water-soluble particles. By leveraging the salt sensitivity of poly(N-acryloylmorpholine) (PNAM), we polymerized NAM from a salt-tolerant poly(N,N-dimethylacrylamide) (PDMA) macroiniferter in 0.5 M $(NH_4)_2SO_4$ to yield free-flowing solutions of polymeric particles comprised of UHMW PDMA-b-PNAM. The kosmotropic $(NH_4)_2SO_4$ caused the salt-sensitive PNAM chains to become increasingly hydrophobic with increasing polymer molecular weight, eventually inducing self-assembly during chain extension. To retrieve the UHMW polymers from solution, simple dilution with water lowered the $(NH_4)_2SO_4$ concentration sufficiently to resolubilize the PNAM chains, affording a highly viscous solution of fully dissolved DHBCs. The low viscosities (<6 Pa·s) and shear-thinning behaviors of these particle solutions permitted their synthesis in a continuous flow setup. The simplicity of this synthetic route has enormous implications for the facile production of UHMW materials on an industrial scale.

Genetic correction of the defective embryogenesis associated with de novo fatty acid synthesis

Authors: Yooseong Wang, Ricardo Roure, Anushka Patil, Dr. Xiaofei Ba

Proper de novo fatty acid synthesis is critical to operating the healthy physiology in living organisms. Fatty acid synthase (FASN) is a step-limit enzyme during de novo lipogenesis. A commonality found in cancer cells is an elevated expression of FASN gene due to its essential role in lipid metabolism. Although multiple FASN-specific antagonists have been identified to inhibit cancer progression, the genetic suppressors of FASN remain elusive. Here, we used the nematode model Caenorhabditis elegans to identify genetic suppressors of fasn-1, the single ortholog of human FASN. Our previous studies identified a temperature-sensitive (ts) mutation fasn-1(g43ts), which caused embryonic lethality at the non-permissive temperature while not affecting the viability at the permissive temperature. The embryonic lethality in the ts mutant provides a facile readout for conducting forward genetic screens. To identify the genetic suppressors of fasn-1(g43ts), we conducted chemical mutagen-mediated forward genetic screens to identify candidate lines that could significantly alleviate the embryonic lethality caused by the ts mutant. We isolated 21 independent suppressor lines with significant restoration of viability with the presence of the original fasn-1(g43ts) mutation . We then performed whole-genome sequencing and used a machine-learning-based bioinformatic pipeline to narrow the candidate lists to six genes from over 2000 mutations induced by the chemical mutagens. We are conducting a RNA interference (RNAi) screen to validate whether the knock-down of these candidate genes could restore the embryonic viability in the fasn-1(g43ts) mutant. Once we confirm the suppression of the candidate genes, we will use CRISPR/Cas9 gene editing to generate the clean suppressor alleles in the fasn-1(g43ts) mutant to confirm their suppressions.

Synthesis of Novel 2-Fluoro-Quinolinyl-Hydrazones as Potential Candidates for the Discovery of New Anti-Leishmanial and Anti-Chagas Disease Drugs

Authors: Ansley Wood and Simon E. Lopez

Neglected tropical diseases (NTDs) are a group of conditions that affect over a billion people globally, mainly impoverished communities in tropical areas. Leishmaniasis and Chagas Disease are two parasitic NTDs transmitted via insect bites. Leishmaniasis is caused by parasitic protozoa of the genus Leishmania, transmitted via phlebotomine sandfly bites. This disease is prevalent in 88 countries, with an estimated 700,000 to 1 million new cases each year. Chagas disease is caused by a protozoan parasite called Trypanosoma cruzi, which is transmitted via triatomine bugs' feces. Chagas disease is mainly found in 21 Latin American countries. An estimated 6 to 7 million people in the world are currently infected with Chagas Disease, leading to approximately 12,000 deaths every year. The currently developed drugs for the treatment of Chagas disease and Leishmaniasis are few, financially inaccessible, often highly toxic to humans, and susceptible to parasite resistance. Therefore, the need for new affordable, safe, selective, effective drugs for the treatment of Leishmaniasis and Chagas disease is urgent. This research aims to synthesize various novel compounds that will be tested as potential new drugs for the treatment of Leishmaniasis and Chagas disease. The target compounds contain an N-acylhydrazone fragment that is found in many biologically active compounds and has shown antiparasitic activity on parasites including those which cause Leishmaniasis and Chagas Disease, as well as inhibition of cysteine proteases involved in several parasites' survival. The synthesis of the target compounds, 2-fluoro-quinolinyl-N-acylhydrazones, requires a series of 4-5 reactions, starting from simple and affordable starting materials (anilines). Upon completion, the compounds will be sent to the Universidad de la Republica, Uruguay, for biological testing and molecular modeling as new potential antileismanianial and anti-Chagas drugs.

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Catholicism, Gender-Affirming Care, and the Transgender and Gender Non-Conforming Community

Authors: Sarah Wutzler, Anna Peterso

Analysis of the relationship between Catholicism, gender-affirming care, and transgender and gender non-conforming (TGNC) communities is critical given the extensive influence of Catholic thought within healthcare systems. Limited research on this subject and the politicization of gender-affirming care makes this analysis especially valuable at this time. Examination of literature reveals that Catholics often condemn gender-affirming practices and advise professionals against offering such care. Justification for this perspective is rooted in the Catholic understanding of human dignity, which includes respect for life beginning at conception and adherence to the principles of totality and integrity. Data on TGNC health outcomes shows that gender-affirming care is beneficial for TGNC individuals. Catholic hospitals retain the right to refuse provision gender-affirming care under U.S. law; however, this refusal is a significant barrier to care for TGNC individuals, who already face disproportionate burdens when accessing care. This research reveals the connection between healthcare barriers created and/or upheld by Catholic principles and lower overall health outcomes for TGNC people.

Investigating the Efficacy of T Cell Gene Editing Using a Microfluidics-Based System as an Alternative to Nucleofection

Authors: Syed S. Ali, Rafi Rammoo, Pedro Zanoelo, Alexander D. Pearce, Matthew E. Brown, Todd M. Brusko

The advent of CRISPR/Cas9 gene-editing has many applications in basic science and precision medicine. Current methods rely on nucleofection to deliver CRISPR/Cas9 ribonucleoprotein (RNP) complexes, which requires harsh electroporation to create pores in the plasma membrane needed to internalize RNP complexes. Therefore, increasing the efficacy of gene editing while maintaining the viability and function of the edited cell population is of the utmost importance for designing gene therapies. As an alternative to existing nucleofection-based methods, we investigated the efficacy of delivering gene edits using a microfluidics-based system to introduce a transient plasma membrane disruption (TPMD), allowing for the delivery of RNP complexes to T cells. To accomplish this, we first identified the optimal pressure for delivering a fluorescent, FITC-Dextran cargo to resting fresh T cells as 70 PSI, with stark decreases in cell viability at higher PSIs and frozen T cell populations. Following our initial optimization, we confirmed that following the delivery of a CRISPR/Cas9 RNP at a 6:1 sgRNA:Cas9 molar ratio to knockout (KO) the gene CD226, cells having undergone TPMD demonstrated comparable editing efficiency to nucleofection when evaluating CD226 expression, 4 days post-transfection using spectral flow cytometry. Lastly, we identified when stimulating T cells immediately following TPMD-mediated editing, those cells demonstrate improved viability and proliferative capacity, measured by proliferation tracking dye dilution, compared to T cells having undergone nucleofection. Overall, our data demonstrate that TPMD-based T cell gene-editing exhibits potential as an alternative to nucleofection-based methods. Future experiments can be directed towards examining editing efficacy with greater cell throughputs and determining the most optimal waiting period following TPMD, after which resting T cells can be stimulated to achieve maximal proliferation for cell therapy applications.

Medicine

Evaluating Muscle Regenerative Capacity and Pathology in a Myotonic Dystrophy Type 1 Mouse Model with Expanded CTG480 Repeats

Authors: Maria Fernanda Alves de Moura, Mackenzie Davenport, Maurice Swanson

Myotonic dystrophy (DM) is the most common form of adult-onset muscular dystrophy. The primary clinical presentation of DM1 is progressive muscle weakness and wasting of the distal muscles, shoulders, neck, and face. DM1 is caused by the expansion of repetitive CTG sequences in the 3'UTR of the DMPK gene. Expansion of these sequences results in the sequestration of the muscleblind-like (MBNL) family of RNA-binding proteins. Our lab recently developed a new mouse of model for DM1 which has 480 CTG repeats inserted into the endogenous Dmpk 3'UTR. Despite this number of repeats resulting in disease manifestation in humans, the muscle of this mouse model is spared with no overt pathology; however, myoblasts in culture develop RNA foci and missplicing. It has been proposed that there is a deficit in muscle regenerative capacity in DM patients, and expression of developmental myosins is increased in patient muscle. To test whether the phenotype in cultured myoblasts is a result of satellite cell defects and whether deficits in regenerative capacity might prelude overt muscle defects, we performed cardiotoxin injuries to the tibialis anterior (TA) muscle of DmpkCTG480 mice and their respective wild-type littermate controls. We analyzed the muscles histologically and evaluated markers of ongoing muscle regeneration such as centralized nuclei and the expression of embryonic myosin heavy chain (eMHC). Surprisingly, we did not find differences in eMHC expression or in the number of centronucleated fibers, suggesting that these mice do not have regenerative deficits.

Medicine

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Alpha-1 Antitrypsin Enhances Humoral Immunity in response to vaccines

Authors: Maya Baker, Noah Jones, Lindsay Renshaw, Emily Moser

Alpha-1 Antitrypsin (AAT) is a critical protease inhibitor that regulates extracellular proteases to maintain tissue homeostasis. Patients with deficiency in AAT show increased susceptibility to pathogens for which vaccines are available. The role of AAT in modulating protective immunity, particularly in antibody responses following vaccination, remains poorly understood. This study aims to explore the role of AAT in the stability of vaccine antigens in lymphoid tissue and its impact on humoral immunity after vaccination. Using AAT knockout (KO) mice, we found that AAT-deficient mice had significantly lower antigen-specific antibody titers after immunization, suggesting AAT's role in enhancing antibody responses. Using bone marrow chimeric models, we determined that AAT must be produced by B cells to contribute to T-dependent antibody responses. To further understand how AAT is prolongs protein antigen stability in lymph nodes, we tracked antigen accumulation and half-life in lymph nodes following immunization with fluorescent protein antigens. Our findings demonstrated that protein antigens degrade more rapidly in lymph nodes of AAT KO mice compared to wild-type, indicating that AAT is essential for preserving antigen stability. This research sheds light on how AAT modulates antibody responses to protein vaccines and its broader implications for vaccine efficacy in AAT-deficient individuals. Understanding AAT's role in antigen stability could lead to new strategies for optimizing vaccine responses in AAT-deficient patients.

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Evaluating the Effect of an Implementation of CARS-2 scoring as a Substitution for ADOS in ASD Diagnosis

Authors: Meybelyn C. Bauza, Gabrielle D. Dallas, Sydney Fialko, Alicia Solis, Amberly Grace, Yumi Kovic, Kerri P. Peters, Takahiro Soda, Lindsay A. Lloveras

Parents of children with concerns for autism spectrum disorder (ASD) have reported delays in diagnosis and being referred for services as long as three years from first concern of ASD to diagnosis (Zuckerman et al., 2015). One of the labeled barriers within receiving ASD services as a means of early intervention is healthcare guidelines, which require a comprehensive autism diagnostic evaluation (CADE) prior to referral for some autism services (Zablotsky et al., 2014). There are many barriers to completion of this evaluation that further exacerbate delays, such as long wait lists and the resource-intensive nature of the assessment tools. Using a roster of 436 patients with ages ranging from 14 months to 7.5 years old, a comparison was made between different insurances and the delay from a CADE referral to a completed ASD diagnosis. Patients were divided based on the date of the initial evaluation, before or after intervention received at the Developmental and Psychiatry Clinic at the University of Florida. Intervention refers to the implementation of a Childhood Autism Rating Scale 2 (CARS-2) scoring at initial evaluation. The study aimed to observe if a decrease in the average time of children receiving an ASD diagnosis would occur. Preliminary analysis conducted demonstrates significant differences between number of days from CADE to diagnosis for the intervention. Future direction will include analysis of more variability of data.

Medicine

Evaluating the Effect of an Implementation of CARS-2 scoring as a Substitution for ADOS in ASD Diagnosis

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Medicine

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A Persistence Landscape Toolbox

Authors: Aidan Bryant, James Golabek, Cory Brunson

Topological data analysis (TDA) uses algebraic topology to reveal structure in high-dimensional data, encoded as topological feature sets called persistence diagrams (PDs). One approach to representing PDs is through persistence landscapes, a vectorized format suitable for statistical or machine learning models. Currently, R users lack a comprehensive tool to compute, explore, and analyze persistence landscapes within the TDA ecosystem, limiting the usage of this method. By developing an R package for this technique and its uses, we aim to expand the analytical tools in the field and integrate persistence landscapes with the existing R ecosystem for TDA. We aim to expand TDA's analytical tools by developing an R package for persistence landscapes, integrating this technique into R's ecosystem to equip users with efficient computation tools, support customized workflows, and encourage broader adoption. We are developing the {plt} R package, which interfaces with the C++ library Persistence Landscapes Toolbox. The package introduces the `Rcpp_PersistenceLandscape` S4 class, created through {Rcpp}, to expose the underlying `PersistenceLandscape` C++ class to R. This allows users to transform persistence data into persistence landscapes and conduct various analyses such as visualization, Hilbert space operations, distances, integrals, and statistical summaries. We are writing a vignette that demonstrates capabilities for statistical analysis, exploratory data analysis, and predictive modeling while introducing the mathematical foundations of persistence landscapes. The {plt} package offers a new way for R users to work with persistence landscapes, and to conduct richer data analyses within R's TDA ecosystem. Upon release, {plt} will be accompanied by comprehensive documentation tailored to enhance accessibility and encourage widespread use of persistence landscapes, ultimately supporting R users across fields in the use of topological data analysis.

Medicine

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Impact of a Histone H2A mutation on cell biological properties related to cancer

Authors: Rishika Cherukuru, Anthony Lamberto, Richard Bennett, PhD, Jixiu Shan, PhD

Histones are proteins that play a critical role in DNA compaction, gene regulation, and access to DNA during replication and transcription. DNA wraps around complexes of histone proteins to form a nucleosome, which packs together to construct chromatin and, eventually, a chromosome. The octamer structure of histone proteins is essential for packaging DNA into the cell nucleus. By examining a database of cancer genomic profiles to analyze histone genes, statistical analysis found a significant number of genomic alterations in the H2A genes of lung cancer patients. Patients with these mutations were found to have lower survival rates compared to those without the mutation. In histone H2A, the most frequent mutation in cancer was a glutamate-to-lysine missense mutation at amino acid position 121 (H2A-E121K). My research is centered on investigating the impact of the H2A-E121K mutation on cell biological properties relevant to cancer. The core hypothesis of this study is that the H2A E121K mutation significantly alters cell biological properties, leading to the transformation of normal cells into a cancer-like state. To test this, we have compared the proliferation rate, apoptosis, and migration of the BEAS-2B lung epithelial cell line expressing mutant H2A-E121K to cells expressing wild-type H2A. The results of these studies are expected to provide valuable new insights into how chromatin architecture protects cells from tumorigenesis.

Medicine

Effects of D1 and D2 Receptor Signaling in the Medial Orbitofrontal Cortex on Probabilistic Reversal Learning

Authors: Rachel Evans, Courtney Sercander, and Nikhil Urs

The medial orbitofrontal cortex (mOFC) is a subsection of the orbitofrontal cortex located in the prefrontal cortex. The mOFC plays a role in goal-based decision making. This process is informed by the relative value of a reward, and the mOFC contributes to making, learning, and remembering this evaluation. The mOFC also bidirectionally regulates effort allocation for a given reward. This allows the ability to make an educated decision based on the relative value of the presented reward. Many reward-based mechanisms are regulated by dopamine, both in the mOFC and in other connecting brain regions. Dopamine is a neurotransmitter known to play a role in experiencing reward and motivation, especially in the mesocorticolimbic pathway. Dopamine binds to two distinct groups of receptors in the brain, these being D1-like and D2-like receptors. D1 receptor types are excitatory, while D2 receptor types are inhibitory. All dopamine receptors are metabotropic. Previous studies have found that D1 and D2 receptors in the mOFC exert opposing effects on reversal learning, acting on pathways to the striatum and the ventral tegmental area. Inhibition of D1 receptors impairs the ability to complete reversal learning tasks, while inhibition of D2 receptors improves performance. Our research goal was to explore the role of D1 and D2 receptors in the mOFC in probabilistic reversal learning tasks. We used fiber photometry to measure dopamine output, and operant behavioral conditioning tasks to study impulsivity and cognitive flexibility. We found that manipulation of D1 and D2 receptors in the mOFC does not result in any significant changes in the examined behaviors.

Medicine

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Establishing a germ-free mouse model of human gut microbiota associated autism-like behavior

Authors: Kaleb Friday-Saunders, Katherine Bauer Estrada, Ana Maria Porras, Karina Alviña

Autism spectrum disorder (ASD) is a neurodevelopmental disorder affecting 1 in 36 children in the US. This disorder can affect a person's ability to socialize, cause persistent repetitive behaviors, or cause limited interests. It is known that some genetic factors are linked to ASD, but recent studies show that the gut and brain have a bidirectional connection that may also affect ASD diagnosis. This connection is intimately related to the gut microbiome, which is made of gut resident microorganisms and the compounds that they produce (such as short chain fatty acids, neurotransmitters, intestinal enzymes and others). In ASD, the composition of the gut microbiome is known to be altered, which can hinder nutritional acquisition and affect their behavior overall. However, the causal relationship between gut dysbiosis and ASD has not been fully established, especially when considering geographical differences that could account for gut microbiome variations. To answers these questions, we developed a "humanized" mouse model using microbiota taken from fecal samples from ASD and neurotypical (NT) children from a study in Colombia. We first characterized this microbiota and confirmed that there is a significant difference in diversity of bacterial species. Those samples were then used to inoculate germ-free (GF) mice via gavage. 3-4 weeks after this process several behaviors were quantified, focusing on sociability and exploration. Our data show that after 1 week, GF mice are effectively colonized by human microbiota. Behavioral data showed that anxiety-like behaviors and overall exploration were comparable between mice colonized with microbiota derived from NT or ASD donor, however there was a significant difference in sociability in the three chambers test, with ASD mice showing reduced preference for social interaction. Our results indicate the successful establishment of a mouse model that can be used to dissect mechanisms underlying gut dysbiosis and ASD related behavioral outcomes.

Medicine

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Characterization of an AAV Mouse Model of a CASP8 Repeat Expansion Mutation

Authors: Isabella Gerstin, Alyssa Collier, and Lien Nguyen

Alzheimer's Disease (AD) is a neurodegenerative disease with a complex genetic basis that is not yet fully understood. The hallmarks of AD include the accumulation of extracellular amyloid beta plaques and intracellular hyperphosphorylated tau. However, the cause of these pathologies and the underlying mechanisms of the majority of AD cases are not clear. The Nguyen lab seeks to address the gap in knowledge of the genetic cause and molecular mechanisms in AD. Our lab has recently identified a GGGAGA repeat expansion mutation in the CASP8 gene (CASR8-RE) that encodes for the polymeric peptide arginine-glycine (polyGR) containing proteins. In AD brains, polyGR-containing proteins that were detected in more than 50% of tested cases are strongly associated with increased disease pathology including higher phosphorylated Tau, Aβ plaques, and neuritic plaques. Distinct variants of the GGGAGA repeat expansion in CASP8 have also shown to have increased risk of developing AD, called AD-R1, when compared to common variants (C-Var). However, how the CASP8-AD-R1 variant contributes to AD has yet to be determined. My project seeks to address the question of whether we can capture AD pathology in mice that were injected with an adeno-associated viruses (AAV) that express the CASP8-AD-R1 variant in the brain. I will perform immunofluorescence (IF) and Fluorescence In-Situ Hybridization (FISH) staining on brain tissue from mice injected with AAV-CASP8-AD-R1, AAV-CASP8-C-Var, or non-expanded sequence (AAV-CASP8-8N). We have yet to determine whether polyGR containing proteins are expressed and accumulate in these AAV mice. These experiments will allow for the first-time visualization of CASP8 polyGR proteins in a mouse model, offering insights into the contribution of this proteinopathy in AD.

Medicine

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Accessible and Tidy Geometric Data Analysis

Authors: John Gracey, Jason Cory Brunso

Background Geometric data analysis (GDA) is a statistical approach that uses geometry to explore relationships within multivariate data, often visualizing data in lower-dimensional spaces to reveal patterns and structures. Despite sharing similar mathematical foundations, GDA methods largely lack cohesion in their implementations to the statistical programming language R due to varied class and object naming conventions, which can obscure their theoretical unity. Objective The goal of this project is to provide R users with an intuitive and unified framework for common GDA tools that accurately reflects the underlying mathematical theory. In particular, we are seeking to integrate popular implementations of principal component analysis (PCA) and factor analysis (FA) into the popular Tidyverse package. Materials & Methods We are working to develop and extend a published package, {ordr}, to properly handle GDA techniques based on eigenvalue decomposition (EVD). This arose from ongoing work to bring {psych} implementations of PCA and FA to the extension {ordr.extra}. The approach requires careful validation of multiple software implementations against each other. We are recording the development process in a package vignette. Results Ultimately, by integrating mathematical modeling approaches with intuitive workflows, we aim to make such methods accessible to a wider range of users and easier to incorporate into their analysis practices. Additionally, by publishing a vignette detailing the research and development process, we hope to reduce ambiguity often found in statistical analysis software and welcome user contributions. We intend this software to help researchers who use geometric techniques like PCA and FA but are not themselves statisticians leverage the unity of these techniques to more clearly and efficiently conduct and communicate their analyses.

Medicine

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ALT Expression

Authors: Sarah McMahon, Brooke Hall, Rolf Renne

Oncogenic viruses account for ~15-20% of cancers worldwide Kaposci's sarcoma-associated herpevirus (KSHV), also known as human herpesvirus 8 (HHV8) is a large, double-stranded DNA virus and the major causative agent of multiple tumors, including Kaposci's sarcoma (KS) and Primary effusion lymphoma (PEL). As a herpevirus, KSHV has a biphasic life cycle with both a latent and a lytic phase. During the latent phase, a restricted set of viral RNAs are expressed that contribute to its tumorigenesis potential. Therefore, understanding the viral transcripts that are expressed and their functions in latency will help future efforts to develop therapeutics for treating these tumors. The viral transcript of interest in this research study is a viral on-coding RNA called Antisense to LANA Transcript (ALT). This viral transcript is ~ 11kb long and is genetically located antisense to the major latency protein, LANA. Non-coding RNAs do not code for proteins, but have important impacts on cellular processes that can support tumorigenesis, including cell proliferation and regulation of cell cycle. While ALT has been identified in previous studies, currently a functional role of this viral transcript remains unknown, especially in the context of viral latency. Given its size and genetic proximity to LANA having a better understanding of this viral non-coding RNA is important for understanding KSHV latency regulation. We hypothesized that ALT regulates the expression of the major latency protein, LANA, to support viral latency. We sought to prove that ALT is expressed during latency in PEL cell lines and if ALT is expressed during latency to prove if it regulates the promoter of LANA.

Medicine

Iron Deficiency in Pregnancy: Iron Intake Analysis of Third Trimester Diet Records

Authors: Zara Haruna, Kathryn Humes, Carly Serlenga, Nicole Wang, Alejandra Iglesias, Yulianices Fernandez, Michele Himadi, Sionika Thayagabalu, Hannah Quintal, Dominick Lemas

According to the World Health Organization, iron deficiency is the most common nutritional deficiency leading to anemia. Pregnant women are prone to developing iron deficiency anemia because they share nutrients with their fetus and their blood volume increases. Iron deficiency anemia increases pregnant women's risks for perinatal mortality, low birth weight, and preterm birth. Preterm birth and low birth weight are leading causes of infant death in the United States. In this way, iron status during pregnancy can significantly affect infant health outcomes. This project's objective is to identify iron deficient diets during pregnancy by comparing daily iron intake to the recommended intake for pregnant women. We analyzed self-reported diet records provided by 48 Breastfeeding and Early Child Health study participants during their third trimester. We entered their diet information into ESHA food processor to extract the nutritional data for each record. Using R, we grouped the third trimester nutritional data together and isolated daily iron intake. Comparing this data to the recommended daily iron intake for pregnant women revealed that 87.4% of participants' daily iron intakes were below the recommended dietary allowance (27 mg). However, 12.6% participants consumed above the recommended dietary allowance, with one participant's intake being greater than the tolerable upper intake level (45 mg). These results suggest that most third trimester participants in the study had iron deficient diets, increasing their susceptibility to poor perinatal health outcomes. We will further explore the impact of this deficiency on infant health by examining its relationship to gestational age and birth weight, emphasizing the importance of prenatal care and early interventions for iron-deficient pregnant women.

Medicine

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Targeting Proliferation of GNAQ-Mutant Uveal Melanoma

Authors: Lauren Hellwege, Katelyn Raburn, Gianluca Medigovic, Jonathan D. Licht, Richard L. Bennett

Uveal (eye) melanomas (UM) originate from the melanocytes within the uvea. The tumors resulting from uveal melanoma develop from normal melanocytes and often metastasize to the liver. Almost all UM harbor an initiating mutation in the G signaling pathway, most commonly in the GNAQ gene. Prior work has identified that GNAQ-mutant UM cells depend on growth mechanisms involving lipoic acid biosynthesis, mitochondria respiration, and the p300-CBP transcriptional coactivator protein to proliferate. We hypothesized that small molecule inhibitors targeting growth pathways specific for GNAQ mutant cells may disrupt UM growth. We, therefore, treated UM cell line Mel202 or 92.1 with either Metformin, a drug that targets mitochondria respiration and is also able to trigger autophagy, or SGC-CBP30, a compound that inhibits the transcriptional co-activator protein p300-CBP. We measured the proliferation and apoptosis of the cell lines following treatment with inhibitors by live cell imaging. We found that treatment with Metformin and SGC-CBP30 blocked the proliferation of UM cell lines. Metformin induced apoptosis of UM cells. Furthermore, SGC-CBP30 synergized with the MEK inhibitor trametinib to block the proliferation of UM cell lines. Inhibiting energy metabolism with metformin or transcription activation with SGC-CBP30 was cytotoxic to uveal melanoma cells.

Medicine

Trends and Predictions in IBD Emergency Department Visits and Admissions: Implications for Healthcare Planning and Policy

Authors: Ali A Aalam, Nofel Iftikhar, Naueen A Chaudhry, Tomas Potlach, Ellen M Zimmermann

Inflammatory Bowel Disease (IBD) poses a major public health challenge in the US. The Emergency Department (ED) often acts as a safety net for managing acute symptoms and severe complications in IBD patients. Analyzing ED visits and inpatient admission trends is crucial for resource allocation, enhancing patient outcomes, and informing public health policy. A retrospective cohort study analyzed data from the Nationwide Emergency Department Sample (NEDS), examining 1.3 billion ED visits across 39 states and Washington D.C. from 2012 to 2021. The research focused on trends in hospital admissions of IBD patients from ED visits, considering those with and without major complications and comorbidities. Odds ratios were used to assess trends, and a linear regression model predicted IBD admissions from 2022 to 2027. Patients included had primary or secondary diagnoses of Crohn's Disease or Ulcerative Colitis, identified by ICD 9 and ICD 10 codes. The study involved patients aged 0 to 90 years, with an average age of 41. Women comprised 55% of the participants. The ethnic composition was primarily White (59.4%), followed by African Americans (17.3%), Hispanics (13.1%), Asians/Pacific Islanders (6.5%), Native Americans (2.5%), and others (1.2%). Medicaid was the most common insurance, followed by private insurance and Medicare. From 2012 to 2021, 139,770 patients with IBD were admitted after visiting the ED, with annual admissions averaging 13,977. Despite a decrease in overall ED visits for gastrointestinal diseases, IBD admissions increased from 2.09% in 2012 to 3.3% in 2021, in relation to overall ED visits. IBD patients with comorbidities consistently had higher odds of ED visits compared to those with major complications or no complications. Predictions indicate a rise in inpatient IBD admissions: 15,940 in 2022, increasing annually to 17,725 by 2027.

Mapping Tumor Metabolism in Lung Adenocarcinoma Using Spatial Imaging and Advanced Metabolomics

Authors: Harrsion Clarke, Olivia Janzen, and Ramon Sun

Adenocarcinoma, a subtype of non-small cell lung cancer (NSCLC), represents the most common and aggressive form of lung cancer, with a projected 125,070 deaths in the US in 2024. A key challenge in lung cancer research is understanding the molecular characteristics that contribute to tumorigenesis in adenocarcinoma. Identifying distinct molecular drivers of disease progression within NSCLC is essential, as it could pave the way for predictive biomarkers and novel therapies. To better understand NSCLC progression, we utilized a genetically engineered mouse model with mutations in KRAS and p53—genes that are commonly mutated in human cancers. By delivering these mutations to mouse lung cells via AdenoCre virus, we can induce lung tumors that model adenocarcinoma. To track tumor development, we employ a high-field 7 Tesla magnetic resonance imaging (MRI) system, which allows for high-resolution, non-invasive imaging of tumor growth and vascular changes over time. Matrix-assisted laser desorption/ionization-mass spectrometry imaging (MALDI-MSI) is also used to investigate metabolic alterations within tumors. MALDI enables spatial mapping of metabolites directly from tissue slices to identify specific metabolic pathways altered in tumor cells. Overall, our integration of advanced imaging and metabolic analysis enhances understanding of NSCLC pathophysiology and reveals potential biomarkers and targets for future therapeutic interventions.

Medicine

Effects of intra-striatal injection of alpha-synuclein preformed fibrils in young versus aged rats

Authors: Swetha Jeyagopal, Gabrielle Summers, Barry Setlow, Jennifer L. Bizon, Matthew R. Burns

Alpha-synuclein is a protein that has been implicated in Parkinson's disease (PD). When this protein misfolds and fibrillates, it can aggregate to help form Lewy bodies and thus contributes to PD progression. Consequently, many researchers have adopted intra-striatal injections of alpha-synuclein pre-formed fibrils (PFFs) in rats to model cognitive and motor symptoms of PD. Despite age being the most significant risk factor contributing to synuclein-associated dementias, aged animal models are rarely used. The focus of our research is to evaluate the effects of injecting alpha-synuclein PFFs into young and aged rats. Sixty-three male Fischer 344 x Brown Norway F1 hybrid rats, either young (6 months) or aged (24 months), underwent surgery to inject either alpha-synuclein PFFs (experimental group) or alpha-synuclein monomers (control group) into the bilateral striatum. Two months post-surgery, rats were food restricted and tested on a delayed response working memory task and a probabilistic reversal learning task. Our initial hypothesis was the PFF groups would perform worse than the controls. We also hypothesized that working memory and cognitive flexibility would deteriorate more rapidly in aged versus young rats PFF rats. The working memory task consisted of delays (0-24s) where the rats had to correctly recall the location of a lever after the delay to receive a food reward. In the probabilistic reversal task, the rats learned to discriminate between two levers that were reinforced with different probabilities that switched between levers. Prior work with the PFF model shows that alpha-synuclein levels peak 2-4 months after injection and decline thereafter, so we have conducted fMRI scans at the 4-month checkpoint to assess the impact of the alpha-synuclein throughout the brain. The overall results suggest that this aged rat model can replicate the progression of PD and its resulting cognitive deficits.

Medicine

Contributions of ovarian hormones to executive functioning in aged female Fischer 344 X Brown Norway F1 hybrid rats

Authors: Rishi Karpur, Katherine M. Gonzalez, Jennifer L. Bizon, Barry Setlow

Prefrontal cortex (PFC)-mediated executive functions have been shown to change with age, and some studies suggest that sex differences may be present due to altered gonadal hormone levels, mainly driven by menopause. While age-related changes in executive functioning have been successfully modeled in rats, these studies have largely been limited to males. Recent work from our labs evaluated both male and female young adult and aged Fischer 344 x Brown Norway F1 hybrid (FBN) rats in a battery of executive functioning tasks, and found that, in contrast to aged males, which were impaired relative to their young male counterparts, performance in aged females was largely intact. Unlike humans, however, aged female FBN rats maintain estrous cyclicity well into advanced ages. As such, we evaluated whether estrous cycling contributes to maintained performance in aged female rats on intertemporal choice, working memory, and probabilistic reversal learning tasks, on all of which aged males have been shown previously to be impaired. Aged female rats (21 months at the start of testing) underwent either ovariectomy (OVX), in which the ovaries are surgically removed to induce estropause, or control (Sham) surgeries, followed by behavioral testing. OVX and Sham females did not exhibit behavioral differences on any of the executive functioning tasks and performed similarly to non-surgical controls from an earlier study. Collectively, these data suggest that maintenance of ovarian hormones in aged female FBN rats does not account for their relatively spared executive functions compared to aged male rats of the same strain

Medicine

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Enhancing MALDI-MSI Glycan Profiling: Comparative Analysis of Novel PNGase Production Methods

Authors: Reece Larson, Roberto A Ribas, Manuel Sanchez, Michael Soto, Craig W Vander Kooi, Matthew S Gentry, Ramon C Sun

PNGase F is used in Matrix-Assisted Laser Desorption- Mass Spectrometry Imaging (MALDI-MSI) to be able to identify N-linked glycans. N-linked glycans can be used as biomarkers of disease and help look at glycan changes in tissues. Therefore, a more efficient production of PNGase F would help increase the availability of this assay. Looking at the effectiveness of two new manufacturing types of PNGase F M1 ultra and M2 ultra. Formalin-Fixed Paraffin-Embedded adjacent slices of mouse wild-type brain tissue slices were dewaxed and then underwent through an antigen retrieval protocol. Afterward, they were sprayed with PNGase F enzyme, two tissues with the old method of production, two with M1 ultra and two with M2 ultra and all were sprayed with an addition of isoamylase. Enzymes were then incubated for two hours, sprayed with α-Cyano-4-hydroxycinnamic acid (CHCA) and ran on MALDI-MSI. M1 ultra showed to have a decrease in every glycan and glycogen chain length profile. M2 ultra shows to be higher in some glycans and lower in others, while higher for the glycogen chain length profile. When comparing regions of the brain such as the hippocampus and cerebellum, these trends hold true except in M2 ultra due to damage to one tissues cerebellum . As a result, it looks like a new manufacturing method for PNGase F would be viable and make this assay more accessible. With increased accessibility, glycan biomarkers for disease could be used in patient diagnosis in the future.

Medicine

Macrophages and Cancer: Exploring DNMT3A Mutation in Bone Marrow-Derived Macrophages

Authors: Mia Morin, Qingchen Yuan, Annalisse McKee, and Olga Guryanova

Clonal hematopoiesis describes the clonal expansion of a hematopoietic stem cell and its mature progeny that harbor a mutation, usually in a leukemia-associated gene. Loss-of-function mutations in DNMT3A, a gene which encodes a de novo DNA methyltransferase, is the most commonly observed genetic alteration in clonal hematopoiesis and can be modeled in mice by a Dnmt3a knock-out. In previous studies, heterozygous DNMT3A loss specifically in the blood system resulted in increased tumor burden and a more advanced disease in a model of colitis-associated colon cancer. Yet, the mechanisms through which clonal hematopoiesis promotes the severity of coincident non-hematologic cancers remain incompletely understood and need investigation, although dysfunctional phagocytes have been implicated. Here, we used bone marrow-derived macrophages from mice with a heterozygous Dnmt3a knock-out to investigate their phagocytic function and ability to support cancer cell proliferation. We found a significantly weakened phagocytic capacity in the heterozygous Dnmt3a macrophages and a trend towards increased cancer cell proliferation. These findings suggest that DNMT3A plays an important role in regulating the anti-tumor immune response, and DNMT3A mutation in the blood system may create a permissive tumor microenvironment for cancer cells to persist.

Medicine

Studying genetic differences between the 17syn+ and KOS(M) strains of HSV-1 and their role in maintaining latency

Authors: Ethan Conerly, Noah Muller, David Bloom

Herpes Simplex Virus-1 (HSV-1) is an enveloped double stranded DNA virus which establishes a lifelong infection within the trigeminal ganglia. The latent and reactivation phases vary in their timeline dependent on which strain is present. Within the laboratory setting two strains are predominant, 17syn+ and KOS(M). 17syn+ is more virulent and readily reactivated, while KOS(M) establishes a latency that is harder to reactivate from, which has currently been attributed to a discrepancy in genome production where KOS(M) has ten times as many genomes within our Lund Human Mesencephalic (LUHMES) neuronal cell line, measured through twenty four hours post infection in comparison to 17syn+. Our experiment aims to further investigate this discrepancy and find if it arises from a genetic difference within the latency associated transcript (LAT) of each strain. This will be accomplished through creating two transfected viruses which will swap regions of the genome encompassing the LAT promoter and encoding the 5' 2kb of the LAT which is a transcriptional terminator located upstream of LAT, to the beginning of ICP0, an intron of LAT responsible for the ability to establish latency and reactivation from latency, from each virus and swapping them between 17syn+ and KOS(M) to determine if this region is responsible for the phenotypic discrepancies in their expression of latency. We will then re-explore the genome loads from the new transfected viruses and the ability of each to reactivate.

Medicine

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Predicting Gene Expression Response to HDACi Therapy in Cancer

Authors: Nikita Nangia, Daiqing Liao

HDAC inhibitors (HDACi) are a class of drugs that target histone deacetylases, enzymes involved in gene regulation. By inhibiting HDACs, these drugs increase the acetylation of histones, leading to changes in gene expression. HDACi have shown promise in treating various cancers as they can reactivate tumor-suppressor genes and downregulate oncogenes. Bioinformatics and machine learning can play a crucial role in understanding the effects of HDACi on gene expression. We developed a computational model to predict the effects of HDACi on gene expression, leveraging machine learning techniques and a comprehensive dataset of cancer cell line data. Our model incorporated data from the Cancer Cell Line Encyclopedia (CCLE), including whole exome sequencing (WES), RNAi dependency data, methylation profiles, RNA sequencing data (CCLE TPM RNAseq and DepMap Expression Public), copy number variations, quantitative proteomics data, and gene-level features. By integrating these diverse data sources, our model was able to effectively capture the complex regulatory mechanisms underlying HDACi-induced gene expression changes. We found that genes with specific characteristics, such as higher GC content, transcript counts, and specific GO annotations, were more likely to be differentially expressed in response to HDACi treatment. Moreover, our model demonstrated good accuracy in predicting the effects of HDACi on a different cell line, suggesting its potential for broad applicability across diverse cancer types. This information can be used to develop more targeted HDACi therapies by focusing on genes that are most likely to be affected by the drug in a particular cancer type. Additionally, understanding the gene expression changes induced by HDACi can help researchers identify potential biomarkers for drug response and toxicity, leading to more personalized cancer treatments.

The Role of Spiritual Coping in Substance Use Disorder Recovery

Authors: Spenser Pham, Apollonia E. Lysandrou, Nabiha Iqbal, and Ben Lewis

Although spirituality is considered to play an important role in substance use disorder (SUD) treatment & recovery, it remains understudied. Spirituality generally reflects connection with others, with nature, or with other 'higher' powers. Spirituality is commonly involved in coping responses to stressful situations or periods of difficulty (such as recovery from addiction). However, the extent of spiritual coping in treatment, degree to which spiritual coping may change from initiation to discharge, and associations between spiritual coping and treatment outcomes remain uninvestigated. The current study addresses these issues. Additionally, we examined the potential role that religiosity may play as a moderator of spiritual coping. M:Patients receiving treatment for SUD completed assessments of spiritual coping, abstinence self-efficacy, and craving at admission, after 30 days of treatment, and at discharge. Within the spiritual coping assessment, we scored responses based on positive and negative coping with each side participating in half of the total score. R:Over the course of treatment, positive spiritual coping improved significantly (ps<.001) and negative spiritual coping decreased significantly (ps<.001). However, negative spiritual coping was sufficiently rare that it was not explored in further analyses. Positive spiritual coping was associated with greater abstinence self-efficacy (p=.001) and decreased craving (p=.005). Importantly, although these associations were stronger among patients with religious affiliations, they persisted regardless of religiosity. D:Findings support the importance of spirituality to recovery. While associations between high spiritual coping and treatment outcomes are consistent with current literature, these data add to that literature by identifying their persistence regardless of religious affiliation. Interestingly, although positive associations were noted for both religious and non-religious groups, a moderated relationship was observed, such that religiosity appeared to enhance the strength of these relationships.

PPP2R2D Expression Quantitative Trait Locus Impacts Therapeutic Response to Anti-Thymocyte Globulin in Type 1 Diabetes

Authors: Melanie R. Shapiro, Matthew E. Brown, Marcus R. Pina, Emerson L. Parks, Leeana D. Peters, Keshav Motwani, S. Alice Long, Daniel J. Perry, Laura M. Jacobsen, Desmond A. Schatz, Michael J. Haller, Amanda L. Posgai, Maigan A. Brusko, Todd M. Brusko

Background: Agents that deplete T cells, including low-dose anti-thymocyte globulin (LD-ATG), have shown success in preserving endogenous β-cell function in recent-onset type 1 diabetes (T1D). However, the degree of response to LD-ATG varies. While germline genetic polymorphisms are associated with many drug responses, the variants that correlate with LD-ATG response remain unknown. Aims: To identify genetic variants predictive of responsiveness to LD-ATG, to determine correlations between these genetic variants and immune phenotypes before and after treatment, and to validate causal associations between response loci and effects on immune function. Methods: Genetic correlates of response were evaluated by performing a quantitative trait locus analysis using the quantitative response (QR) variable (observed minus expected C-peptide) and immune phenotypes predictive of response at baseline, including CD8+ T cell exhaustion. CRISPR/Cas9-mediated knockout (KO) of the gene associated with the response locus was utilized to validate impacts on T cell exhaustion. Results: We identified a locus adjacent to the Protein Phosphatase 2 Regulatory Subunit Bδ (PPP2R2D) gene that was significantly associated with QR. PPP2R2D encodes a regulatory subunit of PP2A, guiding recognition and dephosphorylation of substrates involved in proliferation, survival, and apoptosis pathways. To assess whether PPP2R2D was capable of directly regulating human CD8+ T cell exhaustion, PPP2R2D was knocked out in peripheral blood cells. While PPP2R2D KO increased pS6 activation shortly after T cell receptor stimulation, after an in vitro chronic activation model, enhanced expression of the exhaustion markers PD-1 and TIGIT, as well as decreased proliferation and cytokine production by T cells were observed. Conclusions: Our work suggests that genetic variants affecting PPP2R2D expression may influence response to LD-ATG via impacts on T cell exhaustion. These data may support a precision medicine approach to identify individuals at-risk for T1D who are likely to respond to LD-ATG therapy.

Medicine

mRNA Expression of X Chromosome Inactivation Escape Genes (Kdm6a, Eif2s3x, Gpm6b, Xist) in FCG mice

Authors: Jesse Polsky, Shinichi Someya

X-linked escape genes, which are expressed from the inactive X chromosome, remain active and lead to sex differences in gene expression. Four well-documented escapee genes (Kdm6a, Gpm6b, Xist, and Eif2s3x) were tested to compare relative mRNA expression across the FCG mouse line, including XX and XY males and females. Cochlear samples were dissected and total RNA was isolated from each sample, which was then converted into cDNA for quantitative reverse transcription PCR reactions to determine relative mRNA expression levels. Data, for the escapee genes, was compared to baseline gene expression and statistically analyzed to compare across genotypes and sex, to compare. Only one comparison yielded significant data, male mice, with both XX and XY, expressed more Gpm6b than females, while the rest of the data was not significantly different. Understanding how escapee gene expression varies across both sex and genotype will allow for further research into the causes of various genetic disorders that are related to the allosomes.

Medicine

Effects of chronic vagus nerve stimulation in aging

Authors: José I. Rodríguez, Johleen Seedansingh, Sara N. Burke, Barry Setlow, Jennifer L. Bizon

The aging population is at significant risk for cognitive decline, which adversely affects activities of daily living and overall quality of life. This decline is mediated in part via age-related changes in excitatory/inhibitory (E/I) signaling in the brain, as well as increases in inflammation, both of which disrupt cognitive function. Electrical vagus nerve stimulation (VNS), an FDA-approved treatment for epilepsy, shows promise in enhancing neuroplasticity and reducing inflammation, suggesting that it may counteract age-related cognitive deficits. The broad goal of this research program is to address several potential beneficial effects of VNS in aging: first, to investigate whether VNS can remediate age-related impairments in cognitive tasks mediated by the hippocampus and prefrontal cortex (PFC); second, to determine if VNS can attenuate age-associated E/I dysregulation and impaired synaptic function in the hippocampus and PFC; and third, to determine how VNS affects peripheral and brain markers of inflammation in aged rats. Aged male and female FBN rats (24 mo.) were surgically implanted with a cuff electrode around the left vagus nerve and received daily 1-hour sessions of VNS using parameters previously demonstrated to enhance cortical plasticity and various forms of learning (100 stimulus trains/session at 30Hz, 700 µA, 120 µs biphasic pulse width, 0.8 s train duration), or a sham control procedure, for at least 30 sessions, during which experiments were conducted to gather data for the study's objectives. Preliminary data indicate that this VNS regimen significantly improves working memory performance in aged rats, and significantly alters the profile of cytokine expression in aging. These findings, along with published data across species, suggest that VNS may serve as a promising intervention to mitigate cognitive decline and improve overall brain health in the aging population.

Medicine

RESTORATION OF CARDIAC AND NEUROLOGICAL FUNCTIONS IN FA MOUSE MODELS VIA rAAV BASED GENE THERAPY WITH ENDOGENOUS PROMOTER-CONTROLLED FRATAXIN EXPRESSION

Authors: Matthew Rojas, Kayla Mandolini B.S., Denise Cloutier B.S., Barry J Byrne, M.D., Ph.D., Manuela Corti P.T., Ph.D

Friedreich's ataxia (FA), the most common hereditary ataxia, is an autosomal recessive disorder which reduces Frataxin (FXN) levels in mitochondria leading to various cardiac and neurologic deficits. FA progressively worsens, leading to reduced quality of life and early death. Gene therapy using recombinant adeno-associated viral vector (rAAV) with the human FXN gene aims to address the underlying cause of the disease, which current treatments fail to do. Our team has engineered a novel construct (AAV9-DE7-hFXN), controlled by an endogenous promoter to regulate FXN levels, that has been tested in vitro and vivo in wild-type mice. This pilot study will evaluate this construct in FA's cardiac (MCK-Cre) and neurological (Pvalb-Cre) models via injection at specific selected doses when the mouse is approximately 1-3 days old. A survival assessment and Frataxin level analysis will be used and compared to wild-type mice. The cardiac evaluation will use echocardiography to investigate the effect of the construct and will assess parameters such as cardiac mass and volumes to determine functional and structural changes over time. For the neurologic model, motor function will be analyzed using tests such as the rotarod performance test and a neuroscore exam to assess motor skills and coordination. The data obtained from this pilot grant, alongside findings from Dr. Corti's ongoing U01 project, will be instrumental in shaping robust grant applications targeted towards patient-centered foundations and the National Institute of Health (NIH). This submission aims to garner support for advancing our gene therapy program for potential Investigational New Drug (IND) submissions.

Medicine

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Impacts of Sex and ApoE Genotype on Executive Functioning in Sprague Dawley Rats

Authors: Denise Romero, Katherine M. Gonzalez, Sara N. Burke, Barry Setlow, Jennifer L. Bizon

Among the list of genetic risk factors identified for Alzheimer's disease (AD), the apolipoprotein E (ApoE) gene is the most prevalent, with different alleles having different implications for AD pathology. Previous work has shown the E3 allele to be "neutral" in comparison to the E4 allele. This allele can influence neural function decades before disease onset and is associated with a host of brain changes, including increased inflammation, impaired brain energy metabolism, and compromised synaptic function, all of which impair neurotransmission and could contribute to cognitive impairments. Using homozygous ApoE transgenic rats, where the ApoE gene is excised and replaced with the human E3 or E4 gene, allows us to evaluate how genotype impacts prefrontal cortex (PFC)-mediated cognitive functions. These rats were evaluated on a battery of executive functioning tasks, including intertemporal choice, working memory, and probabilistic reversal learning, all of which can be compromised in individuals with AD. In the intertemporal choice task, rats select between a small, immediately available food reward and a large food reward delivered after a variable delay period (0-60s). In the working memory task, rats have to recall the location of a lever following a variable delay period (0-24s). In the probabilistic reversal learning task that assesses cognitive flexibility, rats have to learn to discriminate between two levers that are reinforced at different probabilities and are then switched multiple times per test session. Preliminary data on the intertemporal choice task suggests that young transgenic ApoE3 males show reduced preference for the large reward as delays increase compared to the other groups, demonstrating that they are more impulsive compared to ApoE4 males and both female genotypes. These initial findings suggest the presence of sex differences in ApoE genotype penetrance and emphasize the importance of evaluating both sexes in studies of executive functions in the context of aging and risk factors for neurodegenerative disease.

Medicine

Quantifying Host and Viral Protein Remodeling during HIV Reactivation from Latency

Authors: Ricardo Roure, Dain Ryan Brademan, Prashant Kaushal, Ruth Huttenhain, Mehdi Bouhaddou

After infection, human immunodeficiency virus 1 (HIV-1) enters a latent stage within the host genome. One approach in developing a cure for HIV-1 is reactivating the latent virus, allowing the host immune system to sense and destroy the virus. During reactivation, HIV produces viral proteins for transmission by utilizing host proteins and post-translational modifications, of which the full extent remains mysterious. This project seeks to quantitatively compare the host proteins affected during HIV reactivation and identify their pathways. We developed a quantitative analysis pipeline using MSstats to assess quality control of mass spectrometry proteomics and phosphoproteomics during HIV reactivation using Phorbol-12-myristate-13-acetate (PMA), conduct statistical analyses between conditions (e.g. PMA vs Mock), and perform gene set overrepresentation analysis to reveal the biological pathways regulated. Our results from the proteomics showed leukocyte activation is most regulated while the phosphoproteomics revealed the cell adhesion pathway, possibly due to cytoskeleton modifications during egress.

Medicine

Evaluating YX968 Proteolysis-Targeting Chimera (PROTACs) as a dual degrader of HDAC3 and HDAC8

Authors: Nyla Searl, Daiqing Liao

Histone deacetylases (HDACs) play a critical role in regulating cellular processes, growth and proliferation. HDACs deacetylate acetylated lysine residues on the N-terminal histone tails and non-histone proteins that regulate oncogenic cellular pathways. Class I HDACs play a major role in regulating the extracellular matrix and epithelial-mesenchymal transition that are implicated in cancer metastasis. Notably, the expression levels of Class I HDAC are increased in cancer and their dysregulation serves as an oncogenic hallmark across various cancer types, including hematologic cancers and solid malignancies. HDACs have an intrinsic, highly conserved, homologous catalytic site which serves as a site of interest for pharmacologic targeting therapy. Most FDA-approved inhibitors of HDAC (HDACis) are pan-inhibitors which lack specificity and can lead to toxicity and additional off-target effects in cancer patients. Recent studies show that proteolysis-targeting chimeras (PROTACs) can successfully perform selective degradation of dysfunctional HDACs by eliminating enzymatic and scaffolding functions. A novel degrader of the HDAC3/8 binary complex, YX968, is predicted to induce a highly specified, potent degradation of HDAC3/8 without triggering pan-inhibitory effects. HDAC3/8 degradation by YX968 will be assessed using protein analysis methods. Cell culture and colony formation assays will be used to study the antiproliferative effects of YX968. YX968, through specific degradation of HDAC3/8, may serve as an effective alternative to current pharmacogenetic cancer treatments.

Medicine

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Disruption of DNMT3A in a Human Monocyte-Macrophage System: a Model of Clonal Hematopoiesis

Authors: Andrey Smirnov, Qingchen Yuan, Prabhjot Kaur, Bowen Yan, Annalisse Mckee, Olga Guryanova

Clonal hematopoiesis (CH) is an aging-related condition wherein a hematopoietic stem cell (HSC) with an acquired mutation gains a selective advantage and contributes a greater portion of mature blood cells. DNA methyltransferase 3α (DNMT3A) is the most commonly altered gene in CH. While presence of CH increases the risk of a blood malignancy in the future, it also contributes to the severity of non-hematological disorders such as cardiovascular disease. Specifically, CH exacerbates solid tumors like colitis-associated colon cancer (CAC) through an incompletely understood mechanism, yet dysfunctional macrophages are implicated. To investigate the functional consequences of DNMT3A disruption in CH-derived macrophages and their role in promoting aggressive CAC phenotype, we established a robust monocyte-macrophage system in vitro using a human monocytic THP1 cell line. DNMT3A loss-of-function (LOF) was achieved through CRISPR-Cas9-mediated genome editing and confirmed on mRNA and protein levels via qRT-PCR and Western blot analyses. Immunophenotypic analysis (flow cytometry) of THP1 monocytes differentiated into macrophages indicated a lower proportion of cells with phagocytosis markers CD14-/CD68+ (p=0.0490) in DNMT3A(LOF) compared to WT. Among the CD14-/CD68+ population, DNMT3A(LOF) macrophages expressed more SIRPα (p=0.0805), a receptor which binds CD47 “don’t eat me” signal displayed by tumor cells, preventing their phagocytosis. Consistently, DNMT3A(LOF) THP1-derived macrophages enhanced proliferation of Caco-2 colon cancer cells proliferation in a co-culture experiment. Further, DNMT3A(LOF) cells were more migratory in a transwell system (p=0.0371), in line with enhanced tumor infiltration in prior studies. These data deepen our understanding of the mechanisms whereby CH can promote solid tumor progression and identify markers of tumor immune escape for therapeutic targeting in the future, providing a novel approach for CAC treatment.

Medicine

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Effects of Concurrent Cannabis on Cocaine Use and Relapse in Sprague Dawley Rats

Authors: Emily M. St. Pierre, Katherine M. Gonzalez, Taylor N. Thomson, Madison L. Halcomb, Linda B. Cottler, Lori A. Knackstedt, Barry Setlow

Polysubstance use (PSU) is inarguably commonplace, with cannabis and cocaine being one of the most prevalent drug combinations. To better understand this phenomenon, we developed a rodent model of cocaine + cannabis PSU in collaboration with UF epidemiologists. Thirty-one male and female Sprague Dawley rats (10 wks.) underwent surgery to implant chronic indwelling intravenous catheters and received 3 days of exposure to either cannabis smoke, placebo smoke, or clean air after recovering. Rats then underwent 3 days of intravenous (IV) cocaine self-administration (SA) training for 3 hours/day, with each infusion (0.5 mg/kg/infusion) accompanied by an audiovisual cue. Following these 3 days of baseline cocaine intake, they resumed smoke or clean air exposure for 5 hours/day, 5 days/week for 5 weeks. During this time, rats continued to undergo cocaine SA sessions 1 day/week, immediately following exposure to smoke or clean air. Once the 5 weeks of PSU were complete, a 30-day abstinence period commenced, and was followed by a cued cocaine relapse test (2 hours). The results show that cannabis smoke-exposed rats self-administered less cocaine than placebo smoke and clean air controls. During the cued relapse test session, however, the cannabis smoke group exhibited elevated cocaine-seeking compared to the controls. Overall, the results show that although cannabis co-use attenuates cocaine intake acutely, it produces heightened cocaine seeking during drug abstinence. These findings emphasize the importance of working with animal models that reflect real-world combinations and patterns of PSU.

Medicine

AI-driven Computerized Posturography to Enhance Fall Risk Screening in Cardiac Rehabilitation: associations with subjective measure of fall risk

Authors: Rhoda Tawk, Ashley Carlisle, Brandyn Rader, MS, Emma Barnes, DPT, Craig Stone, Robert Scales, PhD, Bryan Taylor, PhD

Frailty, linked to greater fall-risk in older adults, affects up to 60% of those with cardiovascular disease; accordingly, exercise-based cardiac rehabilitation (CR) represents the ideal platform for frailty and fall-risk screening and therapeutic intervention. Current fall-risk screening relies on subjective metrics that inadequately assess balance instability. AI-driven computerized posturography potentially offers objective, efficient, and accurate fall-risk identification. This study evaluates fall-risk measured with objective computerized posturography versus subjective questionnaire responses in adults referred to outpatient CR. In 78 CR-referred patients, fall-risk was assessed with the STEADI questionnaire. Moreover, static balance was assessed with the modified Clinical Test of Sensory Interaction in Balance and integrated foot pressure mat. Based on center of pressure (CoP) path length (PL), predictive AI algorithms identified fall-risk severity. Average CoP PL was greater in males vs. females (40±37 vs. 30±21 cm, P=0.01). CoP tended to be greater in older (≥65 y) vs. younger (<65 y) adults (42±35 vs. 29±32 cm) and in heart failure (HF) vs. acute coronary syndrome (ACS) patients (45±47 vs. 38±31 cm), but these differences were not statistically significant. Similarly, STEADI score tended to be greater (worse) but not statistically different in males vs. females (4±3 vs. 2±2), older vs. younger adults (3±3 vs. 2±2), and HF vs. ACS (4±3 vs. 2±2) (all P≥0.25). Interestingly, despite objectively greater fall risk (i.e. greater CoP PL), males tended to report lower self-perceived risk vs. females. A weak but significant correlation existed between CoP PL and STEADI score across all patients (r2=0.123, P=0.003) and in males (r2=0.215, P=<0.001). No such relationship was found for female, younger, and older groups. We find limited evidence of agreement between traditional subjective and objective AI-driven computerized posturography assessments of fall-risk in a CR population. Further evaluation of computerized posturography for identifying fall-risk is needed.

Medicine

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TIGIT-Ig Suppresses T Cell Activation in the NOD Mouse Model for Autoimmune Diabetes

Authors: Sonali Vijay, Matthew Brown, Emerson Parks, Kyle Madrid, Rachel Wilkes, and Todd Brusko

Type 1 Diabetes is an autoimmune disease in which the body's T lymphocytes erroneously attack insulin-producing pancreatic β-cells. Existing therapies for T1D, such as Abatacept and other CTLA-4 inhibitors, have shown promise by reducing T cell activation and delaying disease progression in phase II clinical trials. Additionally, the CD226 gene has been identified as harboring risk variants linked to T1D and other autoimmune disorders. TIGIT-Ig is a promising novel therapeutic agent with potential applications in T1D immunotherapy, leveraging its immunosuppressive effects on T cell activation by augmenting T cell co-inhibitory signaling and outcompeting pro-inflammatory, co-stimulatory signaling mediated by CD226 Prior studies have established that TIGIT is involved in regulating T cell activity, but its specific effects on different T cell subsets in the context of autoimmune diseases like T1D remain unclear. Here, we show that TIGIT-Ig selectively suppresses T cell activation in CD4+ memory T cells, in an antigen-specific manner.. In this study, we analyzed CD155/CD112 expression on T cell memory subsets and the impact of TIGT-Ig on T cell activation markers in splenocytes and CD3-enriched T cell populations from 8–10-week-old NOD mice. Compared to naïve T cells, memory T cells exhibited higher CD155 andCD112 expression, suggesting that TIGIT-Ig may preferentially impact effector T cells while maintaining naïve T cell function. Following TIGIT-Ig treatment, CD4+ and CD8+ T cells showed reduced CD25, CD44, CD69, and CD226 expression, indicating decreased activation in the presence of antigen-presenting cells. In APC-free cultures, TIGIT-Ig treatment reduced activation in CD4+ T cells but not CD8+ T cells, highlighting its selective suppressive effects on T cell subsets. Overall, our data suggests that TIGIT-Ig provides a more targeted approach than other immunotherapies by bolstering T cell co-inhibitory signaling as an immune modulator, with implications for the prevention or suspension of T1D.

Medicine

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Increasing Apoptosis Resistance in Cardiomyocytes: Targeting ARC Stability as a Strategy for Duchenne Muscular Dystrophy Treatment

Authors: Lauren Weigle, David Hammers

Duchenne muscular dystrophy (DMD) is an X-linked recessive disorder that is characterized by a lack of dystrophin, leading to mechanical weakness in muscle cells and resulting in muscle cell damage and death. Cardiomyopathy is a common complication of DMD, distinguished by the enlargement and weakening of cardiac muscle fibers, which impairs the heart's ability to contract and pump blood efficiently. Apoptosis Repressor with Caspase recruitment domain (ARC) inhibits apoptosis in cardiomyocytes and skeletal muscles. Inside cells, ARC is tagged for degradation by ubiquitination. This project aims to increase the stability of ARC by altering lysine residues to prevent ubiquitination. Through site-directed mutagenesis, we created three constructs of ARC, each with a silent mutation of lysine at codon 17, 68, or 17 and 68 together. The purified plasmids will be transfected into a human ventricular cardiomyocyte cell line to test the stability of ARC under stressful conditions. Cells will be treated with isoproterenol after transfection to induce apoptotic pathways, which will expectantly be blocked by stabilized ARC. Western blot analysis will subsequently be performed to determine if mutated ARC is more stable under apoptotic conditions in comparison to wild-type ARC. The precise mechanisms through which ARC inhibits apoptosis remain unclear. Future directions of this project include investigating proteins of apoptotic signal cascades to identify the point at which ARC acts to prevent apoptosis, potentially leading to the innovation of DMD therapeutic strategies.

Medicine

An Automated Approach to Medication Management in Parkinson’s Disease

Authors: Qingqi Yuan, Venkat Srikar Lavu, Jagan Mohan Reddy Dwarampudi, Filipe Pereira Sarmento, Joshua K Wong

Parkinson's disease (PD) is one of the most common neurodegenerative diseases worldwide. PD is characterized by motor symptoms such as tremor, rigidity, and bradykinesia. Levodopa is the first-line treatment for motor symptoms in PD, but its dosage management can be challenging. Neurologists must frequently adjust the Levodopa Equivalent Daily Dose (LEDD) to balance benefits and side effects as the disease progresses. This requires personalized adjustments to adapt to the patient’s evolving condition. We sought to develop an AI algorithm to automate this process while considering patient-specific disease characteristics. We conducted a retrospective study of the Parkinson's Progression Markers Initiative (PPMI) database to develop and validate a machine learning model for predicting LEDD in PD patients. We collected the following data for our AI analysis: time (months) since diagnosis, weight, gender, total LEDD, motor subtype, age at visit, and Movement Disorders Society Unified Parkinson’s Disease Rating Scale (MDS-UPDRS) scores. We implemented a Random Forest regression algorithm for its robustness with heterogeneous datasets and minimal need for data preprocessing. The model’s performance was validated using a five-fold cross-validation technique and evaluated on a separate hold-out dataset to ensure generalizability. Using data from 731 patients, the model achieved a Root Mean Square Error value of 273.39, a R^2 value of 0.54, and a Pearson correlation coefficient of 0.74, indicating high accuracy in predicting LEDD and a strong correlation between predicted and actual values. Feature importance analysis revealed that months since diagnosis, weight, and UPDRS scores played a significant role in model performance. Our findings demonstrate that machine learning can effectively predict personalized LEDD for PD patients throughout the course of their disease. The implementation of this model demonstrates a foundation towards personalized medicine in PD care.

Medicine

Epidemiology of Ankle-Related Basketball Injuries Treated in Emergency Departments during 2014-2023

Authors: David Zhang, Lydia Pezzullo, Matthew Martenson, Ryan M. Nixon, Heather K. Vincent

Basketball's physical demands place players at high risk for lower extremity injuries, particularly ankle sprains, which comprise around 25% of basketball-related injuries and frequently require emergency department (ED) treatment. This study examines ankle injuries treated in EDs from 2014 to 2023, exploring trends by sex and age. We hypothesized that ankle sprains would be the most common injury across groups, with fractures and dislocations more prevalent among males and younger athletes experiencing more acute injuries. Males represented 84.7% of cases, and Black/African American individuals were the most documented racial group (32.6%). Most injuries occurred in sports facilities (53.7%). Statistical analysis revealed significant differences in injury prevalence by sex and age ($p<.001$). Females had higher odds for sprains (OR = 1.33), while males showed higher rates of fractures and dislocations, especially in the 25-35 age group. The youngest group (13-18 years) reported higher incidences of falls, poor landings, and ankle rolling. Sex- and age-specific mechanisms highlight different risk factors: females often sustained injuries from falls or being pushed, while males more frequently experienced injuries from collisions or poor landings. These findings support targeted prevention efforts, such as strengthening and stability programs for females and flexibility training for males, to reduce injury risk across age and sex groups.

Medicine

Selective Reduction of Cocaine Seeking by WA478: A Novel Compound with Potential for Treating Cocaine Use Disorder

Authors: Delfina Caceres-Brun, Brandon L. Warren

There is a critical need for novel and effective treatments for cocaine use disorder (CUD). Here we test whether WA478, a novel compound that acts as an antagonist at both the sigma-1 receptor and the dopamine transporter (DAT), reduces cocaine seeking in male and female Sprague-Dawley rats. To determine the specificity of the compound in reducing cocaine self-administration, without affecting other natural rewards, we also test WA478 in rats trained to self-administer palatable food pellets. We found that an intraperitoneal (IP) injection of WA478 (10 mg/kg) 30 minutes before a cocaine self-administration session significantly decreased the number of cocaine infusions compared to IP controls injected with saline. However, responding for palatable food pellets was not significantly affected by WA478. These results suggest that WA478 selectively reduces cocaine seeking while preserving naturally rewarded behaviors, highlighting that WA478 may have potential as a pharmacotherapeutic intervention for CUD and provides a foundation for further investigations into its therapeutic efficacy.

Pharmacy

Synthesis and evaluation of A-ring substituted compounds inspired by Mitragynine with an open D-ring structure

Authors: Michael Casanueva, Christopher McCurdy, Sampa Gupta, Sushobhan Mukhopadhyay

Mitragynine is an alkaloid compound found in Mitragyna speciosa (kratom) leaves, a plant native to Southeast Asia. Not only has kratom been used traditionally for its stimulant, analgesic, and soothing properties, but in recent years, mitragynine has gained attention for its potential therapeutic use as a safer alternative due to being a partial agonist at the μ-opioid receptor, lending itself as a potent tool to mitigate opioid overdose. Given the constant increase in opioid overdose deaths in the 2000s, the exploration of possible medications for addiction and withdrawal is imperative. The unique structure of mitragynine, which contains multiple rings, suggests that specific regions of its design play a critical role in receptor binding. The A ring's structure-activity relationship (SAR) with the above receptors will be studied by constructing the target molecule with different indole derivatives. Therefore, we aim to assess the impact of A ring substitution on mitragynine's therapeutic effects, binding affinity, and potency.

Incorporating new substituents on carbons nine through twelve will be done by conducting total synthesis from different methoxylated and chlorinated indole derivatives. The interactions of mitragynine analogs with key receptors will be explored, focusing on the μ-opioid receptor for analgesic effects, the α2A-adrenergic receptor for sedative effects, and serotonergic receptors for psychoactive effects. SAR analysis will highlight the specific regions of the molecule crucial for receptor binding. Binding affinity and functional potency will be measured to evaluate the SAR and receptor selectivity. We then conducted H-NMR for characterization. Further research into SAR of B, C, and D rings will provide a more comprehensive understanding of each ring's role in the molecule's therapeutic effects.

ExoTarget: A designer peptide prediction model to maximize extracellular vesicle precision delivery of gene therapies

Authors: Yangying Jiang, Zachary Greenberg, Dr. Mei He

Engineering extracellular vesicles (EVs) to precisely deliver genome editors to treat genetic disorders represents an emerging frontier in biotechnology and drug development. However, generalized tissue penetration could reduce the efficacy and increase the off-target risk in vivo. Therefore, selecting a ligand to drive tissue-specific targeting of EVs for delivering gene therapies could be a game changer. Herein, we developed our explainable AI model, ExoTarget, to automate the discovery of peptide-specific ligands for EV precision tissue targeting. Using HiperGator, ExoTarget serializes advanced computational tools, including PepNN, ColabFold, RFDiffusion (RFD), and AMBER, to facilitate peptide-protein interaction analysis and design. Specifically, we show that by inputting a peptide-protein pair in FASTA format, ExoTarget identifies targetable domains using ColabFold and PepNN, followed by outputting high-affinity designed peptides using RFD, and validates the design-target interaction with 10-nanosecond molecular dynamics simulations using AMBER. To demonstrate ExoTarget, we applied our platform to three tissues: inner ear, lung, and muscle tissue to produce high-affinity designs. Next, we experimentally validated our top designs with the recombinant protein target using biolayer interferometry, showing that our designs obtained a dissociation constant (Kd) median around 100 nM. In our future work, we aim to expand ExoTarget's accessibility by advancing toward a web server hosted on HiperGator, enabling users to be guided through each workflow stage, from initial peptide-protein pair input to final validation of peptide designs.

Pharmacy

Bovine placental-derived natural bio-ink for the development of a deep wound healing hydrogel

Authors: Fabiana Mastantuono, Samantha Ali, Zongliang (Carl) Jiangc, Mei He

Trauma wound care seeks natural biomimetic materials to improve the regeneration of functional tissues and muscles. The shape-defined hydrogel could be emerging for tailoring to different trauma situations. In order to overcome the challenge of shape control fidelity in a hydrogel, we propose a bovine placental-derived natural bio-ink with 3D printing, which is composed of droplets encapsulating placental collagen type 1 (COL 1) and amniotic fluid-derived extracellular vesicles (AF-EVs). Amniotic fluid is a rich source of EVs, and research has demonstrated their successful application due to their anti-inflammatory, angiogenic, and regenerative properties. We hypothesize that COL 1/3 from bovine placenta can better replicate human tissue environments, tapping into placenta's known rich regenerative and biochemical properties. We extracted and purified collagen type 1 from bovine placental tissue, assessing its purity, protein content, and biocompatibility with lung epithelial cells. AF-EVs were isolated through various methods and characterized by nanoparticle tracking analysis and transmission electron microscopy. Scratch assays and biocompatibility tests showed that AF-EVs exhibited 27% better regenerative properties than stem cell EVs. Additionally, collagen droplets containing amniotic fluid EVs were successfully generated using our microfluidic platform. Our results demonstrate that bovine placental collagen is highly pure and gels faster than commercial collagen. AF-EVs significantly improve wound healing in comparison to stem cell EVs. Thus, this bio-ink holds promise for deep wound healing and tissue repair applications, offering a novel approach for deep wound care using nature-derived, biomimetic materials that can be encapsulated into droplets. The next step is incorporating these droplets into a wound-healing hydrogel.

Pharmacy

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Pharmacy

Delta opioid receptor bitopic ligand VRB86C produces biased partial agonism and safer analgesia, and reduces voluntary ethanol consumption

Authors: Sloane Murphy, Salliam Pando, Samantha Tournesy, Tao Che, Vsevolod Katritch, Balaz R. Varga, Sarah M. Bernhard, Shainnel O. Eans, Georgios Skiniotis, Brian Kobilka, Susruta Majumdar, Jay P. McLaughlin

Aims: Delta opioid receptors (DOR) are known to regulate pain, mood and alcohol consumption. The therapeutic development of DOR full agonists for pain and alcohol abuse has been thwarted by related seizure activity. In contrast, DOR partial agonists, biased against arrestin signaling, reportedly lack seizures while retaining therapeutic efficacy. However, partial agonism is poorly understood. Whereas agonists activate GPCR signaling by interacting with conventional orthosteric binding sites, ligands interacting at putative allosteric binding sites modulate the activity of agonists. Highresolution crystal structures of several inactive-state Family A GPCRs reveal a sodium binding pocket centered around the highly conserved D2.50 residue of the second transmembrane domain which may be responsible for allosteric modulation. Guided by new insights of DOR structure and signaling obtained by structure-aided design, we designed and explored the functional selectivity of bitopic ligand VRB86C to simultaneously target the classical orthosteric and allosteric site of the DOR. We then examined if VRB86C acted as a DOR partial agonist, producing analgesia and reducing alcohol consumption without drug-induced liabilities like seizures.

Probing analogs of macrocyclic tetrapeptide CJ-15,208 for orally-active kappa opioid receptor antagonism as a potential therapeutic treatment to prevent stress-induced cocaine reinstatement

Authors: Andrew Watson1, Shainnel O. Eans1, Ryosuke Shinouchi1, Bowen Tsai1, Ariana C. Bric Tutt1, Jeremy S. Coleman2, Dmitry Yakovlev2, Brian I. Knapp3, Jean M. Bidlack3, Jane V. Aldrich2, Jay P. McLaughlin1

The macrocyclic tetrapeptide natural product cyclo[Phe-D-Pro-Phe-Trp] (CJ-15,208) and its stereoisomer cyclo[Phe-D-Pro-Phe-D-Trp] ([D-Trp]CJ-15,208) both demonstrate kappa opioid receptor (KOR) antagonist activity following oral administration, preventing stress-induced reinstatement of cocaine-seeking behavior. To further explore the structure-activity relationships and enhance KOR antagonist activity, we examined 73 macrocyclic tetrapeptide analogs in vitro with competition binding assays using the KOR-selective radioligand [3H]U69,593, identifying 24 that possessed KOR affinity with a Ki value of 20 nM or less. Of these, analogs BPN-37088 and 37118 demonstrated a KOR Ki value of 3.2±0.5 nM and 4.5±0.4 nM, respectively; less than half that of [D-Trp]CJ-15,208, and antagonized KOR-agonist-inhibition of stimulated cAMP production in hKOR-CHO cells with IC50 values of 23±7.7 nM and 160±38 nM, respectively. Mice were administered analogs orally (at 30 mg/kg, p.o.) and tested in vivo for their ability to antagonize the antinociception of the KOR-selective agonist U50,488 (10 mg/kg, i.p.) in the 55oC warm-water tail-withdrawal test. Consistent with the in vitro screening, a number of analogs produced KOR antagonism after a 2.5 h pretreatment. Upon further characterization, BPN-37088 and 37118 produced dose-dependent and selective antagonism lasting at least 2.5 h after U50,488 was administered either peripherally (10 mg/kg, i.p.) or centrally (100 nmol, i.c.v.) with doses as low as 1 mg/kg, p.o. BPN-37088 or 3 mg/kg, p.o. BPN-37118; over ten-fold more potent than the parent peptide [D-Trp]CJ-15,208. Pretreatment with BPN-37088 (3 mg/kg, p.o.) or BPN-37118 (10 mg/kg, p.o.) prevented stress-induced reinstatement of extinguished cocaine conditioned place preference, but was without effect on cocaine-induced reinstatement. Collectively, these data identify enhanced KOR antagonist activity of the analogs for potential development, as well as the therapeutic potential of KOR antagonists to prevent relapse to drug-seeking behavior in abstinent subjects.

Pharmacy

Impact of Cultural and Language Barriers on the Cardiovascular Health of Arab Americans

Authors: Amira Alkoriji, Sharon DiFino, Ph.D., CCC-SLP

Arab Americans are a smaller minority group in the United States with a population of about 3.5 million people. They encounter significant health care disparities, particularly regarding cardiovascular disease and diabetes. Cultural and language barriers play a critical role in limiting access to adequate care and health education in this population. Several studies have pointed out that Arab Americans lack appropriate educational tools tailored to their unique needs. Diabetes, in particular, is a prominent issue for Arab Americans with up to 23% of the population having this disease. Existing educational literature often fails to account for cultural and linguistic differences, preventing many Arab Americans from fully understanding their risks and management methods for cardiovascular conditions. Religious practices such as Ramadan and modesty issues, can pose challenges to maintaining a healthy lifestyle. First-generation Arab American immigrants face serious difficulties in communication during medical appointments, particularly those with limited English proficiency. Language barriers often result in lower health literacy, leaving individuals less informed about their conditions and treatment options. The absence of interpreter services further exacerbates this problem. In addition, many Arab Americans do not engage in preventive health care practices. This delays treatment for chronic diseases which benefit greatly from early detection and consistent management. The lack of preventive care can lead to overall poor health outcomes for Arab Americans. By conducting a literature review, this study aims to address the cultural and language barriers faced by Arab Americans in managing cardiovascular health. Data was collected via UF databases as well as through traditional search engines such as PubMed. The goal of this study is to analyze the importance of culturally relevant health education, access to interpreter services, and the promotion of preventive care for Arab Americans.

Public Health and Health Professions

The Bilingual Advantage: Delaying Early Onset Dementia and Improving Cognitive Recovery Post CVA Patients

Authors: Mariana Arango, Chelsea Ball, Eryn Brazlavsky, Dr. Sharon Difino

Bilingualism is defined as the ability to proficiently speak and understand two or more languages. People are often unaware of the hidden benefits of bilingualism. Among those hidden benefits emerging research has demonstrated how bilingualism enhances cognitive reserve (CR). CR refers to the brain's ability to adapt to help maintain function and prevent decline. This literature review aims to demonstrate how the bilingual advantage positively correlates to the delay of early on-set dementia and faster post cerebral vascular accident (CVA) recovery. Research was garnered using data collection via PubMed, Google Scholar, and the University of Florida databases. The studies utilized predominantly consisted of cross-sectional designs that allowed for the examination of individuals with varied levels of cognitive function. Results yielded that bilingualism offers a protection against the onset of neurocognitive decline, for instance dementia. Bilinguals with extensive code-switching abilities—switching between languages or dialects based on situational context—experience a delayed dementia onset by an average of 3.3 years (Brini et al., 2020). This deterioration of cognitive function onset has been hypothesized to be linked to the higher executive functions created through a life of consistent code-switching. In terms of post CVA recovery, the mental flexibility required to switch between two languages strengthens the neural pathways and enhances CR. More specifically, this CR provides resilience post CVA rehabilitation by allowing bilingual individuals to activate alternative neural networks. Through the in-depth analysis of the cross-section between neural networks and bilingualism, this literature review seeks to provide evidence that suggests higher cognitive reserve relating to bilingual individuals with dementia and CVA.

Public Health and Health Professions

“The Language of Pain: A Cry for Cultural Consideration”

Authors: Deirdre Breen, Truc Pham, Sharon DiFino

The language of pain is defined as a complex form of communication that involves an individual’s experiences to describe unpleasant emotional and sensory stimuli. The subjective nature of pain often makes it difficult for others to understand. Despite pain being unique to each individual, it is not a private experience as pain and culture are inextricably intertwined. Culture influences our perception and expression of pain, which includes our explanations for illness, adaptability to treatment, ability to cope and seek help, and ultimately our relationships with our healthcare providers and community. The language of pain, particularly from the cultural perspective, is largely overlooked in literature; as mainstream practice is primarily concerned with the objectification and quantification of pain. The lack of cross-cultural and cross-linguistic consideration is harmful for patients of various ethnic and cultural backgrounds as complications in communication between the patient and healthcare provider arise when the language used to describe and ascribe pain is not agreed upon. Such miscommunications often result in inadequate assessment and treatment. Through careful collection and analysis of data from traditional search engines such as Google Scholar and PubMed, this literature review aims to raise awareness for the importance of language as it relates to the growing need for cultural competency in the healthcare setting as well as to identify the risks associated with linguistic and cultural incompetence.

Bridging Barriers: Exploring Speech and Language Disorders Among Indigenous Populations and Cultural Influences on Therapy

Authors: Kasyn Carlton, Sharon DiFino

There are 9.7 million Indigenous peoples in America, making up about 2.9% of the population. The national poverty rate for Indigenous Peoples is 25.4%, ranking the highest among minority groups. As a result, Indigenous peoples tend to have a higher prevalence of speech and language disorders, occurring 5-15% more than the general population. For the purpose of this paper, Indigenous refers to Native Americans, American Indians, and Indigenous and tribal communities. Data for this literature review was collected through search engines such as Google Scholar, PubMed, and the Government Census. Due to social, cultural, and economic barriers, many individuals do not seek therapy for different speech and language disorders. Additionally, the historical trauma that Indigenous peoples faced have created a breach of trust with the educational and healthcare system in the United States. This causes hesitation among individuals to receive interventions from speech-language pathologists (SLPs). If intervention is sought out, it is extremely difficult to receive culturally responsive care as 0.3% of SLPs identify as Indigenous – meaning that there is limited access to culturally competent SLPs on reservations or in areas with large Indigenous populations. Language and cultural barriers also impact whether or not an individual will seek out intervention. Different cultures have varying communication styles which impact how speech disorders are perceived and diagnosed. Cultural beliefs can alter the way the community describes the disorder and often let speech disorders go undiagnosed as they conflict with cultural beliefs. For these reasons, it is important to increase cultural awareness and education. This literature review will highlight the discrepancies faced by Indigenous peoples on the issues of speech and language disorders

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Overlooked Aspects of Spinal Cord Injury Rehabilitation: Communication and Swallowing Impairments

Authors: Isabella Colosimo; Elizabeth Evans, MS; Charles Ellis, PhD

Individuals with Spinal Cord Injury (SCI) experience profound disruptions in daily life, requiring a complex approach to rehabilitation. Current clinical guidelines emphasize comprehensive care, encompassing both acute and long-term interventions. Acute care typically addresses critical medical concerns, such as the management of ulcers, thrombosis, gastrointestinal dysfunction, and respiratory complications. Long-term care extends to multidisciplinary support, including nutritional guidance and physical, occupational, and psychological therapies, aimed at enhancing recovery as well as quality of life. However, very little attention is given to communication and swallowing function after SCI, even though both are critical for independence and good health. This study seeks to explore the role of Speech-Language Pathologists (SLPs) in the treatment of post-injury communication and swallowing impairments, while also identifying gaps in current rehabilitative care through a comprehensive review of existing literature. A review of the literature was completed to explore SLP roles, engagement and management approaches. The current research revealed that despite the documented prevalence of communication and swallowing disorders among SCI patients, SLPs are frequently excluded from these care protocols and inefficiently supplied to care centers. Future research must emphasize the importance of SLPs in care plans for those with SCIs.

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Assessment of the Psychological and Social Sequelae Associated with Health Outcomes in Adolescents and Young Adults with Type 1 Diabetes

Authors: Jennifer Daniel, Hannah Manis, M.A., Alicia Pardon, M.S., Sara E. Wetter, M.A. , Cheyenne Reynolds, M.S, Dr. Kimberly Driscoll, PhD.

Limited research has focused on Type 1 Diabetes (T1D) in American youth, particularly regarding illness identity, resilience, medical trauma, stigma, adverse childhood events, and healthcare discrimination. This study addresses these areas by examining their impact on T1D management and outcomes. With a growing link between diabetes and mental health over the past decade, our observational, longitudinal study aims to shed light on how these factors influence young people with T1D. Recruitment and data collection are ongoing, conducted in partnership with the University of Florida (UF), the University of Colorado's Barbara Davis Center (BDC) for Diabetes, and Tallahassee Memorial Health (TMH). Participants complete three online waves (Wave 1, Wave 2, Wave 3) of questionnaires and receive compensation totaling $70 ($15 for Wave 1, $25 for Wave 2, and $30 for Wave 3). For in-person recruitment, study staff introduce the study and compensation opportunities directly to adolescents and young adults with a warm hand-off approach with their healthcare provider. Interested participants review and complete consent forms if interested in enrolling. In addition to in-person recruitment at UF, participants have been recruited through social media. To date, we have recruited a total of 105 participants: 61 from UF, 7 from the BDC, 1 from TMH, and 36 through social media. Throughout recruitment, I have observed diverse emotional responses from adolescent participants and their caregivers. While some adolescents are eager to share their experiences, others feel hesitant or uncomfortable discussing sensitive topics like medical trauma, stigma, or adverse childhood events. Many adolescents express uncertainty about joining the study due to discomfort or distress at sharing personal information. Additionally, caregivers play varied roles in these decisions: some provide their child full autonomy in deciding to participate, supporting independent choice. Conversely, others decline participation entirely, often citing lack of interest in research or time constraints.

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Speech Diversity using AAC: Enhancing Bilingual Family Engagement and Communication

Authors: Makenzie Daniel, Casey Strauss, Trinidad Rojas, Sharon Difino

The U.S. Census records that although most children speak English at school, roughly 20% of them speak a different language at home. This means that Speech language Pathologists (SLPs) will oftentimes provide services to children that speak another language. One of the services that an SLP can offer is the utilization of an Alternative and Augmentative Communication (AAC) device. The American Speech-Language-Hearing Association (ASHA) defines AAC as, "a means of communication besides talking." Specific communication devices (AAC devices) are being used in SLP offices. These devices are tablets or laptops that ease the barrier of communication between someone with and without a speech impairment. The devices do this by allowing nonverbal AAC users to press icons that produce speech. This will help them to easily communicate with others. It was reported that 20% of SLPs provided support using an AAC device with both English and another language. However, for bilingual AAC users, it was once believed that more challenges would arise if their device was programmed with English and "home language" settings. This belief has the potential of creating a barrier between the child and their family members due to the language disconnect. Despite these misconceptions, integrating both English and a "home language" within an AAC device will benefit the child as their language develops. Through the use of Google Scholar and PubMed, we desire to research the impact of a bilingual child's use of an AAC device and their engagement with family members.

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Assimilation to the Point of Extinction: The Incidence and Impact of Linguistic Racism and Discrimination

Authors: Zoë Dupont, Krysthel Cisneros, and Kyra Howel

Linguistic racism occurs when acts of racism are perpetuated against individuals on the basis of their language use. This literature review seeks to examine the ways in which linguistic racism evolved and how it presently informs the way people may discriminate against others. Research outlined that those who speak a dialect of English, or have English as a second language, are perceived as being lower-status. The "new racism" of the 1980s indicated a shift in the basis of racism from biological markers to drawing on cultural markers, giving rise to "language purism". The language or dialect with which one speaks can be considered the most direct demonstration of their culture. In Spanish classrooms, researchers found that instructors criticized code-switching and "lexical borrowing" in heritage Spanish-speaking students. Lexical borrowing describes instances in which words from one language are adopted into another. Code-switching was defined as "instances when speakers switch between codes (languages or language varieties) in the course of conversation" (Román et al., 2019). Additionally, researchers contend that due to internal linguistic discrimination, heritage Spanish speakers may give up speaking Spanish and default to only speaking English. Cultural prejudice impacts one's success in the hiring process, the way they are treated in court, and socialization in school during impressionable years. Through databases such as PubMed and Google Scholar, this literature review compiled resources to further explore how the disregard for language differences leads to an eradication of dialects, which are culturally important and link communities together.

When Accents Speak Louder Than Words: Accent Discordance's Impact on Patient-Provider Communication and Health Outcomes

Authors: Kyli Gooden, Elizabeth Evans, and Charles Ellis

Studies have shown that poor patient-provider communication can have a negative impact on health-related outcomes and well-being. There is also evidence that when patients and providers lack linguistic concordance the likelihood of unsuccessful healthcare interactions increases and contributes to further misconceptions and biases. Consequently, patients may feel marginalized, and the perceived credibility and competence of providers decreases. To date, there is limited information on how combined speech (pronunciation, prosody, accent) and linguistic diversity (native language) contribute to health-related outcomes. The objective of this review was to examine the current literature related to the impact of accented speech on patient-provider communication and satisfaction with healthcare experiences. A review of the current literature suggests accent and linguistic diversity can reduce the quality of care and inevitably contribute to reduced overall satisfaction and quality of life. More specifically, a lack of accent concordance can negatively influence patient-provider communication in a similar fashion to a lack of language concordance between patient and provider.

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Barriers to Literacy Engagement: Reading Interest in Children with Hearing Loss

Authors: Ivana Jordan, Elizabeth Evans, Charles Ellis

From 1997 to 2008, the National Health Interview Survey (NHIS) reported that 4.5 per 1,000 children in the United States ages 3-17 were deaf or hard of hearing without the help of hearing devices. Hearing loss (HL) in children contributes to delays in language, speech, and emotional development. Consequently, poor literacy skills have been linked to individuals with significant HL. Approximately 1 in 3 deaf students graduate high school having reading skills between the second and fourth grade level. The purpose of this study was to examine reading interest in children who are deaf or have severe HL, utilizing data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010-11 (ECLS-K:2011), which followed children identified in kindergarten all the way through the third grade. Parents reported their child's interest in reading at the third grade level. Simple descriptive statistics were used to profile the sample (N=248) and their interest level in reading along with demographic factors: 54.84% male, 45.16% female; 49.19% white, 12.1% black, 27.42% hispanic, and 11.29% other. 39.9% came from a household income of $30,000, while 23.83% came from $30,001-$60,000 and 36.27% came from $60,001 or more. Among respondents, more than 50% reported minimal to no interest in reading. Evidence suggests that there is a link between hearing loss and reading development and interest likely due to difficulties with phonological awareness, comprehension, vocabulary, and fluency. The findings here suggest that these reading difficulties may be influenced by household income, race, and gender.

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Advancing Alzheimer’s Care: Integrating AI with Music Therapy for Improved Outcomes

Authors: Hannah Mannino, Kathryn Humes, Sophia Larralde

Alzheimer's disease (AD) presents a significant challenge in cognitive and emotional care, and music therapy (MT) has been shown to improve mood, reduce anxiety, and enhance memory recall in patients. Recent advances in artificial intelligence (AI) offer new ways to elevate the effectiveness of MT. While AI has been successfully integrated into areas such as music recommendation systems and generative music models, there is potential for AI to be applied in real-time therapeutic interventions. This research explores how AI can go beyond current applications to deliver personalized and dynamic music therapy by monitoring patient physiological and emotional responses in real-time. AI can be integrated with biometric sensors, such as EEG or heart rate monitors, to analyze a patient's mood, cognitive state, or agitation levels. By feeding this data into adaptive music-generating algorithms, AI could modify therapeutic music in real-time, optimizing interventions to align with the patient’s emotional and cognitive needs. Additionally, AI could help therapists by analyzing how patients respond to different aspects of music, like tempo or melody, making it easier to personalize therapy sessions and improve their effectiveness. This approach would not only improve patient outcomes but also reduce the cognitive load on therapists, enabling them to focus on other aspects of care. This study reviews the existing literature on AI's role in music therapy and identifies gaps where AI-driven, adaptive music therapy could significantly enhance care for Alzheimer's patients. By offering specific integration strategies, such as using AI to adapt music based on biofeedback, this research highlights new directions for advancing AI-enhanced music therapy in clinical settings.

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Exploring Risk Factors For Stroke Among Florida Counties.

Authors: Sydney Lentz, Elizabeth Evans M.S., Charles Ellis Jr. Ph.D

Understanding the risk factor profile of Florida counties is crucial to understanding management approaches that improve the health of those counties and reduce risk for conditions such as stroke. The objective of this research was to profile the demographics of stroke in Florida counties with a special emphasis on stroke in older versus younger adults. Data for this project was obtained from the CDC Behavioral Risk Factor Surveillance System, which offers information related to age of stroke onset and information about hospitalizations based on county. Key outcome variables included incidence, average age of onset, common risk factors and general outcomes.

State level data demonstrated that counties with a high incidence of risk factors including heavy drinking, smoking, obesity, and a lack of physical activity also had high stroke rates. These findings suggest that one's environment may influence their health habits, which in turn influence their risk of stroke. Additionally, living in a Florida county which has a significant prevalence of one or many of the risk factors may increase one's risk of stroke at a younger age. This data highlights a relationship between stroke risk factor profiles and stroke risk in Florida counties, particularly among adults at younger ages. These findings have implications for children and young adults living in environments where risk factors for stroke are high. .

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Cognitive, Clinical, and Contextual-level Characteristics in Hispanic/Latina(o) Adults with a History of Cancer

Authors: Longoni, A.,Santos, L.G., Garriaga, S., Davenport, M., & Arias. F

Agustina Longoni, Lauren Santos, Stella Garriga, Michael Davenport, and Franchesca Arias

Cancer is a major medical concern in the Hispanic/Latina(o) community in the United States (US), and approximately 30% of Hispanic/Latina(o) persons in the US will be diagnosed with cancer during their lifetime (American Cancer Society, 2015). Acute cancer and cancer treatment have been associated with cognitive decrements. However, the long-term cognitive effects of cancer among Hispanic/Latina(o) adults remain under-investigated. Our study addresses gap by investigating the cognitive, clinical, and contextual-level characteristics of Hispanic/Latina(o) persons with and without cancer history. Hispanic/Latino(a) adults (N=1095) enrolled in the HABS-HD study ((Mage = 66.02, SD = 5.33); (Meducation = 10.03, SD = 5.05; 70% female; 92% White)) with cancer history (n=101) were compared to propensity-matched sample (matched by age and sex) of Hispanic/Latino(a) adults ((Mage = 65.89, SD = 5.99); (Meducation = 10.00, SD = 5.54; 70% female; 90% White)) without cancer history. History of vascular risk factors, renal and pulmonary insufficiencies, psychiatric conditions, global cognition, learning and memory, executive functioning, processing speed, and language were assessed. Area deprivation index was calculated. Analyses of variance calculated to assess group differences. Hispanic/Latina(o) adults with cancer history did not differ from their counterparts in global cognition, verbally mediated memory, language, or executive functioning. Cancer history predicted differences in processing speed tests (Symbol Digit Modality= F(4,198)=5.77, p=0.003, Cohen's d=0.2). Regarding clinical characteristics, Hispanic/Latina(o) with cancer history differed from their counterparts in cardiovascular comorbidities (F(4,198)= 7.33, p=0.007), not on medical comorbidities or contextual factors. Hispanic/Latina(o) immigrants with cancer history exhibited subtle weaknesses in processing speed that occurred in the context of an otherwise intact cognitive profile. Implications and future research directions will be discussed.

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Does Location Matter? : Examining Distribution and Access to Specialized Stroke Care in Florida

Authors: Hannah McCartney, Elizabeth Evans, M.S., CCC-SLP, Charles Ellis, Jr., Ph.D., CCC-SLP

Background: Stroke is the fourth leading cause of death and a major cause of disability. Stroke risk is attributed to clinical and behavioral factors, such as high blood pressure, excessive alcohol use, diabetes, cardiovascular disease, and physical inactivity. To treat stroke, a tiered stroke center system has been established to optimize specialized care for treatment of stroke. Despite specialized care, stroke burden and access to care for stroke is not shared equally among rural and urban communities. This project aims to examine stroke prevalence within rural and urban Florida counties relative to the availability of stroke centers providing specialized care for stroke. Methods: Stroke-related data for this project were obtained from the Florida Behavioral Risk Factor System (BRFSS) and the Robert Wood Johnson (RWJ) County Rankings. County-level data from both data sources were utilized to identify the number of strokes reported in each county. Access to specialized stroke care information were obtained from the Agency for Healthcare Administration Hospital Stroke Programs Report. Linear regression models evaluated the association between county-level rurality vs. stroke prevalence. ArcGIS mapping software was used to map the addresses of the identified stroke centers within their respective counties. Results: A statistically significant positive association was found between the percentage of rurality and the percentage of adults who have ever been told they have had a stroke at the county level. More specifically, as the percentage of rurality increases within a county, stroke prevalence in the population is also expected to increase. Conclusion: Residence (rural vs urban) has a significant impact on stroke prevalence and access to stroke care in Florida counties. Although a significant number of stroke centers exist in urban areas in Florida, less care is available in rural areas.

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"A Correlational Study Between Dropout Rate and Eligibility of Free and Reduced Lunch in Florida"

Authors: Sarah McCartney, Elizabeth Evans MS, Charles Ellis PhD

Exposure level to noise pollution is an important public health metric, as it can have many health implications for populations facing higher levels. The health implications of noise pollution are not as well known by the public compared to other environmental metrics such as air pollution or water quality. According to the National Institute of Environmental Health Sciences, in 1981, about 100 million Americans faced levels of noise pollution high enough to affect their health. Access to quiet places of living and limited exposure to loud noises is crucial for both mental and physical health. However, marginalized populations can be faced with governmental zoning and distinct socio-economic challenges that cause higher-than-healthy levels of noise exposure due to environmental racism. Environmental racism is defined by the American Public Health Association as "the disproportionate impacts of environmental hazards on people of color". A literature review was conducted to assess the current prevalence of noise pollution as environmental racism and its impact on marginalized communities as well as health outcomes. Articles were found and information was compiled using academic databases such as PubMed and searching certain key words like "noise pollution", "marginalized communities", and "environmental racism". It covers research from 2008-2024 focusing on studies that investigate health outcomes and case studies. Through a critical analysis of findings, the literature review addresses how noise pollution specifically affects marginalized communities and health outcomes, as well as highlights the need for more environmental justice-seeking policies to mitigate noise pollution.

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Noise Pollution and Environmental Racism: Impacts on Health Outcomes and Marginalized Communities

Authors: Kathryn Norris

Exposure level to noise pollution is an important public health metric, as it can have many health implications for populations facing higher levels. The health implications of noise pollution are not as well known by the public compared to other environmental metrics such as air pollution or water quality. According to the National Institute of Environmental Health Sciences, in 1981, about 100 million Americans faced levels of noise pollution high enough to affect their health. Access to quiet places of living and limited exposure to loud noises is crucial for both mental and physical health. However, marginalized populations can be faced with governmental zoning and distinct socio-economic challenges that cause higher-than-healthy levels of noise exposure due to environmental racism. Environmental racism is defined by the American Public Health Association as "the disproportionate impacts of environmental hazards on people of color". A literature review was conducted to assess the current prevalence of noise pollution as environmental racism and its impact on marginalized communities as well as health outcomes. Articles were found and information was compiled using academic databases such as PubMed and searching certain key words like "noise pollution", "marginalized communities", and "environmental racism". It covers research from 2008-2024 focusing on studies that investigate health outcomes and case studies. Through a critical analysis of findings, the literature review addresses how noise pollution specifically affects marginalized communities and health outcomes, as well as highlights the need for more environmental justice-seeking policies to mitigate noise pollution.

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Understanding the Relationship Between Southeast-Asian Americans' Attitudes Towards the CSD Field and Their Interactions With It.

Authors: Amanda Noy, Sharon DiFino

According to the American Speech-Language and Hearing Association (ASHA) in 2024, Asian Americans and Pacific Islanders are severely underrepresented in the SLHS field - with only 3% of ASHA's representative members self-identifying as Asian American Pacific Islander (AAPI). This underrepresentation is attributed to systematic differences between races related to culture, which often determines the attitudes, beliefs, and traditions of its subscribing populations. A consensus has been established across several studies that Asian attitudes surrounding the Communication Sciences and Disorders (CSD) field and related disorders tend to be negative, with one study claiming that elderly Asians in particular demonstrated poor acknowledgment of the significance of speech-language pathology services (Sung 2014). This study synthesizes the scarce resources available discussing Asian cultural attitudes toward the CSD field. Data was collected via hand searching and search engines such as PubMed and Google Scholar. The data will be used to draw connections between these different sources to explain the underrepresentation of Southeast Asian-Americans, in particular, in CSD professions and the limited search for CSD services in Southeast Asian-American households. Understanding what factors might be contributing to these problems will enable healthcare professionals to better culturally accommodate this population in such a way that they feel encouraged to engage with and immerse themselves in the field.

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Sociodemographic factors and their impacts on older adults' chronic pain phenotype: Findings from an ongoing prospective cohort study

Authors: Isabella Ortiz, Michael Brownstein, MD, Kimberly Sibille, PhD, Zhigang Li, PhD, Rene Przkora, MD, Robert Cook, MD, Yan Wang, PhD

The Study on Medical Marijuana and Its Long-term Effects (SMILE) is an NIH-funded prospective cohort study aimed at investigating how medical marijuana impacts chronic pain management in older adults, compared to non-medical marijuana users. This research project focuses on the baseline data from the SMILE study to examine the relationship between demographic factors and pain outcomes. Prior research has shown that sociodemographic variables such as age, gender, and race/ethnicity significantly influence the experience of chronic pain. The objective of this study is to analyze how these demographic factors affect reported pain levels at baseline and determine whether specific groups are more likely to experience certain types of pain, such as joint, arthritis, or musculoskeletal pain. In addition, the study will explore how chronic pain influences participants' daily activities and lifestyle, as measured by the pain inference questionnaire, to assess variations across demographic groups. By identifying patterns in pain experience based on demographic characteristics, this project aims to provide insight into potential disparities in chronic pain management and inform future healthcare strategies for older adults.

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Exploring the Role and Effectiveness of AI in Interpreting within Healthcare

Authors: Rebekka Perinne, Nina Burt, Dr. Sharon DiFino

Communication is crucial in healthcare between doctors, researchers and patients. However, efficient communication can be hindered by language barriers, which can influence patient outcomes. In the United States, 9% of the population being treated in healthcare settings have Limited English Proficiency (LEP) and are negatively affected by these issues (Silva 2021). Research conducted found that language barriers are currently being combatted in a variety of ways, including the usage of professional interpreters, online translators and written sources. This literature review aims to build upon this prior research by exploring how artificial intelligence (AI) tools, such as machine translation (MT), are also being utilized in translation and interpretation in healthcare settings. The use of AI may help alleviate language barriers caused by a shortage of interpreters (Ramirez 2008). These barriers pose a challenge for people with LEP and may prevent them from receiving proper care. Simple online translation tools lack the ability to contextualize text, however, newer MT tools that are knowledge-based can contextualize their input, mimicking how humans interpret language differently based on the context surrounding the words (Carbonell 1981). This literature review focuses on AI and aims to assess its current use in healthcare translation and interpretation, compare its effectiveness to human interpreters, identify barriers to its broader adoption and explore how it is integrated with professional interpreters. The literature review will be conducted using Google Scholar and PubMed. The research will also explore why AI is not more widely used, despite its potential, by examining professional and institutional resistance, as well as the role of trust and expertise.

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Understanding the influence of Asian accents on healthcare outcomes in the United States

Lead author: Truc Pham, Co-authors: Deirdre Breen, Amanda Noy, PI: Sharon Difino

In a review of 138 studies, 62% of studies found a significant relationship between self-reported racism and physical health and 72% found a significant relationship between self-reported racism and mental health. For Asian Americans, discriminatory practices were associated with an increased risk for chronic conditions such as heart disease and respiratory illness as well as depressive symptoms. This study assesses the impact of the perception of Asian accented speakers (particularly focused on Southeast Asian accents) on patient outcomes and the severity of diagnosis. A literature review was conducted to analyze the underlying discriminatory practices of accented Asian Americans in healthcare and how this affects their willingness to seek care. Data was obtained through traditional search engines such as Google Scholar and PubMed, as well as by hand searching. From this research, the study explains the factors of racial profiling and implicit bias which impacts the quality of healthcare for individuals with Asian accents. This study will look into factors such as cultural expectations based physical appearance, cultural pride, and cross cultural interactions between the ethnicity of the doctor and patient. This research aims to show how the perception of Asian accents isolates patients from their own health care decisions and emphasizes the importance of equity for patient care.

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Using the WHO 2024 Social determinants of health framework to highlight barriers affecting PrEP use among LatinX sexual minority men in the US

Authors: Roselyn Delase Davour, Sonila Dubare, Heather Vecsey, Luis Gonzalez-Diaz, Shantzie Ponce Samayoa, Courtney Pyche, Adam Carrico, Carlos Rodriguez-Diaz & José F. Colón-Burgos

HIV disproportionately affects Latino men who have sex with men (LMSM) in the United States (US) and Puerto Rico(PR). PrEP (Pre-exposure prophylaxis) is a preventative medication that reduces HIV transmission and is useful for targeting high-risk groups like LMSM. The use of PrEP among LMSM in the US and PR is closely related to the systemic health inequities they face. Barriers and facilitators affecting each stage of PrEP care continuum were identified in a systematic literature review. These were then organized according to the WHO 2024 Operational Framework of Social Determinants of Health Equities. This framework addresses the social determinants of health equities by classifying them into six domains: Economic Security and Equality, Education, Physical Environment, Social and Community Context, Health Behaviors, and Health Care. Results showed that Economic Security and Equality factors that impact PrEP use pertain to income and employment or work constraints. Social and community context included factors such as social networks, community dynamics such as Machismo, discrimination and community organizations. Education refers to the education level of LMSM, and health behaviors were related to alcohol and drug use. The physical environment domain included logistical limitations stemming from the geographical location of services and patients. The barriers and facilitators relating to Health Care encompassed accessibility, quality and affordability of services, healthcare and PrEP delivery systems. Using the WHO 2024 Framework allows for the standardized monitoring of social determinants of health. These results highlight the need for tailored interventions that build on facilitators and reduce barriers preventing PrEP use among LMSM in the US and PR. In practice, interventions should make PrEP more accessible and acceptable in marginalized communities, as well as across demographics, to increase utilization and achieve health equity.

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The Impacts of Noise (Pollution) on Happiness and Mental Well-Being of Students and Staff at the University of Florida

Authors: Alejandro Ramirez, Dr. Sharon DiFino, Ph.D., CCC-SLP

The University of Florida is often distinguished by its rich culture as a Southeastern Conference (SEC) Collegiate identity which is rooted in traditions, football, and overall school spirit. However, all of these factors are contributing to the total noise that students and staff alike are exposed to on campus. Where do we draw the line between the level of noise exposure that amplifies UF students' and staffs' sense of community versus a level of noise that interferes with the happiness and mental health of those who experience it? Despite the plethora of existing research on noise pollution and its negative impacts on the physical and mental health of listeners, there exists a gap in the literature pertaining to the relativity of noise and how some listeners may opt for louder spaces to harbor a sense of belonging amongst their peers. Therefore, this project seeks to find a significant correlation between the average decibel levels of various areas on campus and self-perceptions of happiness and well-being from students and staff. Decibels (dB) are defined as the most common unit of measurement for sound; some examples of this measurement include a faint whisper at approximately 30 dB and a vacuum cleaner at about 70 dB, and a jackhammer at 130 dB. The data for this project is collected through recorded noise samples with a sound level meter and Qualtrics survey responses. The main goal of this research is to gain a fundamental understanding of where the UF community stands with the current state of noise on campus; this will allow the opportunity for current and future UF administrations to act accordingly based on the data that is collected and analyzed.

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Gender-Based Knee Injury differences in Professional Basketbal

Authors: Jordyn Salbe, Ashley Faini, Isabel Baselga, Benjamin Churba, Frederick Kates (PhD)

Background Knee injuries currently play a significant role in professional sports, specifically basketball. Currently, many professional teams, mens and womens, are working to limit the amount of injuries through devices such as braces and exercises to strengthen the knee. We are exploring the similarities and differences regarding the injuries in the National Basketball Association (NBA) and Women's National Basketball Association (WNBA). The aim is to use this information to recommend Artificial Intelligence (AI) technology to reduce the rate of injuries for both men and women. Methods This research explores gender-based risks associated with sports injuries. Using publicly available, cross-sectional data of two seasons, we compare the incidences of injuries in the NBA and WNBA to determine whether gender-based differences exist in the same sport. Relative risk of sports injuries will be calculated using Fisher's exact test and the chi-square goodness of fit test due to the relatively small sample and number of injuries. Results Relative risk based on the biometric attributes such as age, biological build, BMI, and height will determine whether gender-based differences exist in professional basketball. Through the use of artificial intelligence (AI) devices, we can track specific components such as biometrics, GPS locations, travel distance, and speed while playing to pinpoint injury occurrence and prevent injury moving forward. Discussion We are determining the efficacy of wearable biometric tracking technology in terms of injury prevention and reporting. With usage of the wearable technology, athletes can be tracked more efficiently to prevent gender-specific injuries. In addition, the lack of standardization of EMR/EHR databases makes tracking difficult for injury prevention. Conclusions AI can be used in injury prevention for all athletes by gathering biometric and fitness data and reporting to a standardized EMR/EHR. Future research should look at the implementation of AI in other professional sports.

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Bridging the Gap: Mentorship as a Catalyst for First-Generation College Student Successs

Authors: Sophia Scribani, Mati Diehl, Divya Somayaji, Emma Millar, Emma Millar, Rick Kates PhD

Introduction: First-generation college students (FGCS) face distinct academic, social, and financial barriers that often hinder their success in higher education. These challenges include limited access to college preparatory resources, unfamiliarity with institutional norms, social isolation, and economic hardships, contributing to lower retention and graduation rates than their continuing-generation peers. Mentorship programs have gained recognition as vital interventions that provide tailored support, guidance, and resources to enhance FGCS academic success. Methods: This literature review critically examines the role of mentorship programs in addressing these challenges by synthesizing research from key journals on college student development in higher education. Results: The results demonstrate that mentorship programs tailored for first-generation college students positively impact academic success by addressing "family achievement guilt" and fostering persistence in higher education. Mentorship improves social integration and mental health by providing role models who guide psychosocial development and help students navigate societal marginalization. Furthermore, retention statistics show that mentees benefit from academic tutoring styles and career development support, leading to higher graduation rates and career preparedness. Discussion: By exploring quantitative and qualitative data, this research aims to contribute to a deeper understanding of how mentorship programs can effectively promote the academic success and personal development of FGCS. The findings underscore the importance of mentorship in mitigating the barriers faced by FGCS and enhancing their overall educational experience. Conclusion: This study recommends program improvement and scalability in higher education institutions, emphasizing the need for tailored mentorship programs to support FGCS. The research underscores the critical role of mentorship in fostering academic success and personal development, advocating for broader implementation and support of such programs s

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The Importance of Tissue Identity in MRI-Derived tDCS Models

Authors: Giovana Silva, Kevin Iversen, Samantha Pedersen, Tyler Busch, Ruogu Fang, Aprinda Indahlastari

Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique where electrodes applied to the skin deliver electrical currents and modulate the neuronal cell environment. Research shows that current density (J) in the brain from tDCS can remediate cognitive functions in older adult populations. We aimed to investigate how individual tissue identity and segmentation contribute to the obtained J value. Six models were created for analysis, named M1-M6. M6 was assigned as the reference model, containing the tissue identities typically used in the field (white matter, grey matter, CSF, skin, and bone). Each of M2 – M5 included one additional tissue to isolate their contribution to the current density (blood, eye, fat, and cancellous and cortical bone, respectively) and M1 included all tissues tested. Four human participants (two males, two females) were segmented into M1-M6. Tissue segmentation and volume meshing were completed in Simpleware, and ROAST-generated artificial electrodes were added to the model. Electrodes were placed at the F3 (cathode) and F4 (anode), with 2mA as input current. COMSOL generated electric fields using the AC/DC module. Tissues were assigned conductivity values based on prior research. The white matter and grey matter masks were isolated and combined to compute J values in the brain. J values isolated in the brain region for M1-M6 were tested for significance via a Welch's t-test in RStudio. The results showed that M1 (median = 0.020381 Am-2), M4 (median = 0.018377 Am-2), and M5 (median = 0.015608 Am-2) were statistically significant (p-value <0.001). Models M2 and M3 were not significant. This observation was likely due to their smaller size and localized position with respect to the electrodes and the brain. Similarly, the significance seen in the remaining models may be caused by the larger coverage area related to the brain area.

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ART (Antiretroviral Therapy) Inspires Art: Examining How Visual Art Created by HIV+/AIDS Patients Helped Decrease the Stigma Around AIDS in Florida

Authors: Catherine Smith, Nina Stoyan-Rosenzweig

Art is a language that surpasses simple words and can share a multitude of experiences that connect humans from all walks of life. This includes the ability to educate others about potentially challenging and or heavily stigmatized issues. A particular stigma filled issue in the past 100 years has been HIV (human immunodeficiency virus) which is a disease that can develop into AIDS (acquired immunodeficiency syndrome). The transmission of HIV is an epidemic in the United States with Florida being considered the epicenter within the Southern part of the country. Oftentimes, people were ostracized from their social groups, scared out of their towns, or forced to abandon all that they once had. To combat the dangerous and debilitating stigma that one may face when they are diagnosed with this disease, HIV+ artists have turned to creating visual art to speak about their experiences. To highlight their efforts in more detail, a digital exhibit was created to understand, explain, and showcase art made by HIV+ individuals who are either from or have ties to Florida.

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Bridging Invisible Struggles: Unveiling the Women's Health Crisis in Rural and Impoverished Communities in the United States

Authors: Mikayla Stesney, Kaylee Stacey, Danielle Robins, and Dr. Frederick Kates

Women's healthcare is a common topic of discussion within political and common spaces in the United States. State governments continue to bear down on existing health policies aimed at women's health since the overruling of Roe V. Wade in 2022. Established in 1973, Roe V. Wade served to protect the reproductive rights of American women. The reversal of this historically significant court case reflects a step backwards in women's healthcare in the United States. While policy changes affect all women within the jurisdiction of the ruling, women in impoverished and rural communities are disproportionately impacted. This study focuses on the impacts of a lack of women's health resources in impoverished and rural communities and presents potential solutions that governing bodies and public health associations within these communities could consider. This study also considers the impact healthcare legislation has on women in general society as well as in our targeted population.

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Beyond the DSM: A Cross-Cultural Examination of OCD Symptom Interpretation

Authors: Stephen Anton, Feihong Wang, Anne Zhou, Georis Tawe

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) serves as the primary diagnostic tool for mental health disorders in Western medicine, yet its cultural validity remains questioned. This study examines how individuals from underrepresented communities interpret and understand behaviors typically classified as Obsessive-Compulsive Disorder (OCD) symptoms. Preliminary survey data reveals distinct cultural interpretations across different ethnic groups. Asian respondents viewed obsessive thoughts as normal life experiences requiring exploration and understanding, suggesting that facing these experiences could be therapeutic rather than pathological. They also expressed concerns about media misrepresentation of OCD in popular culture. Hispanic participants emphasized religious and moral frameworks for interpreting these behaviors, particularly noting patterns of excessive cleaning and organization. African respondents provided crucial insights about communal living contexts, explaining how behaviors classified as "excessive" in Western individualistic frameworks may be normative within collective cultural settings. When asked about coping strategies, participants across ethnic minorities consistently prioritized spiritual practices, traditional healing methods, and community support over clinical interventions. Cultural mismatch and stigma were identified as primary barriers to seeking professional mental health services. These findings suggest that the DSM-5's Western individualistic framework may inadequately capture the cultural complexity of OCD-like symptoms in diverse populations, highlighting the need for more culturally inclusive diagnostic tools that incorporate non-Western perspectives on mental health experiences.

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Exploring How Non-Black Perceptions of AAVE Widen Health Disparities For African Americans

Authors: Zurii Tucker, Nina Burt, Sharon Difino

African Americans make up 13.5% of the United States population, yet they have higher rates of mortality compared to other races, a fetal mortality of approximately 10 deaths in every 1,000 live births–which is twice as much as their Caucasian counterparts, and a higher prevalence of chronic diseases, such as cancer, diabetes, cardiovascular disease, hypertension, and depression. Despite efforts to change health disparity issues, African Americans' experience with discrimination in health care affects their overall patient outcomes. This literature review will investigate how patient use of African American Vernacular English (AAVE) affects clinicians' perceptions. AAVE is defined as a dialect of standard American English that has developed from contact between colonial English and African languages and has its own distinct grammar set. Data was collected through search engines such as Google Scholar and the National Library of Medicine. Several articles indicate that linguistic usage can influence clinicians' perceptions of their patients. These perceptions were largely indicated to be negative, thus leading patients to change their language use through code-switching. Code-switching is defined as use of different dialects, languages, and mannerisms to indicate formal and informal interactions within and between social groups. The general mistrust African Americans have in American Healthcare is rooted in discriminatory practices towards the group, as described in Harriet Washington's book "Medical Apartheid." Clinicians who hold negative perceptions from the onset of care could likely influence their treatment with bias. These actions would lead to misdiagnosis and a greater distrust in the healthcare system for African American populations.

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Assessing sublethal toxicity on lipid regulator of Atorvastatin in embryonic and larval zebrafish (Danio rerio)

Authors: Phyllis Wah, Hailey Skaggs, Ciara Saccente, Emma Ivantsova, Lev Avidan, Cole D. English, Christopher L. Souders II, Christopher J. Martyniuk

Atorvastatin is a cholesterol-lowering statin medication for humans that works by inhibiting the enzyme 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase. While this pharmaceutical is bioavailable to marine organisms, its potential toxicity to them is not well characterized. In my research, I conducted RNA-seq and measured sub-lethal developmental and behavioral-related endpoints in zebrafish to identify toxicity mechanisms related to environmentally relevant exposures. Atorvastatin did not impact survival, hatch success, or deformity frequency in zebrafish larvae. At the molecular level, RNA-seq revealed 1 µg/L atorvastatin affected the expression of collagen type I, alpha 1a, fatty acid desaturase 2, alpha M integrin (complement component 3 receptor 3 subunit), and prolactin while 100 µg/L atorvastatin altered genes like solute carrier family 12 (potassium/chloride transporter), member 5b, G protein subunit alpha z, lysine (K)-specific demethylase 6B, and growth hormone 1. Examples of gene sets altered by 1 µg/L atorvastatin included B-Cell Chronic Lymphocytic Leukemia, CD8+ T-Cell Activation, and TNF -> NF-kB Expression Targets while 100 µg/L atorvastatin altered pathways associated with Th17-Cell Activation in Crohn's Disease, Oxytocin Signaling in Brain Nerve Cell (Hypothesis), and V(D)J Recombination. Data for survival statistics, gene expression, and behavioral activity will be presented. This study improves knowledge regarding the relative toxicity of atorvastatin to marine species to improve risk assessment strategies for statin drugs.

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Evaluating Propanil Toxicity in Zebrafish Embryos and Larvae: Behavioral, Apoptotic, and Developmental Insights

Authors: Camilo Escobar, Eden Eyal, Christopher J. Martyniuk

Propanil is a widely used amide herbicide (AH) in commercial agriculture, primarily for controlling weeds in rice fields. As a water soluble contaminant, it functions as a photosynthesis inhibitor and is absorbed through the leaves and roots of broad-leaved weeds. However, despite its extensive application, there is limited animal and human health data on the impacts of propanil exposure on non-target species. Propanil is known to rapidly biodegrade into more toxic and persistent metabolites, such as 3,4-Dichloroaniline (3,4-DCA), raising concerns about its potential long-term effects. An extensive in vivo toxicity screen using propanil was conducted on zebrafish embryos/larvae over a 7-day exposure period, testing a range of concentrations (0.1, 1, 10, 100 µg/L). The embryos were then assayed for visual motor response (VMR), rapid apoptosis measuring acridine orange fluorescence (AO), and 6 morphological endpoints. Embryonic zebrafish survival and time of hatching was unchanged across all treatments while morphological deformities, including yolk sac and pericardial edema, were low but exclusive to propanil-containing samples (<1%). Lower propanil concentrations (10 µg/L) were associated with higher apoptosis ($p < 0.05$). Propanil VMR results, examined using a light-dark preference test, will be discussed. This study advances current knowledge on the toxicity associated with amide herbicides, namely selective weed killers such as propanil, and assesses impacts such as sub-lethal physiological and behavioral changes.

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Sexual Racism, Resistance and Empowerment Against Racism, and Queer Asian American Men's Muscle Dysmorphia

Authors: Phuc Phan, Thomas Le

Body image research has documented that Asian American men experience disproportionately high rates of muscularity-related concerns compared to other racial groups. This is particularly pertinent among queer Asian American men who face frequent experiences of sexual racism within the queer community, which can significantly shape their body image attitudes. Nevertheless, no studies have yet examined the impact of sexual racism on queer Asian American men's muscle dysmorphia symptoms. Thus, the present study investigated 1) whether sexual racism and resistance and empowerment against racism are associated with muscle dysmorphia symptoms, and 2) whether resistance and empowerment against racism moderates the association between sexual racism and muscle dysmorphia symptoms among a sample of 154 queer Asian American men. Regression analyses indicated that sexual racism ($b = .35$, $p < .001$) was significantly and positively associated with greater muscle dysmorphia symptoms, whereas resistance and empowerment against racism ($b = .002$, $p = .984$) was not associated with muscle dysmorphia symptoms. Additionally, resistance and empowerment against racism did not moderate the association between sexual racism and muscle dysmorphia symptoms. The present study contributes to the scarce body image literature on queer Asian American men by highlighting how sexual racism shapes their muscle dysmorphia symptoms. These findings underscore implications for future research, clinical interventions, and prevention efforts.

Characterizing Sediment Microbial Communities and Investigating the Impact of the Physicochemical Environment on Methane Cycling Across Methane Seeps in the Gulf of Alaska

Authors: Nalani Quintana, Daniel Utter, Victoria J. Orphan

Ocean floor methane seeps are essential to global methane cycling and climate control. However, the environmental factors impacting anaerobic oxidation of methane (AOM) powered by anaerobic methanotrophic archaea (ANME) and sulfate-reducing bacteria (SRB) consortia at these seeps remain largely understudied. By investigating the sediment microbial communities and geochemical conditions from varying depths and habitats (e.g. clams, frenulates), we explored the composition and function of ANME-SRB consortia at methane seeps in the Gulf of Alaska. Sediment samples were collected via a deep-sea research submersible and studied using DNA extraction, 16S rRNA PCR amplification, and FISH microscopy to profile microbial communities and their distribution. Porewater was geochemically analyzed to grasp the environmental conditions influencing AOM. Our results reveal variability in microbial community composition and activity, particularly at depths of 6 to 15 cm below the seafloor, where high DNA concentrations and microbial aggregates were observed, suggesting active AOM processes. This study enhances our understanding of microbial interactions at oceanic methane seeps, offering insights into the relationship between AOM consortia and marine ecosystems. Further research on the ecological implications of ANME-SRB consortia will prove instrumental to understanding the role of seafloor carbon cycling on climate change.

Miscellaneous

MIRAGE: Multi-model Interface for Reviewing and Auditing Generative Text-to-Image AI

Authors: Matheus Kunzler Maldaner, Wesley Hanwen Deng, Jason Hong, Ken Holstein, Motahhare Eslami,

While generative AI systems have gained popularity in diverse applications, their potential to produce harmful outputs limits their trustworthiness and usability in different applications. Recent years have seen growing interest in engaging diverse AI users in auditing generative AI that might impact their lives. To this end, we propose MIRAGE as a web-based tool where AI users can compare outputs from multiple AI text-to-image (T2I) models by auditing AI-generated images, and report their findings in a structured way. We used MIRAGE to conduct a preliminary user study with five participants and found that MIRAGE users could leverage their own lived experiences and identities to surface previously unnoticed details around harmful biases when reviewing multiple T2I models' outputs compared to reviewing only one.

Miscellaneous

Phosphorus Dynamics in Restored Stream

Authors: Natalia Madrid, Kemberly Nertulus, Debabrata Sahoo

Phosphorus (P) is the fifteenth element on the periodic table. It is primarily found in the form of phosphate in the environment and is an essential nutrient vital for life. Phosphorus is frequently used in agriculture and in urban environments as fertilizer. While its scarcity can limit plant growth, excessive phosphorus can lead to runoff into nearby bodies of water, potentially creating harmful ecological conditions such as eutrophication, harmful algal blooms, and hypoxia. Because of this, efficient phosphorus management in agriculture and urban settings is critical for a sustainable environment, especially for aquatic ecosystems. While information exists on multiple land management practices to minimize the loss of P from land to water, very limited information is available on how various stream restoration practices aid in assimilating P in streams. Streams are the conduits that connect the land with downstream waterbodies. Understanding how P cycles within restored streams could enhance our knowledge of the effectiveness of stream restoration practices on P cycling. This study aims to analyze the dynamics of phosphorus in restored streams by conducting short-term nutrient injections in a recently restored stream in Greeneville, South Carolina. Various stream features such as cross vanes, single-arm vanes, and step-pool features are incorporated in the restoration. P, nitrogen (N) and NaCl salts were added to prepare the dosing solution. Stream flow was measured to establish the dosing rate. A Mariotte bottle was used for injection. Background and plateau water samples were collected to estimate the cycling of P and N by calculating the uptake lengths for these nutrients. While the study waits on phosphorus-specific data the presentation will utilize initial data such as conductivity curves, flow rates, basic water quality parameters and stream features to discuss the general movement of P in the stream.

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Healthcare Accessibility: Bridging the Gaps Towards Better Health

Authors: Vedaant Mutha, Eavin Valerio, Eric Levy

Despite significant advancements, healthcare accessibility remains a critical issue in the United States, with disparities that persist across socioeconomic, demographic, and geographic lines. My study delves into the experiences of individuals who are facing barriers to healthcare access while identifying potential solutions for enhancing equity in the healthcare system, drawing inspiration from the works of prominent researchers like Dr. Camara Phyllis Jones and Dr. David Satcher, who have dedicated their careers to understanding and addressing health inequities. Utilizing the Amazon Mechanical Turk Platform, a 17-question survey was conducted sampling 198 adults across the United States. The study explores the perceived barriers to care and the impact that socioeconomic factors and gender play in healthcare access. Findings reveal that transportation, affordability, and lack of insurance emerged as the most prevalent barriers, with lower-income individuals disproportionately affected by transportation limitations. In addition, women viewed health disparities and prioritized affordability as a barrier, while men highlighted the lack of public health insurance programs. These findings highlight the need for a versatile approach that addresses the gap in access to health care. Policy interventions should focus on expanding access to affordable health care, improving public transportation systems, and implementing gender-sensitive strategies to address the unique challenges of women and men alike. By addressing these disparities through multilateral policy interventions, the United States can strive to provide equitable and accessible health care for all its citizens, regardless of what they cannot control. This study provides valuable insights for policymakers and healthcare providers to work towards a more inclusive and equitable healthcare system for all.

Miscellaneous

Investigating Potential Soil Respiration in Native vs Non-native Tree Formations

Authors: Ana S. Acosta, Pilar Castro Díez

This study investigates soil respiration in native and non-native tree formations within Monfragüe National Park (MNP), Cáceres, Spain. Historically, the area was occupied by native holm oak and cork oak (Quercus ilex and Q. suber), with non-native eucalyptus and pine plantations established in the 1970s, later abandoned and partially converted to rockrose shrublands (Cistus ladanifer). The Biological Invasions Research Group at the University of Alcalá has been investigating the carbon dynamics of these diverse tree formations. As part of this effort, we examined the respiration rates of soil samples from each vegetation type using a CO_2 flux chamber. Samples were re-hydrated to a moisture level optimal for microbial activity (~60-70%) and their respiration rates were periodically measured as they lost moisture. Respiration rates varied both within and between species, indicating there may be other significant factors such as soil composition or microbial ecology that may significantly affect respiration rates. Further investigation into soil respiration, nutrient partitioning, and carbon sink potential may provide insights into the ecological roles of native versus non-native species within complex natural areas such as MNP.

Miscellaneous

Differences in Functional Outcomes Between Spinal Fusion and Vertebral Body Tethering: An Investigation into Scoliosis Surgeries

Authors: Tom Leppens, Sebastiaan Schelfaut, Danielle Dichoso, Lennart Scheys

Currently, no studies have comprehensively compared the effects of VBT (vertebral body tethering) and spinal fusion on these various functional outcomes within a single scoliosis cohort. This project aims to compare the decrease in functional outcomes at 3 months and 1-year post-surgery between thoracic fusion, lumbar fusion, and VBT groups. Additionally, it seeks to identify key predictors of trunk mobility loss at these postoperative intervals.

Miscellaneous

Effort of tagging loggerhead (Caretta caretta) and green (Chelonia mydas) sea turtles on Casey Key, Sarasota County, FL from 2017 to 2023

Authors: Alexis Isherwood, Dr. Jake Lasala

Mote Marine Laboratory's Sea Turtle Conservation and Research Program (STCRP) has tagged nesting sea turtles on Casey Key in Sarasota County Florida since 1983. Tagging surveys are conducted annually from mid-May to August, covering a 7.24-kilometer stretch of beach to tag nesting loggerhead (Caretta caretta) and green sea turtles (Chelonia mydas). In 2020, the COVID-19 pandemic impacted STCRP's ability to take on interns, thus impacting their ability to encounter sea turtles. The objective of this research project was to evaluate the catch per unit effort (CPUE) of taggers. This project compares pre-pandemic years (2017-2019), the pandemic year (2020), and the post-pandemic recovery phase (2021-2023). Non-parametric tests were used to test for differences in CPUE and mileage covered in relation to these time periods. There was a significant difference in tagger effort in 2020 compared to the average effort in 2017-2019 and 2021-2023. However, no significant difference was observed in the mileage covered each night across these years. These findings suggest that while the pandemic affected the availability or behavior of taggers, it did not significantly impact patrol coverage. This indicates that the program maintained continuous monitoring coverage despite the pandemic. .

Miscellaneous

Comparing Tornado Production from Merging and Isolated Supercell

Authors: Michael Self, Matthew Flourno

This project aims to analyze tornado production across merging supercells using an extensive database of 'right-moving' supercell tracks in the contiguous United States. The two main objectives are: (1) contributing to a robust database consisting of thousands of supercell tracks, and (2) analyzing this database to address key questions about the behavior and characteristics of merging supercells and their associated tornadoes. The database is developed by tracking all observed supercells using archived radar imagery (GR2Analyst) and pairing these tracks with tornado paths, severe thunderstorm warnings, and environmental parameters such as storm-relative helicity (SRH), convective available potential energy (CAPE), and the supercell composite parameter (SCP). The focus of this project is on supercells that have other supercell(s) merge into them during their lifespan. Some research questions to be addressed include: the frequency of tornadic and non-tornadic merging supercells, the tendency of azimuthal shear before and after a supercell merger, and the timing of tornado production compared to the supercell merger. The results of this project will be updated as additional contributions are made to the comprehensive supercell database. Current findings are based on more than thirty convective days from early 2022 through mid-2023. Based on this analysis, more than half of the dominant merging supercells produced at least one tornado. Additional preliminary findings show that both the mid-level and low-level maximum azimuthal shear tends to slightly increase, on average, after a dominant supercell experiences a merger with another supercell.

Miscellaneous

The Houston Derecho: A MPAS and HRRR Model Verification Case Stud

Authors: Marinna Stopa, Jeff Beck, Michelle Harrold, Will Mayfield

Every year in May, NOAA's Hazardous Weather Testbed (HWT) Experimental Forecast Program (EFP), under the guidance of the Storm Prediction Center (SPC) and National Severe Storms Laboratory (NSSL), conducts the Spring Forecasting Experiment (SFE). The SFE compares different forecasting models which help scientists accelerate the transfer of promising new tools from research to operations, inspire new initiatives for research, and identify and document performance of modeling systems. While the SFE compared five different models in 2024, this research project will focus on the currently operational High Resolution Rapid Refresh (HRRR) model, and four different runs of the Model for Prediction Across Scales (MPAS) which is currently in development. HRRR and MPAS vary in a few ways, which will be verified through comparing the weather patterns the respective model forecasted versus what was observed.

Additionally, this research project will focus on the Houston Derecho event of May 16, 2024, through May 17, 2024, as a case study. This will serve to determine how well the models ran during one particularly extreme convective event, in addition to how well they performed generally through the convectively active month of May.

Through this verification effort, the research team will be able to determine the following based on the data: whether (1) initial conditions from the HRRR or Rapid Refresh Forecast System (RRFS) (2) Thompson or NSSL microphysics or (3) Weather Research and Forecasting (WRF) or Model for Prediction Across Time (MPAS) dynamic core performed better throughout the duration of the experiment. With all of this in mind, the research team will be able to determine whether the HRRR or MPAS model fared better in its forecasting ability.

With plans for operational implementation of the RRFS with MPAS in 2025, comparing it with the currently operational HRRR will prove vital to ensuring it is ready. These findings will aid in this effort, as well as contribute to the lacking existing literature on derecho events.

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An Investigation of the Relationship between Income Levels and Vital Statuses among Asian, Black, and White Triple-Negative Breast Cancer Patients

Authors: Esther Pham, Maya Byfield PhD

Triple-negative breast cancer (TNBC) is characterized by a low expression of the estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2). It accounts for about 10-15% of all breast cancers. Prior research has discussed that Black breast cancer patients have a higher chance of developing TNBC cells and a higher death rate in comparison to their White counterparts. Further studies were suggested to determine what could be behind such correlation, which became the guiding purpose of this research to investigate the effect patients' income levels have on their vital statuses. In addition to Black and White populations, the Asian population was added as an extra component. Due to the expensive cost of hospital visits and treatments, it was hypothesized that as the income level decreases, the percentage of death increases. Utilizing the Surveillance, Epidemiology, and End Results (SEER) database, 44,715 records were obtained and analyzed. The data demonstrated that, while Asians had fewer deaths in all incomes, Blacks had the highest death percentages. Black patients had no significant difference at low income (<$50K), suggesting that poverty may not be the cause of their increased death rate. Therefore, the hypothesis was not supported. Other factors, such as a population's culture and mindset, were discussed.

Miscellaneous

The Influence of Prey Base on Invasive Raillietiella orientalis Infection Prevalence in Native Snakes

Authors: Myzell Amaro, Jenna Palmisano, Andrew Durso, Anna Savage

The lung parasite, Raillietiella orientalis, is an invasive pentastome that resulted from a spillover event from the invasive Burmese python (Python bivitattus) in South Florida. R. orientalis is a significant conservation concern to native snake populations in the Southeastern United States, with infections being associated with mortality events and population declines. Little is known about its life history and the impacts to native snake populations. In response to the invasion, the Snake Lungworm Alliance and Monitoring (SLAM) organization was created to perform opportunistic surveillance of the spread of infection. We perform necropsies on collected roadkill and dead in habitat snakes, investigating the respiratory tract to detect the presence of invasive R. orientalis infection. R. orientalis is identified by the distinct size, head shape, and hook positions. To discover patterns of infection, we are assessing the prevalence and intensity across ecological niches and geospatial data of necropsied snakes. Using a Chi Square analysis, we expect that snake species that consume ectotherms are likely to have higher prevalence of R. orientalis infections considering the intermediate hosts described in the literature.

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