2021 Fall Undergraduate Research Symposium

November 3rd, 2021

Artist Statement

Alisha Bhatia

In 1900, Max Planck introduced his Planck's constant to predict the blackbody radiation which his portrait superimposes in the oil painting above. His work is a representation of the transformative nature of research. Stardust from opposite ends of the universe – maybe one part the remnants of a long-exploded star, the other a scorched moon that veered too close to a sun – once collected, forming perfectly random arrangements to form us, flesh full of an exact entanglement of nerves, tendons, and veins. Our minds, products of the stardust, are voyagers of the universe itself. Research advances the human frontier so that each generation may live better than the next. We smash atoms, the smallest unit of matter, to form isotopes which radiate the most complex amalgamation of tissue that is cancer. We explore production methods and response to law to distribute food to the masses. We can do this because researchers hundreds of miles and generations apart build upon each other's work. We are curious about the way the world works. Though each discovery may seem small, they combine to form our species' wealth of knowledge. Planck's discovery allows quantum computers to improve machine learning, philosophers to understand time, artists to illustrate breathtaking nebulae, and nuclear physicists to create clean energy. Each person's contribution fuels the gears that drive our society forward. Research creates meaning out of this vast universe. Our equations, art, and language lift off the page and linger in the air, as palpable as the stardust of billions of years ago. This human instinct is worth celebrating. Undergraduate researchers are students of the world; they train to discover the nature of people, space, and nature. They are our future; they are our stardust.

TABLE OF CONTENTS

Modeling Growth and Development of Hemp (Cannabis Sativa) Varieties under Greenhouse and Controlled Environment Conditions

Authors: Paul Daiber, Alwin Hopf

Hemp is a strain of Cannabis Sativa which is grown for industrial use as fiber, fuel, and phytochemicals. Florida hemp growers are currently facing numerous agronomic challenges in an uncertain environment, ultimately limiting the potential of the hemp crop as a sustainable source of fiber and resources. In this context, developing a model-based decision support system will be useful to address some of the challenges of hemp growers and other stakeholders. Understanding and statistical or process-based simulation of the growth and development of hemp as a function of environmental, management and genetic factors is an initial step towards the development of these models. We collected destructive and non-destructive measurements from different hemp cultivars under different growing conditions to study the development of architecture and biomass accumulation over the growing season. Obtained data was analyzed statistically and folded into preliminary predictive models through mechanistic and statistical approaches. Key phases of development of growth were identified and correlated to preceding environmental conditions. The research presents initial approaches towards simulating growth and development of industrial hemp plants. Future work will include a stronger focus on process-based mechanistic modeling of physiological processes and validation on datasets from different cultivars and environments.

Investigating the diversity and distribution of edible chanterelle mushrooms in Florida

Authors: Kaori Hall, Ben Lemmond, Matthew Smith

Cantharellus is a popular genus of edible, plant-symbiotic ectomycorrhizal fungi that are often referred to as “chanterelle mushrooms.” These mushrooms are found fruiting from the ground during summer and are well known for their distinctive, funnel-shaped mushrooms. Cantharellus mushrooms are often brightly colored, ranging from yellow to orange to pink to cream. Many Cantharellus specimens are morphologically similar to one another, making it challenging to distinguish species without using molecular techniques. For example, almost all Cantharellus specimens with reddish coloration were considered to be C. cinnabarinus; however, molecular data have shown that many specimens previously referred to as C. cinnabarinus are actually different, but morphologically similar species. Very little research has been done to determine the distribution of Cantharellus species in Florida. We hypothesized that there may be previously undetected Cantharellus diversity and potentially unnamed species in the state. We are currently using molecular phylogenetics (based on DNA sequences from Translation Elongation Factor 1-alpha (TEF1) and 28S ribosomal DNA) combined with morphological analyses to study the diversity and distribution of Cantharellus in Florida. Our preliminary analyses have revealed 21 putative species, including evidence of at least 7 unnamed species that require further study.

Disruption in the Middle School Family System: Parental Views on the Impact of Covid-19

Authors: Sarah Michner and Dr. Jennifer Doty

The COVID-19 pandemic instigated unprecedented changes in daily life as stay-at-home orders forced caregivers and their children to be at home together for prolonged periods of time including tensions with work-school balance, disruption of daily routines, and online learning. The current qualitative study employs thematic and content analyses of parental views to investigate the changes in daily life experienced by middle school youth in the family system during the COVID-19 pandemic. Specifically, the study examines 1) the changes in parent-child relationships, 2) caregiver's involvement in schoolwork, and 3) changes in middle school youth's technology usage. Across two studies, we examined 32 parental interviews (88% mothers, mean age 39.8 years) and 117 parental (61% mothers, mean age 38.5 years) qualitative questionnaire responses regarding changes in their children's technology from a larger quantitative study. Parents reported meaningful changes in the parent-child relationship, they engaged in greater involvement children's schoolwork than before, and they faced difficulties in establishing reward and punishment systems during the COVID-19 pandemic. Moreover, parents reported that their middle school children spend more time using technology than before the pandemic. We hope the results of this study will inform future interventions and better target the needs of parents and families as the pandemic continues to endure. including evidence of at least 7 unnamed species that require further study.

Analyzing Exam Formatting and Its Impact on Student Performance in Agricultural/Applied Economics Courses

Authors: Juan Pachon, Dr. John Lai, Dr. Bachir Kassas

There have been ongoing efforts to understand how student performance can be accurately assessed through examinations done in the classroom. The motivation lies in discerning whether seemingly irrelevant factors have an impact on exam performance, so that measures can be taken to improve the accuracy and equity of performance assessment tools. An interesting component is exam formatting, which has been studied since the 1980s, resulting in extensive literature with mixed and inconclusive results (specifically in the fields of psychology and business); but there has been less analysis conducted within the Agricultural/Applied Economics field. This research focuses on the effects of two exam formatting treatments: exam sequencing and question difficulty order. Two exams were administered in two different classes across two consecutive semesters. One exam focused on the impact of ascending/descending difficulty order, and another on the impact of forward/reverse question order. We focus on investigating the treatments' effects on average exam scores, as well as evaluating the impact on students who might be struggling (differences in low performers) the impact on exam letter grades. The results of this will inform professors and lecturers on how to account for potential biases within their Agricultural/Applied Economics courses.

Heavy Metals Entering Lake Alice via Storm Drains from Parking lots

Authors: Romy Garraud

The purpose of this research was to see if pollutants, specifically heavy metals, that are sourced from cars, are going into Lake Alice via the storm drains that are connected to specific parking lots. In this study, three outfall sites that deposit stormwater into the University of Florida's Lake Alice, were selected to be tested for three heavy metals: zinc, nickel, and lead. These outfall sites are connected to inlets that are connected to parking lots in close proximity, with either high or low parking, in order to see if the volume of cars affects the number of heavy metals that enters the storm drains and into Lake Alice. Solution tests were conducted at the Soil Testing Lab at the University of Florida. Inductively Coupled Plasma (ICP) was used to determine each of the three heavy metal concentrations. Zn had the lowest values ranging from 0.001-0.022(mg/L) with no significance between the amount of parking and Zn concentration in stormwater. Pb had the highest overall average of all three heavy metals with 0.063(mg/L) and it was found that parking does affect concentrations of Pb found in stormwater ($p=0.05554$). Ni had an overall average of 0.49(mg/L), so it lies moderately between the values of Pb and Zn. Parking was found to affect significantly the amount of Ni in stormwater ($p=1.618e-07$). Typical water quality values in Florida lakes at the 50th percentile is Zn is 0.00683(mg/L); Pb is 0.001(mg/L); Nickel is 0.002(mg/L) (Hand 2004). For both levels of parking, high and low, the samples from the study have higher values than the average amount of Pb, Zn, Ni found in Florida lakes. The findings show that heavy metals are entering Lake Alice through the storm drains and most likely the pollutants are sourced from cars in parking lots.

Black Trans Youth Activists' Wellbeing Among Anti-Black Racism, Trans-Specific Violence, and COVID-19

Authors: Destiny Vincent, Jules Sostre, Roberto Abreu

Within the COVID-19 pandemic there has been a rise of anti-Black racism and transgender specific violence. In just the last year there has been an overwhelming amount of coverage regarding anti-Black violence such as hate crimes and police brutality. Race-related violence has been linked to higher experiences of psychological distress like PTSD, anxiety, and depression. In addition, there has been a steady increase of both discrimination and violence toward trans people in the US, to include the passing of multiple anti-trans bills and laws and the murder of trans women. Black trans-women account for almost half of the percentage for trans murders. More so, it has been seen and documented that the pandemic has inexplicably affected marginalized communities, with Black and LGBTQ Americans among those who have been highly impacted. This emphasizes both structural and social inequality directed at these populations. For example, Black Americans have disproportionately experienced higher rates of mortality, hospitalization, and mental health impacts by the COVID-19 pandemic. Those within the LGBTQ+ community have experienced even more psychological distress due to the pandemic and trans specific violence. In this project we aim to explore how the rise of these injustices has affected Black trans youth activists (ages of 13 to 25). We expect to uncover the psychological impact of COVID-19 within the last year (2020) along with the role that activism has played in this community's ability to be resilient and resistant.

Potato seed systems in Ethiopia: network analysis to evaluate disease management strategies

Authors: Vasilios Kosmakos, R. Will McCoy, Jiahe Yao, Berea A. Etherton, Haileab Atsbeha Kassaye, Frezer Asfaw, Rogers Kakuhenzire, A. I. Plex Sulá, Yanru Xing, and Karen A. Garrett

Root, tuber and banana crops are essential for the food security of people across Ethiopia. Potato production in Ethiopia is threatened by the spread of the disease bacterial wilt, caused by the Ralstonia solanacearum species complex. R. solanacearum can spread through informal trade of potato seed, a common practice across Ethiopia and neighboring countries. The bacterial wilt pathogen can survive in soil for up to 20 years, and although there is currently no perfect treatment for bacterial wilt, management techniques which raise soil pH have been shown to substantially reduce the degree of infection. We analyze potato seed systems and trade networks within Ethiopia and between Ethiopia and surrounding countries. We use network metrics to characterize the seed system present in the Ethiopian state of Oromia, and simulate pathogen spread along the trade networks using an impact network analysis approach, based on data from local surveys. Finally, we model the spread of knowledge about management techniques such as (raising soil pH,) along with seed trade and evaluate how this may reduce the spread of bacterial wilt. The results of this analysis can be used to inform policy decisions about potato production and trade, and locations for disease surveillance, thereby allowing for increased management of bacterial wilt. Reducing crops loss to R. solanacearum will substantially increase potato production and reduce farming difficulties in Ethiopia.

Surveillance and Mitigation Strategies For Invasive Pests and Pathogens of Tomato, Pepper, and Potato in Florida and the Surrounding Region

Authors: Kyle Schroeder, Eleni M. Stilian, Piotr Suder, A. I. Plex Sulá, Berea A. Etherton, Yanru Xing, and Karen A. Garrett

Agricultural production in Florida is threatened by the frequent introduction of new pathogens and pests. This project focuses on new threats to solanaceous crops (tomato, pepper, and potato), including Tomato brown rugose fruit virus (ToBRFV), Pospiviroids, Ralstonia solanacearum race 3 biovar 2, and Tuta absoluta. Our objectives are as follows. First, we evaluate the potential spread of the key pathogens and pests if introduced into Florida and the surrounding area, including risk based on trade networks, cropland connectivity, biology of the pests, and abiotic/climate-based risk. Second, we evaluate simulated introduction scenarios to identify the best responses to potential introductions of the key pathogens and pest in the region. Because ToBRFV was recently discovered in Florida, analysis for ToBRFV will focus on strategies post-introduction. We identify the most strategic areas to implement surveillance and mitigation for the region, based on the risk of infection as a factor of proximity to ports of entry and urban areas, and landscape connectivity between farms. Effective surveillance and mitigation methods are those that frequently stop invasions in our simulations. By relating geography and management techniques to risk of introduction, our analysis can allow more targeted investment of resources to eradicate or contain new pests introduced to the region. Our framework also has the potential to be used by decision makers for other pests.

Effects of Streptomycin Treatments on Huanglongbing Disease of Citrus

Authors: Ma Andrea Gatmaitan, Jinyun Li, Connor Hendrich, and Nian Wang

Citrus Huanglongbing (HLB, also known as citrus greening) is caused by the fastidious, phloem-colonizing alpha-proteobacteria Candidatus Liberibacter asiaticus (CLas) in Florida. CLas is yet to be cultured in artificial media. CLas is sensitive to multiple antibiotics such as streptomycin, penicillin, and oxytetracycline. In this study, we aim to investigate how CLas causes HLB symptoms using streptomycin treatment as a probe. We hypothesize that reducing titers of CLas with streptomycin prevents HLB symptom development. CLas positive citrus leaves at different stages of symptom development were treated with streptomycin via injection and immersion. 20 HLB symptomatic leaves were injected with 2 µg/mL of streptomycin and another 20 leaves were immersed in 2 µg/mL streptomycin solution. qRT-PCR assays showed that the injection of streptomycin has significantly reduced CLas titers at 7 days post inoculation. In contrast, leaves immersed in streptomycin solution did not show any significant changes in CLas titers. Further experiments are ongoing to determine the relationship between CLas titers and HLB symptom development.

The Protective Role of Organic Load on the Stability of Coronaviruses During Thermal Processing

Authors: Alexander Mueck, Tautvydas Shuipys, Naim Montazeri

Novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), genus Betacoronavirus, emerged as a highly transmissible pathogen in 2019, responsible for the COVID-19 (coronavirus disease 2019). Consequently, the pandemic has posed an unpreceded burden on public health and the global economy. Although the primary route for SARS-CoV-2 transmission is through inhalation of respiratory droplets, secondary routes through fomites may also play a role at lower rates. A large research effort worldwide is directed at investigating SARS-CoV-2 inactivation on environmental matrices, particularly through the application of chemical disinfectants. However, studies on the role of heat on SARS-CoV-2 inactivation are limited. Due to the status of SARS-CoV-2 as a BSL-3 pathogen, surrogate viruses are commonly utilized to study the virus under BSL-1 and BSL-2 requirements. In this study, Pseudomonas bacteriophage phi6 was used as one of the established surrogates for SARS-CoV-2, as both are enveloped, RNA viruses. To investigate the effect of thermal treatment on virus survival, phi6 at 7.5 log PFU/ml in PBS (pH 7.4) was treated at 72ºC for 0, 10, and 15 seconds to mimic high temperature short time (HTST) pasteurization. Thermal treatment was conducted with and without the presence of organic load in suspension (according to the ASTM E1053-20) to determine the protective impact of organic matter on virus survival. This research demonstrated that phi6 in PBS suspension is sensitive to 72ºC thermal treatments leading to complete inactivation (>5.5 log PFU/mL, $p<0.05$) within 10 s when no organic load was present. Even though organic load seemed to have no significant protective effect against virus survival under our experimental conditions, shorter time intervals need to be investigated to provide more accurate thermal inactivation kinetics. Future research will explore the thermal inactivation of phi6 in high protein and high sugar content matrices.

Nitrate based fertilization increases growth & photosynthetic rates in dwarf tomato seedlings

Authors: Gabriel Baerga Uselis and Gerardo H. Nunez

Nitrate and ammonium are commonly used in fertilizers to deliver Nitrogen (N) to plants. Nitrate can be taken up in large quantities by the plant because it can be stored in the vacuole. On the other hand, plants are unable to safely store ammonium. Thus, ammonium must be immediately assimilated through an energy-consuming process. This study aims to examine the effects of ammonium-based fertilization vs. nitrate-based fertilization on plant vegetative growth and photosynthetic activity. We hypothesized that plants under nitrate-based fertilization have higher photosynthetic rates and thus higher biomass accumulation than plants under ammonium-based fertilization. We tested this hypothesis using dwarf tomatoes (Solanum lycopersicum cv. Micro Tom) grown in a greenhouse. Juvenile plants, with 3-4 true leaves, were separated into two treatments: T1 plants were grown in a solution containing 70 ppm N delivered as calcium nitrate, while T2 plants grown in a solution containing 70 ppm N delivered as ammonium sulfate. The experiment lasted for four weeks. We weighed the plants each week to compare growth between the treatments. The last week of the treatments, we measured photosynthetic rates using an infrared gas analyzer and then proceeded to harvest the plants and measure leaf area using image analysis software. Higher photosynthetic rates, mass allocation and leaf area were observed in plants from T1 when compared to T2 plants. These differences are likely a result of plant's ability to store nitrate safely for future use which ensures a constant supply of nitrogen for the plant.

Effects of L-tyrosine on pH-dependent growth and acidification by the laurel wilt pathogen, Raffaelea lauricola

Authors: Jane Nguyen, Ross Joseph, and Nemat O. Keyhani

Raffaelea lauricola is a fungus vectored by ambrosia beetles, and is responsible for laurel wilt, a disease that affects members of the Lauraceae family, including the important agricultural crop, avocado. Carried by its beetle symbiont, the fungus can infect the vascular system of healthy trees, leading to wilting and tree death in a matter of weeks or months. Previous studies have shown that R. lauricola has optimal growth in the pH 5-7 range, with limited growth at higher pH (pH >8). Here, we show that the growth inhibition at high pH can be “rescued” by the addition of select amino acids, such as L-tyrosine. This study aimed to utilize pH (growth) assays to further probe the effects of L-tyrosine on R. lauricola growth. R. lauricola was grown on standard mycological media including potato dextrose agar (PDA) at either pH 6 or 9.5, amended with L-tyrosine, and in the presence of a buffer. Bromocresol purple, a pH indicator dye, was added to provide a qualitative means of examining the ability of this fungus to modulate the pH of its environment. Radial growth and color of the media were noted over a 14-day time course. The results indicated that when L-tyrosine is present, the fungus shows decreased radial growth at both pH 6 and pH 9.5 media plates. However, in the presence of this amino acid, R. lauricola can acidify its environment at a faster rate, allowing for growth at the higher pH. Future research will investigate the effects of other amino acids, as well as different compounds that may also have the capabilities of rescuing fungal growth at high pH’s. This study can provide further insights into the metabolic properties of this fungus, which may be used to develop methods for reducing the impacts of laurel wilt disease.

Experimental Test of the Role of Small Habitat Patches in Fragmented Landscapes

Authors: Eli Shaw, Thomas Smith, Robert Fletcher

Habitat fragmentation impacts ecosystems around the globe and poses a threat to the stability and security of those ecosystems. Increasing the connectivity in a landscape, making larger and resource-abundant habitat patches more accessible by species, is often discussed in terms of two major conservation strategies: habitat corridors and stepping stones. Corridors, or long strips of uninterrupted habitat, have been extensively tested while stepping stones, small patches of habitat connecting larger patches, lack empirical evidence. In fact, the concept of Propagule Redirection from fisheries science presents the possibility that small patches of habitat could absorb dispersing individuals, with dispersers staying in low-quality habitat instead of reaching target patches. If applied to terrestrial ecosystems, the Propagule Redirection Hypothesis suggests that stepping stones actually hinder dispersers in reaching larger habitat patches and work against their ultimate conservation value. In this experiment, we developed one of the first empirical tests of the function of small habitat patches in a fragmented landscape utilizing the cactus bug Chelinidea vittiger - prickly pear Opuntia humifusa spp. lata study system. We set up model landscape treatments with a small, large, or two small stepping stones placed between a release site and large target patch, as well as a control with no intervening small patch, and examined the rate of dispersal to the target patch across these different treatments. We controlled for the impacts of the matrix across experimental sites by modeling the connectivity of each experimental landscape and estimated mortality across different treatments in order to build a larger picture of the dynamics shaping the relative success of small habitat patches in connecting dispersers to more ideal habitat.

What's going on down there? Belowground responses of nine Bermudagrass genotypes to nutrient addition

Authors: Aadil Rahman, Hannah L. Rusch

Bermudagrass (Cynodon dactylon L.) is a warm-season perennial grass grown for forage in tropical as well as subtropical regions around the world. Previous research has shown that genotype 322 produces the highest above ground biomass as well as a linear progression of above ground growth in response to increasing fertilizer rate (Mendoza Mahomar, 2020). However, roots and rhizomes are an important storage organ that helps with regrowth after a state of dormancy in cool seasons and after grazing events, as well as an important structure in ensuring soil quality. Thus, it is important to acknowledge below ground responses in terms of root and rhizome growth when considering stress resilient perennial systems. The objective of this study was to quantify root and rhizome production in relation to nutrient addition and genotype. The experiment was a randomized complete block design with four replications in a split- plot arrangement. Whole plots were composed of four fertilizer rates of nitrogen, phosphorus, and potassium at ½x, 1x, 2x and 6x the recommended rates. Subplots consisted of nine genotypes, seven new genotypes and two controls, 'Tifton 85' and 'Florida 44'. Below ground biomass was harvested once in June 2021 at a depth of 15cm. Our results showed no significant interaction between genotype and nutrient addition in relation to root and rhizome biomass. However, found a significant main effect of both variables independently. We observed an increase in root/rhizome biomass from ½x the recommended rate to 6x the recommended rate. We also observed that genotype 322 did not produce a significant amount of roots and rhizomes compared with other genotypes. The results suggest that root and rhizome growth is largely a genotypic trait and genotype 322 focused most of its energy in above ground biomass resulting in lower root and rhizome production.

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Authors: Juan Pachon, Dr. John Lai, Dr. Bachir Kassas

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Using fish count surveys to examine the spatial and temporal distribution of the invasive lionfish Pterois volitans in the Florida Keys

Authors: Nick Funicelli, Rachel Martin, Will Patrone

This paper presents trends in lionfish distribution in the Florida Keys from 2009 to 2020. The relative abundance and geographic expansion of the red lionfish Pterois volitans were tracked using the Volunteer Fish Survey Project from the Reef Environmental Education Foundation (REEF). This program uses volunteer snorkelers and SCUBA divers to record fish abundance at locations across the globe. Metrics analyzed include changes in relative abundance, number of locations observed per year, percent of surveys observed per year, and the differences in these metrics when comparing 'experts' and 'novices' per the classification system made by REEF. Regression analysis and significance tests were used to identify correlation over time. Although there is a positive correlation between the number of locations that have lionfish and time, the percentage of surveys conducted in the Florida Keys identifying lionfish has declined over time. We also examine the importance of citizen science in academic research, highlighting the need to continue support for organizations like REEF and others that engage in collecting and distributing data via citizen science.

Estimating The Range of Sustainable Producers In North Central Florida

Authors: Rosario J Jhon, Stofer Kathryn

Sustainable producers are producers that balance the effects of their production on the environment, social aspects, and profitability. We wanted to estimate the overall number of sustainable producers that were eligible for our survey. The purpose is to obtain the number of sustainable producers that responded to our survey compared to the total pool. Information gathered from the USDA and the U.S. Agricultural Census 2017 was used to estimate the possible number of sustainable producers using specialty crops in our counties of interest. Vegetables and potatoes were the specialty crops specifically looked for comparison. Livestock such as cattle, including calves, were also observed for comparison. The data was recorded into an excel spreadsheet. An indicator of sustainable agricultural practice (ISAP) was also used to approximate the number of possible sustainable producers. The ISAP uses five characteristics of horticultural production such as, seed source, pest/disease control, weed control, maintenance of soil fertility, and crop management as indicators of sustainability. The estimated range of possible sustainable producers were between 28 and 967. This possible range of sustainable producers is miniscule compared to the overall number of producers in North Central Florida. Further research must be conducted on incentivizing producers to become sustainable.

The addition of Nitrogen in warm season mixed vs solo forage pastures

Authors: Shangida Shareen, Hannah Rusch

Bahiagrass (Paspalum notatum L.; BG) is a major forage crop used for cattle production. It is a warm season C4 grass native to the Americas and produces abundant, low quality forage. Pasture fertilization is a major expense and concern in cattle production. The integration of rhizoma peanut (Arachis glabrata Benth; RP) with BG increases forage quantity and quality and soil nitrogen. Rhizoma peanut Pasture fertilization The objective of this study was to compare nitrogen management practices between two warm season pastures and its effect on forage biomass. We hypothesized that nitrogen addition would favor BG biomass accumulation more than the BGRP pasture. To evaluate this, a randomized complete block design) with a split plot arrangement and four replications was established at the Beef Research Unit near Gainesville, Florida, USA. Two pasture systems, BG and BGRP were established in 2015 and in spring 2021 four treatments were established: BG, BGRP, BG+N and BGRP+N..We used ANOVA and a least significance differences test for mean separation in R to compare treatments. For the month of May, BGRP produced more biomass than BGN and similar biomass as BGRPN and BG In June, July, and August BGRPN produced the most biomass. BGRP and BGN produced less biomass than BGRPN in June and July but more than BG. However, in August, BGN and BGRP produced similar amounts of biomass as all other treatments. We concluded that inclusion of RP and N in BG pastures increased biomass compared to BG and may also improve forage quality.

Results from Pre and Post Intervention: Can a Housing-based Training Program also improve Family Strengths and Relationships?

Authors: Marisley Leal, Katherine Vasquez, and Randall Cantrell

The housing-based training program, Homeflow, analyzed the connection between home maintenance, family operations, and light mechanical home repairs. The program has been shown to influence family strengths and relationships as well as how families function (Cantrell 2013; Cantrell et al. 2019). This study is constructed from the dataset resulting from the Homeflow training program. Family strengths and relationships are defined by the quality and quantity of time spent together. Using the Core and Balance Model of Family Leisure Functioning, this study examined how family activities and behaviors can aid in family functioning (Zabriskie, 2001). Analyzing pre-and post-intervention independent t-tests, statistical significance was found in respondents' confidence to improve family strengths and relationships as a result of the training program. This research shows the importance of home-based training programs that analyze families holistically.

University Faculty Perceptions of Global Warming and Public Health

Authors: Sophie Jacquemin, Milton Newberry, and Kathryn Stofer

The devastating consequences of climate change are becoming even more devasting in all regions of the world, impacting all aspects of life. The close relationship between climate change and public health is particularly important to understand. Climate change negatively impacts both social and environmental determinants of health, ultimately worsening human health. In their latest report, the Intergovernmental Panel on Climate Change concluded that humans are responsible for climate change. University faculty play a crucial role in educating young people who will ultimately shape the future by deciding rights, law, policies, and regulations. Young people must understand the impacts of climate change, which faculty have the opportunity to teach. Because college faculty are extensively educated, we often assume they understand, and agree with, the scientific research that indicates the detrimental effects of climate change and its impacts on public health. However, we cannot make this inference without empirical data supporting our claim. Thus, we designed a quantitative study using comprehensive survey to shine a light on how university faculty across the U.S. perceive climate change and its relationship with public health. In the future following data collection, we will use descriptive and inferential statistical analyses to analyze the data. Colleges across the United States, split into eight geographic regions, were randomly selected to participate. We suspect that geographic location of the school, circumstances the faculty grew up in, and their agricultural knowledge, and other independent variables, will be associated with their perceptions of climate change impacts. The results of this study will be crucial in understanding misconceptions of climate change and public health. Targeting those misconceptions in future education, on climate change and public health will be key in informing the general American population on the severity of climate change.

Blueberry Leaf Spectroscopy: Next Generation Tools for Florida Growers

Authors: Faith Twinamaani and Gerado H. Nunez

The color of a leaf, which is the result of pigments such as chlorophyll and carotenoids, can reveal a lot about plant function. By taking a close look at the pigments that give leaves their color, the physiological processes happening within a plant can be better understood. In fact, many growers use leaf color to guide how much nitrogen they use to fertilize their crops.

The most common way to measure leaf pigments is by extraction with a polar solvent in a laboratory. However, this method is time-consuming, destructive, and limited by the range of wavelengths one can explore. In addition, this method is not very convenient for growers, who must first ship leaf samples to a laboratory then wait days or weeks for the results.

Leaf spectroscopy provides a quick, non-destructive way to measure pigment concentrations. We measured chlorophyll a, chlorophyll b, and carotenoid concentrations in blueberry plants using the CI-710s SpectraVue Leaf Spectrometer. We also quantified chlorophyll a, chlorophyll b, and carotenoid concentrations using the traditional extraction-based method in the laboratory. We compared both methods and found that leaf spectroscopy can potentially help growers make timely and informed decisions about how they grow.

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Does Methamphetamine-induced Staphylococcus aureus Cytolytic Toxin Production Damage Osteosarcoma Bone Cells

Authors: Jordan Rodriguez, Vanessa Enriquez, Luis R. Martinez

Methamphetamine (METH) is a highly addictive recreational psychostimulant abused by ~1.6 million Americans annually. METH poses a threat to the well-being of users while causing formication, the sensation of insects crawling on the skin, which is associated with skin-picking by the drug users. The skin-picking allows the bacterium methicillin-resistant Staphylococcus aureus (MRSA) to enter the body and induce a severe inflammatory bone disease known as osteomyelitis. MRSA secretes cytolytic toxins (PSMs and PVL) as a reaction to the host immune response. These toxins can destroy the user's bone and allow the bacteria to evade immune cells, thus preventing the body from clearing the infection. We aim to investigate the effect of METH on MRSA infection in the bone. We hypothesized that METH stimulates MRSA toxin production and secretion leading to damaged bone cells. Using a bone cell line, we will investigate the combined effects of METH and MRSA on bone cell viability and functional activity, as well as changes to the secretion of MRSA cytolytic toxins. Cell viability will be assessed while bone cell activity will be measured by alkaline phosphate assay. The expression of PSM and PVL will be monitored using qPCR and immunoblot. Our preliminary findings indicate that METH compromises bone cell viability. There is currently a gap of knowledge on the effect of METH on infection and immunity, therefore these studies will provide a new perspective on METH users bone disease and its management.

Investigating Exercise's Role on Muscle Physiology in Older Adults with Knee Osteoarthritis

Authors: Bryce Murillo, Dr. Alisa Johnson, Dr. Yenisel Cruz-Almeida

Knee osteoarthritis (OA) roughly affects 32.5 million adults in the U.S., yet little is known about its effect on muscle physiology, specifically in the quadriceps. Exercise is used as a treatment for knee OA as it has been known to decrease inflammation, increase mobility, and decrease overall pain levels, however little is known on how it alters muscle physiology in this clinical population. We aim to investigate the acute effects of exercise on muscle physiology in those with knee osteoarthritis when compared to age-matched healthy controls. The participants will undergo quantitative sensory testing to gauge their sensitivity to several types of stimuli and we will have them perform a series of strength training exercise tasks to quantify their knee range of motion and quadricep strength in both legs. We will take muscle physiological measures (e.g., natural oscillation frequency, dynamic stiffness, mechanical stress relaxation time) before and after the participants perform the exercise task to gauge the acute effects. The measurements will be taken immediately after completing all the exercise tasks to see the most immediate effects of the strength training. We hypothesize that there will be a decrease in muscle stiffness (muscle mobility and range of motion) and increase in muscle tone (muscle tension at rest) post-exercise. Understanding how exercise affects muscle physiology in knee OA individuals will be a key step in determining how to better utilize its role as a treatment.

Intercultural Competence in Mentoring: An Evidence-Based Practice between an Undergraduate and a Doctoral Student

Authors: Isabella M. Kirshteyn & Huseyin Uysal

Undergraduate research dates back to the 1990s in the U.S. (Kinkead & Blokus, 2012). Mentoring plays a pivotal role in the development of research skills of undergraduate students. Research shows that undergraduate students benefit from mentoring service provided by graduate students (Brown, 2016; Carsrud, 1984; Dolan & Johnson, 2009). However, we know less about the mentoring process that involves international graduate students as mentors. Therefore, more research is needed to understand the intercultural mentoring in undergraduate research. This evidence-based practice paper investigates how an intercultural mentoring relationship can be flourished and maintained. Also, it attends to the role of intercultural competence in undergraduate research. Accordingly, we go beyond Johnson's (2016) traditional definition of mentoring that positions the mentor as the one who "provides the mentee with knowledge, advice, counsel, challenge, and support" (p. 23) and the mentee as the receiver of knowledge with a relatively more passive role. We approach mentoring as a reciprocal learning experience that is "characterized by trust, respect, and commitment" (Zellers et al., 2008, p. 555). As the participants, we, the authors, reflect on our mentoring practice for two semesters in this study. We show how our roles as mentor and mentee evolved in time and through inquiry. Moreover, we avoid possible interruption to our mentoring relationship through maintaining transparency and clear communication. Using our lived experience, we propose a model for intercultural mentoring practices in undergraduate research and provide recommendations for using graduate-undergraduate student mentoring in research-oriented universities.

Substrate Cloning

Authors: Breanna Healan, Carl Denard

Gene cloning involves a series of biomedical techniques in which a specific gene of interest is identified, located, and subsequently cloned out of DNA. Gene cloning serves two primary purposes. Firstly, gene cloning is utilized in developing recombinant versions of the non-functional gene and using this information to understand the nucleotide sequence along with the function of the normal gene. The gene can then be manipulated to analyze the effect of a specific mutation. The process is initiated by restriction enzymes that cut DNA at the specific recognition sites, through which digestion established compatible ends to assist in the specificity of the insertion. An expression vector must be inserted in place and treated with two restriction enzymes to create a compatible end.

In this fashion, our lab is developing a cloning workflow for streamlining the insertion of native substrates of a group of disease-relevant proteases. We aim to use these substrates to observe the activity of these proteases in our yeast-display system. For the initial rounds of cloning, we are focusing on the native substrates of matrix metalloproteinases (MMPs), beta-secretase 1 (BACE1), and insulin-degrading enzyme (IDE). The decision to focus on these proteases relies on their characteristic activity within a host of diseases (multiple types of cancers, type 2 diabetes, Alzheimer's, etc.) and the increasing need to develop more specific therapeutics to combat these illnesses. Once the substrate cloning initiative is complete, we will repeat the workflow with the active sequence of the proteases and clone them into the substrate-containing plasmids. Fully assembled plasmids will be transformed into S. cerevisiae and expression of both substrate and protease activity will be analyzed using flow cytometry.

Uneven Terrain Treadmill Challenges Walking in Younger and Older Adults

Authors: Colton Gonsisko, Ryan Downey, Daniel Ferris

In the elderly, decreased mobility negatively impacts quality of life and leads to an increased risk of falls, which can cause debilitating damage. However, the underlying factors that lead to mobility decline are not well understood. This work tested a novel uneven terrain treadmill apparatus in three different populations (younger adults, higher-functioning older adults, lower-functioning older adults) to see if it could challenge walking stability. Each subject walked over uneven and even (flat) terrain at a constant speed. They were equipped with an insole force sensor in each foot, and a single inertial measurement unit (IMU) placed over the sacrum on the back. The insole force sensors were used to identify the timing of gait events (heel strike, toe off); the IMU was used to estimate sacral position as a function of the gait cycle. The lower-functioning older adults showed significantly increased step duration variability compared to higher-functioning older adults over flat terrain. It was found that step duration variability increased significantly for uneven terrain compared to flat. Similarly, the anteroposterior (AP) and mediolateral (ML) sacral excursion variabilities increased significantly across all terrains compared to flat. In the AP direction, excursion variability also increased significantly with increased age and lower ability. The results suggest that the apparatus does indeed challenge the subjects' ability to walk across all populations, making it a potentially useful device for future research on mobility decline. For example, the ability to characterize biomechanical and neurological activity during challenged walking could be useful for predicting the probability that an individual will have a fall or as a metric for testing the effectiveness of existing therapies targeting walking.

Assessing Protein Adsorption and Electrochemical Properties of Thin Film and Nanostructured Electrodes

Authors: Shruti Kolli, Andrés Sánchez, Blanca Limones Ahijón, María Ujué González, Sahba Mobini

Nanostructured electrodes demonstrate decreased impedance, offer effective surface area for bioelectrodes, and increase charge storage capacity. This results in safer and more efficient stimulation and recording when compared with non-nanostructured bioelectrodes. With recent developments in nanostructured electrodes as an improved method of addressing neural injury, there is a need to assess their performance in biological conditions and to measure the interactions of the electrode surfaces with biological molecules such as proteins that are relevant for future clinical application. Protein adsorption plays a significant role in the functionality and properties of these electrodes, and less adsorption is ideal for longer lasting and functional electrodes. Therefore, we aim to assess properties of protein adsorption on untreated and incubated Platinum, Gold, and Titanium thin film (TF) electrodes and provide a comparison with protein adsorption on a Platinum nanostructured electrode. This will be accomplished by incubating the electrodes in a protein solution of 300 ug/mL of BSA in DI water at 37 degrees Celsius. Protein structures will be visualized on the electrodes via ellipsometry and optical microscopy. Then, a Bradford Protein Assay will be optimized and conducted using the protein samples to assess the extent of protein adsorption onto the TF and nanostructured electrodes. The results of the project found that the Gold TF electrodes had the lowest adsorption of proteins when compared to the Platinum and Titanium TF electrodes, and the Platinum nanostructured electrode had less protein adsorption when compared to the TF electrodes. This suggests the viability of Gold as a promising material for developing electrodes when considering protein adsorption, along with the advantages of incorporating nanostructures into electrodes for increased durability and functionality in use in patients.

3D Printing of Various Hydrogels at KAIST

Authors: Nathaniel Ball, Steve Park

Hydrogels are fascinating subjects of research, due to their wide variety of properties, compositions, and applications. In this paper, three classes of hydrogels are created and tested and for their suitability in 3D printing: A biogel designed for biocompatibility and use in artificial skin, a hydrogel made of gelatin and κ. carrageenan, and a Pluronic F-127 hydrogel integrated with a metal-organic framework (MOF). Since the three types show substantial difficulties in realizing their potential through 3D printing, possible paths forward are discussed so future research might successfully print these materials.

Automating in vitro Reliability Testing of Bioelectronic Implantable Neurotechnology

Authors: Joshua Ciorciari, Michael Villegas, Ladan Jiracek-Sapieha, and Jack Judy

The fabrication of peripheral neural interfaces (PNIs) should be durable enough to reliably sense motor neuron activity and stimulate sensory neurons for the lifetime of the patient. To test the durability of newly researched and developed PNIs, Reactive Accelerated Aging (RAA) can be used. RAA exposes the neural interface to a heated solution of Hydrogen Peroxide (H2O2) for a given period which simulates implantation within the body for an even longer period. In previous experiments, a chemical indicator was used to determine the concentration of H2O2 present in the solution. Running colorimetric assays in this way needed to be done manually and required the use of another instrument to get a quantitative result. An automated system to maintain the H2O2 solution at a fixed concentration and temperature has been developed. To measure the H2O2 concentration, an electrochemical process called chronoamperometry was used. Chronoamperometry is performed by applying a potential across electrodes submerged in the solution and measuring the current response. The Platinum disk electrode (H2O2 sensor) was fabricated to increase the accuracy, efficiency, and frequency of H2O2 concentration measurements. The current response measured with the H2O2 sensor is a function of H2O2 concentration and along with a calibration curve can be used to determine the H2O2 concentration electronically. The system maintains the goal H2O2 concentration by electronically controlling syringe pumps to add concentrated H2O2 when needed, maintaining the solution at 20 mM H2O2. The temperature regulation is performed with a PID temperature controller, that controls the DC power source of a heating mantle. The PID controller maintains the solution at 67 C. This system allows for the RAA testing to be automated and will generate on the order of 100x more H2O2 concentration data points with the ability for a closed feedback loop system.

Neural Network-based Rapid Predictor of Biological Nerve-Fiber Activation

Authors: Justin Golabek, Connor Dupuis, Shreya Saxena, Matthew Schiefer, Erin Patrick

Objective: To greatly enhance the clinical effectiveness of electrical neuromodulation therapies for various medical conditions (e.g., pain, movement disorders, depression, and sensorimotor prosthetics), efficient and patient-specific computer models are needed for the prediction of the neural response. The objective of this work is to develop a method based on deep-learning neural networks to replace computationally expensive methods for the prediction of neural fiber activation by electrical stimulation. An AI-based, rapid neural-activation predictor will decrease the computational demands and allow for implementation of real-time patient-specific models.

Methods: We developed and optimized an artificial neural network (ANN) to predict the volume of tissue activated (VTA) in deep brain stimulation (DBS). Training and optimization was parallelized using 200 nodes on HiPerGator. We benchmarked our ANN performance against the current 'gold-standard' for VTA, the NEURON simulation environment. Additionally, we compared our ANN performance to the DF-Howell method, a non-neural network based rapid-predictor.

Results: The optimized ANN could replicate the VTA predicted by NEURON with less than 2% error across a realistic range of stimulus parameters. On this range, our ANN outperformed DF-Howell for all combinations of stimulus parameters, reducing errors by an average factor of 3.

Incorporating Metal Nanoparticles to Enhance Mechanical Properties of Denture Base Materials

Authors: Vinh Dao, Annika Dasher, Vasanthakumar Balasubramanian, Peter Novotny, Christopher Batich

Dentures made of poly-methyl methacrylate (PMMA) resin provide suitable mechanical properties to survive everyday use, however they lack the toughness to sustain a drop. As a result, dentures that obtain micro-tears from drops or regular use may result in midline fractures. The occurrence of these fractures warrants further investigation for new denture base composites. The present investigation involves incorporating zinc (Zn), zinc oxide (ZnO) dispersion, and silver (Ag) nanoparticles into the PMMA base to resolve these issues and extend the lifespan of dentures. Our experimental methods have produced results that have increased the denture base's ultimate tensile strength (UTS) of the denture base while additionally converting the samples from a brittle to a more ductile nature. In addition, we have observed that utilizing Zn, ZnO, and Ag nanoparticles at concentrations of 0.2%, 1%, and 2% have resulted in varying effects on the base polymer, some of which have promising implications. The incorporation of nanoparticles has been characterized by Scanning Electron Microscopy (SEM), Instron Tensile Tester, and Raman spectroscopy. We are also working to adjust the reaction conditions, such as time and temperature, to optimize the polymerization reaction further. To create a more substantial denture base, we will form a core and shell model by alternating levels of polyelectrolytes and chitosan. This interwoven nanofiber polymer offers strong parallel linkages and hydrogen bond cross-linkages. This approach has the potential to provide a more durable and pathogenic-fighting denture than those current commercial options.

Designing an Artificial Blood Meal (ABM) for the Feeding of Ae. aegypti Mosquitoes

Authors: Alexander Weaver, Vasanthakumar Balasubramanian, Phillip Koehler, Roberto Pereira, Nagarajan Rajagopal, and Christopher Batich

Mosquito-transmitted diseases such as Zika virus, West Nile virus, Chikungunya virus, dengue, and malaria severely threaten global health. Research into mosquito-borne illnesses poses a serious challenge because blood-feeding to rear female mosquitoes is difficult from logistical, ethical, economic, and safety perspectives. We identified an aqueous solution for feeding mosquitoes that does not contain blood (an artificial blood meal; ABM) and has been developed to reduce the challenges associated with transporting and storing blood for rearing purposes. The novel component of this meal is a general protease that is hypothesized to reduce the molecular size of lactalbumin protein units in solution, which promotes mosquito feeding. Additional ingredients in this ABM formulation include phosphate-buffered saline as a solvent, adenosine triphosphate (ATP), sodium chloride, and a commercial-grade whey protein powder. The dry meal is shelf-stable and can be held at room temperature except for ATP, which must be refrigerated. This ABM encourages vitellogenesis as engorged mosquitoes have been shown to produce viable eggs and larvae with no indication of physical or functional impairment. Additionally, the dry mixture is significantly cheaper to procure than defibrinated bovine blood (the standard for mosquito feeding) and is independent of whole blood components, like hemoglobin and serum

Development of a Screening Platform for SARS-CoV-2 Protease Activity

Authors: Ethan Slaton, Samantha Martinusen, Benjamin Stone, and Carl A. Denard

Protease dysregulation is frequently associated with disease. Current proteases therapeutic targeting strategies largely rely on active-site binding small molecules, resulting in catalytic inhibition. However, due to the highly similar active sites of related proteases, small molecule active site inhibitors often lack specificity and lead to off-target toxicity. Thus, there is a need to understand how proteases work and how to control their activity with highly-specific and substrate-selective molecules. This requires that we not only discover protease regulatory sites beyond the active site, but also design molecules that elicit the desired function when interacting with these sites. Unfortunately, current high-throughput screening technologies typically isolate ligand binding events, with little to no information how ligand binding relates to modulatory function.

Here, we present a yeast-surface display system that isolates protease modulators based on how they alter protease activity rather than selecting protease binders. We have selected SARS-CoV-2 proteases as our initial proteases due to the heightened need for development of new therapeutic methods as emergent variants pose risks to current vaccination efficacy. These proteases are directly involved in viral replication and thus a key target of current therapeutic developments. We have shown that these proteases are active within our system. Using tools for transcriptional and post-translational control, we are currently mapping the functional landscape of these proteases. Once established, we will isolate nanobody-based modulators of these proteases by screening large nanobody libraries. This knowledge will serve as the foundation for the development of effective therapeutics to combat SARS-CoV-2, as well as other coronaviruses.

Secreted factors of dendritic cells, rather than the cells themselves, activate Indoleamine 2,3-dioxygenaser

Authors: Mariana E. Viso, Jennifer A. Simonovich, Arun Wanchoo, and Benjamin G. Keselowsky

Chronic inflammation can cause tissue destruction. This inflammatory response is partially regulated by Indoleamine-2,3-dioxygenase (IDO). IDO is an enzyme that transforms tryptophan into N-formylkynurenine, leading to the expression of the aryl hydrocarbon receptor (AhR) pathway. The activation of this pathway prevents dendritic cells (DCs), an immune cell type, from reaching an inflammatory state (DC maturation), thus inhibits inflammation.

The methylene blue and ascorbic acid reaction is used to measure IDO activity in-vitro; however, methylene blue is not naturally occurring in the body. The mechanism for maintaining IDO activity in the extracellular space is unknown. The goal of this research is to determine whether IDO can be activated through interactions with the DCs themselves or something they produce.

Mature and naïve DCs were incubated with an AhR reporter cells, engineered to create the light-producing enzyme when the AhR pathway is expressed, and were then treated with IDO. An endpoint reading of luminescence was performed to measure if the pathway was expressed.

We found that the supernatant from both naïve and the mature DCs induced AhR expression when treated with IDO, demonstrating that IDO can activate the AhR pathway of DCs, even if they have reached an inflammatory state. Because the supernatant was used for this experiment, rather than the DCs themselves, it can be assumed that IDO is activated by some byproduct of the DCs and does not need to physically interact with them. This put us a step closer to understanding the mechanism of IDO activation in the extracellular space.

Application of the Schwan Equation to Biological Cells with Non-Trivial Geometries

Authors: Krista Marrocco, Erin Patrick Ph.D.

Electric fields aid in the development, maintenance, and control of biological cells and is an active area of research. A wide range of medical applications came from this area of research, including would healing, slowing the progression of cancer, pain relief, tissue regeneration, and bone repair. A valuable effect of an electrical field on biological cell is the depolarization or hyper polarization of the transmembrane voltage of the cell. Herman P. Schwan developed an analytical equation ($\Delta\psi$=1.5aEapp) to easily calculate the transmembrane voltage of spherical cells. We wanted to apply concepts of the Schwan equation to cells of non-trivial geometries, since bacterial cells are primarily rod-shaped. We used a finite-element solver (COMSOL) to solve the differential equation for non-trivial geometries. Then we fit a Schwan-like relationship between field and membrane potential for rod-shaped cells of various sizes.

Emulation of a RGB-D Camera in Unity

Authors: Ryoma Molnar, Seong-Woo Kim

Like other professions, roboticists have adopted simulation as a staple in their design processes, as it allows them to test their designs without immediately turning to expensive physical prototypes. Thanks to the advantages of simulation, robot middleware such as the popular Robot Operating System (ROS) can treat data from simulations like real data and define virtual robots using file formats such as the Universal Robot Description Format (URDF). One simulation environment is the Unity Engine which can use the ROS Sharp package to interface with ROS. However, ROS Sharp comes only with a basic sensor simulation package.

One important capability that ROS Sharp misses is Color-Depth (RGB-D) Camera simulation, which allows a robot to obtain the 3D geometry and color data of the environment. The resolution and volume of data from such a camera outperforms other sensors with similar roles, such as LiDAR, while also being economical. Thus, the technology is promising and ROS Sharp's inability to simulate RGB-D Cameras represents a major capability gap.

The objective of this study therefore is the development of a ROS-compatible RGB-D Camera simulator in Unity. This can be achieved using shaders, which can manipulate the output image of a camera, otherwise called a render texture. One component, called a fragment shader, will sample different points of the image to extract depth data. As the simulator uses different mechanisms than a real RGB-D Camera, the data is unrealistically noise-free. Nonetheless the simulator can extract depth data from its surroundings and therefore sense the environment geometry.

The RGB-D Camera simulator will be developed further through the addition of a vertex layer to warp the geometry of the image texture according to data taken from the fragment layer and a means to facilitate data transfer between Unity and ROS.

Using Artificial Intelligence in Osteoarthritis Recognition of Rodent Knees

Authors: Michael Guyot, Jacob Griffith, and Kyle Allen

Osteoarthritis (OA) is a painful and debilitating disorder affecting over thirty billion adults in the United States. Histological grading is a commonly used tool to assess tissue degeneration and joint-level changes in preclinical models of osteoarthritis. However, this type of subjective grading introduces the possibility of error and bias. The long-term goal of this study is to identify which features are the most important in determining the level of OA progression. In this study, which establishes the feasibility of the approach, a support vector machines (SVM) model was used to group rodent knee histology images into healthy and OA groups. Local interpretable model-agnostic explanations (LIME) were then used to determine the weight given to each feature by the classifier.

The designed classifier had 93% accuracy for group classification. Additionally, the LIME model indicates that the cartilage area, bone circularity, and cartilage circularity were the heaviest weighted features in determining group classification.

This study introduces and demonstrates the feasibility of an objective approach for identifying key histological features related to preclinical models of OA. Future work in our lab plans to leverage these features to 1) identify links between joint remodeling and pain-related behavior and 2) determine the impact of exercise on OA progression.

Measuring Fascicle Lengths in Extrinsic and Intrinsic Thumb Muscles Using Extended Field-of-View Ultrasound

Authors: Taylor Rakauskas, Tamara Ordonez Diaz, Jennifer Nichols

Measuring muscle fascicle lengths is critical for understanding the force-length and force-velocity properties of muscles. Muscle fascicles are defined as bundles of muscle fibers and can be measured in vitro by dissection or in vivo using ultrasound or magnetic resonance imaging . Ultrasound is relatively cheap, easy to use, and has been accepted as a reliable measurement method for a variety of muscles. However, most prior ultrasound studies have focused on the lower limb, with few studies examining upper limb muscles and no studies, to our knowledge, explicitly measuring thumb muscle fascicles. Effectively measuring fascicle length of thumb muscles is an important step toward understanding force transmission in the multiarticular muscles of the wrist and hand. Thus, the objective of this study was to test the reliability and validity of measuring muscle fascicle lengths of extrinsic and intrinsic thumb muscles using extended field of view ultrasound (EFOV-US) imaging. Eight healthy adult subjects (4 female, avg. age 21.6) participated in this IRB-approved study. In each subject, one extrinsic thumb muscle, the flexor pollicis longus (FPL), and one intrinsic thumb muscle, the abductor pollicis brevis (APB), were imaged. Additionally, to enable comparison to prior work, the extensor carpi ulnaris (ECU) was imaged. The EFOV-US method used obtained reliable fascicle length measurements for the ECU, FPL, and APB. EFOV-US measurements for the ECU ($p = 0.12$) and APB ($p = 0.58$) were not significantly different than those reported in the literature. To our knowledge, this is the first study to measure fascicle lengths of extrinsic and intrinsic thumb muscles using EFOV-US technology. Measuring thumb muscle fascicle lengths in vivo will inform our understanding of hand forces and hand pathologies.

EEG-based cognitive state classification in pilots using multi-class sequence-to-sequence LSTM network

Authors: Sruthika Baviriseaty, Victoria Rodrigues, and Nicholas Napoli, Ph.D

Classifying cognitive states can help prevent accidents in high-risk jobs, especially for aircraft pilots. Developing an aeronautic crew monitoring system that can detect attention-related human performance-limiting states (AHPLS) and mitigate them in catastrophic situations is of much interest. However, previous work on this topic has focused on the general population and rarely investigated multiple cognitive states. This work presents a classification algorithm that pinpoints aeronautic scenarios, outputs multi-class outputs, and captures time-frequency dynamics of electroencephalography (EEG) signals. Our classification of cognitive states is done using the Scenarios for Human Attention Restoration Using Psychophysiology (SHARP) dataset. The SHARP study was conducted at the NASA Langley Research Center on line-operational commercial airline pilots. This dataset focuses on four different AHPLS: channelized attention (CA), startle/surprise (SS), high workload (HW), and low workload (LW), and these will serve as ground truths for our classification model. We propose a sequence-to-sequence long short-term memory (LSTM) recurrent neural network (RNN) to predict the cognitive states. As for the features, two types of engagement index (EI) were investigated: the classic EI and a dynamic EI, which aims to capture the time-frequency dynamics of the EEG bands within a window of time. This project is currently a work in progress, and we aim to identify if the inclusion of temporal feedback connections via LSTMs improves the predictive power of a model compared to classic probability algorithms. In the future, upon successful performance of this model, we plan on incorporating additional physiological metrics such as electrocardiography, galvanic skin response, and respiration data.

Development of a Novel 3-Axis Hall Effect Load Cell

Authors: Ryoma Molnar, Kyle D. Allen, Scott A. Banks

Even with animal models, gait arenas are useful in developing models for arthritis. One such device is EDGAR (Experimental Dynamic Gait Arena for Rodents), which can measure the force exerted by rodent subjects using four Kistler 9317B force plates. These sensors are 5000 dollars each, incurring major costs and placing budget limitations on instrumentation.Therefore, the objective of this study is to develop a highly economical load cell using a rosette of hall effect magnetometers and a layer of compliant material. Despite attempts at creating a linear relation between the magnetic field strength and loading, the response remained highly nonlinear, warranting development of an alternative model. To do this, the researcher developed a calibration scheme involving a robot with a magnetic end effector tracing a space filling curve. This experiment will yield the magnetic field readings from every possible position of the magnet. From there, a model fitted to the data will resolve the position of the magnet from the magnetometer readings, and feed said position to a three-dimensional mechanics problem to find the loading on the sensor.
The model itself has not yet been developed, although there are clear development paths. Future developments will include a physics based inverse square law model using rational regression and a neural network regressor, the latter of which may be modified to relate loading and magnetic field strength directly with no intermediate step.

Fabrication of Biocompatible Anisotropic Conductive Films

Authors: Oluwabusayo Oni, Yeong-Seoul (Kayla) Kim, Bae Jae-Young, Gloria Kim, and Seung-Kyun Kang

Anisotropic conductive films (ACFs) are widely used in the packaging of flat panel displays and liquid crystal displays due to its fine pitch interconnection technology. ACFs are designed to provide unidirectional vertical conductivity and electrical insulation in the pitch direction. Typically composed of epoxy resins, and gold/nickel coated polystyrene nanoparticles, ACFs are not biocompatible. This poses a major issue in their use in medical devices intended for use inside the human body.
The purpose of this presentation is to discuss an alternative formation of ACFs that will render them usable in the human body without losing the advantages seen in ordinary films. The films would be constructed to be compatible with polybutylene adipate terephthalate (PBAT) based devices. As an alternative to epoxy resin within the films, the biopolymer polyamide (PA) would be used. To replace the Au/Ni particles dispersed throughout the film in a typical ACF, Zinc (Zn) particles would be sputtered onto the film instead. Considering the data presented in this report, the proposed design for a novel biocompatible ACF does seem feasible.

Impact of Online Camera-based Proctoring Systems on Student Perspectives

Authors: Amy Wu, Patriel Stapleton, Jeremiah Blanchard

Typically, students utilize a front-facing camera arrangement in remotely proctored exams; however, the camera system focuses only on the shoulders and head of the examinees, limiting the proctoring angle. As an alternative, the side-facing camera can survey the head, upper torso, and the assessment setup. In our ongoing study, we are analyzing student perceptions and behavior within two camera arrangements - front-facing and side-facing - during online proctored examinations. Our study concentrates on students in the Discrete Mathematics (COT3100), AI for Games (CAP4053), and Design Patterns (CIS4930) courses. During an assessment, each class's participants answered a pre- and post- survey regarding their experiences before and after the exam. Upon thematically analyzing previously qualitatively-coded data, we focused on two concepts, privacy concerns and expected problems / issues with the proctoring arrangement. For both camera arrangements, respondents were concerned about their physical privacy and expected to face issues/problems throughout the exam. Prior to the proctoring, the student participants had little to no preference to the camera system that they utilized for the examinations other than the familiarity; preceding the exam, their responses favored the side-facing camera due to its flexible testing environment. In future work, we will seek to understand more about student behavior during proctored assessments, and ultimately, to build a more efficient approached to assessments in online education.

Cryoprotectant and Storage Conditions for Lipid Nanoparticle Formulations

Authors: Manuel Cortes, Byungji Kim, Ryan Hosn, Darell Irvine

The ability to maintain vaccine efficacy from synthesis, to storage, and lastly administration is among the most important clinical-setting considerations. Due to the enzymatic susceptibility of RNA vaccine technology, optimization of the cryoprotectant and storage conditions is an essential step. Here, we explore sucrose as a cryoprotectant with varying concentrations (0%, 5%, 10%, 30% in saline), solvents (phosphate-buffered saline and tris-buffered saline), and storage temperatures (4°C, -20°C, -80°C, and liquid nitrogen) for an RNA-loaded lipid nanoparticle (LNP) formulation for HIV. In vitro data from dynamic light scattering (DLS) and cryogenic electron microscopy (Cryo-EM) narrowed down the leading storage temperatures to 4°C and -20°C, as they maintained a polydispersity and hydrodynamic diameter comparable to the freshly synthesized batch. For the in vivo experiments, IVIS bioluminescent imaging showed PBS saline to provide the strongest signal, while LNPs with a concentration of 10% sucrose exhibited the strongest immunological activity using an enzyme linked immunosorbent assay (ELISA). Consolidating these results, we proved that storage at -20°C in PBS at a 10% sucrose concentration optimizes RNA-LNP stability and immunological activity. Overall, this study has important implications in achieving sustainable production and distribution goals for vaccines in a global setting.

Image Segmentation of Trabecular Bone in Rodent Knee Histology

Authors: Chris Palles, Jacob Griffith, Kiara Chan, Kyle D. Allen

Osteoarthritis (OA) has traditionally been evaluated using subjective grading scales. Our lab previously developed a graphical user interface to help quantify this process. This project focused on developing reducing subjectivity when quantifying subchondral bone stained with hematoxylin and eosin (H&E). OA was surgically induced in 24 rats via a medial collateral ligament transection and medial meniscus transection procedure. The other 24 rats received only a skin incision (sham control). To separate the region of interest, a trained grader traced the osteochondral interface and the top of the tibial growth plate in 90 blinded images. After this region was isolated, a custom MATLAB script isolated the trabecular bone from the bone marrow voids. To account for natural variation in histological staining, the user selected which of three options represented the best segmented image. This served to reduce bias seen in manual segmentation from untrained graders. As ground truth, a trained grader manually removed the bone marrow voids in Adobe Photoshop. A Bland-Altman plot demonstrated no difference between the methods, and no points fell outside the agreement limits. Therefore, the semiautomated method successfully produced similar segmentation of the subchondral bone while reducing grading time. This study establishes another tool to assess joint histology and provides a foundation for improving quantification of histological images to study OA progression in rodents.

Developing Ground Truth Adipose Tissue Labels for Use in Histological Image Segmentation Analysis

Authors: Nisha Kotta, Julie Jameson, Joshua Peeples, Jonathan Grasman, Alina Zare, and Whitney Stoppel

Adipose tissue plays a role in many debilitating skeletal muscle disorders. When developing an acellular scaffold for repair of such disorders, it is critical that the scaffold does not lead to cell phenotypes or tissue structures that resemble muscular disorders. Therefore, it is important that these materials degrade at a rate that allows for adequate cellular infiltration without causing excessive adipose tissue accumulation at the tissue-scaffold interface. Here, we evaluate the cellular response of a set of lyophilized silk fibroin sponges containing collagen I, heparin and/or vascular endothelial growth factor that have been implanted subcutaneously in rats. The purpose of this work is to develop reduced-biased methods for analysis of histological images of explanted biomaterial scaffolds. We accomplished this by creating a set of 'ground truth' labels by hand-labeling adipose tissue in 120 histological images. These labels were then successfully used to train and validate the pre-existing U-Net model for biomedical image segmentation to identify areas of adipose tissue accumulation. The results from this work allow us to better understand the drawbacks of the U-Net model, highlighting the most important aspects to focus on when developing our own machine learning model to accurately identify regions of interest in histological images.

Effects of Light Conditions and Falls Concerns on Older Adults' Gait Characteristics

Authors: Yue Luo, Xiaojie Lu, Nicolas S Grimaldi, Sherry Ahrentzen, Boyi Hu

Falls are one of the main safety concerns for the aging population, possibly caused by the difficulty in maintaining the gait and balance during walking. Vision and psychological effects are reported to be major factors affecting human gait and balance. This study aimed to compare the gait characteristics of older adults with different falls concerns under usual ambient and visual-guided light conditions. Twelve community-dwelling adults were recruited. Participants were instructed to walk from their bed to the bathroom with their normal walking speed four times. Participants' gait characteristics, including the walking performance, posture, and stability measures, were compared using mixed analyses of variance with light conditions as the within-subject factor, and falls concerns as the between-subject factor. The study found: (1) When compared to the usual ambient night light condition, the lighting with a visual-based guiding prompted participants to have a lower maximum value of right hip flexion and a higher maximum value of trunk accelerometry. Higher confidence in walking and increased numbers of walking direction corrections might contribute to the changes under the visual-guided light conditions. (2) When compared to older adults with low fall concerns, those with high fall concerns demonstrated a slower walking speed as well as a reduction in motion smoothness.

Design of Fibonacci Spirals to Mitigate High Stresses

Authors: Fabiana Amato, Lakiesha Williams

The Fibonacci sequence was first introduced in 1202 by Leonardo Pisano. The sequence consists of finding the next number by adding up the two numbers before it. The ratio of any two consecutive terms converges to 1.618, which is referred to as the golden ratio. This golden ratio presents itself in nature in numerous ways, from the structure of our ears to the number of petals in a flower. Oftentimes, nature uses this system as a means of protection from energy waves such as the rams' horns, human fists, and the cochlea. This study proposes the use of nature's "golden ratio" to navigate new ideas for designing and developing safety systems in athletic and recreational helmets; by incorporating a more efficient energy mitigating system into the padding of current equipment. The system proposed consists of a series of Fibonacci spirals between two blocks with a honeycomb structure, which has been proven to be effective in energy absorption. A computer-aided design (CAD) software is used for the design of the prototype and visualization of the final product. Then, the system is created using a 3-D printer with proprietary resins. After obtaining the final product, the Fibonacci system will be tested by a mechanical tester (Instron). The ability of the spiral system to mitigate stresses will be assessed by performing compression and fatigue tests. If the system proves to be efficient, further testing will ensue and it will be scaled up for potential use as padding within sporting equipment.

TikTok Use and TikTok Perceptions: Associations with Consumer Behavior, Individual Differences, and Well-Being

Authors: Arman Mahmood, Sophia Rodriguez, Simona Shamas, Phuong Thao Phan, Allison O'Hara, Brianna Novillo, Hà Nguyễn, Taylor Myers, Lissette Martinez, Sophie Jean-Michel, Bailly Gray, Alana Grasso, Elaine Foos, Kyla Arcebido, Benjamin Johnson

TikTok has emerged in recent years as a highly popular social media platform, and a valuable setting for brands and influencers to engage in strategic communication. The social media app, which is centered around short video clips, also gained new usage during the COVID-19 pandemic. We conducted a cross-sectional survey with a convenience sample of American university students, to explore how they use and perceive TikTok, and test associations with consumer behavior, personality, and well-being. A total of N = 196 participants (82% women, aged 18-24), including 47 non-users, participated in March-April 2021. Analyses controlled for study variables to isolate unique variance explained, using partial correlations and ANCOVA. We found that the daily time spent using TikTok (self-reports and smartphone logs) was not associated with behavior or well-being. Instead, we found that active (e.g., posting, seeking out friends on the platform) and passive (e.g., browsing feeds) patterns of use had associations with different perceptions and responses to the platform. Furthermore, specific mental perceptions during use—escapism, habitual use, awareness of advertising, wishful identification, social comparison, and trust in TikTok, each exhibited connections to consumer behavior, emotion, COVID-related behaviors, and other study variables. Compared to non-users, TikTok users reported more materialism and COVID-related changes in media use.

Variation in Leaf Venation Patterns Across Oak Species

Authors: Maya Olsen, Claudia Garnica-Díaz, Raiza Castillo-Argaez, Susannah Dorrance, Jeffrey Chieppa, Kathryn Fuller, Michael Aspinwall, and Grace P. John

Leaves act as the principal photosynthetic organ for most plants. Variation in leaf structures can determine plant habitat suitability and drive niche specialization. Leaf venation architecture influences hydraulic vulnerability and scales with leaf size across the global landscape. Yet, the impact of covariation between leaf shape and size and the degree to which scaling relationships are driven by adaptation to climate remain unexplored. We used oaks as a model system to test associations between leaf size, shape, and venation in the context of species adaptation to climatic niche. We quantified leaf traits (leaf area, perimeter, length, and width) in a common garden of nine co-occurring oak species from three phylogenetic sections representing different climatic niches. To test the effect of leaf shape, we calculated leaf perimeter to area ratio (PA) mathematically correcting for the intrinsic decrease of PA with increasing object size. We measured major and minor order vein diameters and length per leaf area (VLA) and quantified climatic niche based on current species-specific geographic distributions and annual climate patterns. We found major vein density to scale negatively with leaf size, such that larger leaves had lower major VLA and species that occupied warmer habitats had smaller leaves with higher major VLA. While leaf shape (PA) also differed by phylogenetic section, we found no direct associations between PA and venation architecture or climate after correcting for leaf size. We found no significant associations between minor veins, leaf shape, size, phylogenetic section, or species distribution. We found strong support for developmental scaling of leaf major VLA with leaf area within a genus. Our results indicate that small-leaved species with greater VLA occupy higher thermal niches. The phylogenetic alignment between climate and leaf shape and size warrants further study of adaptive shifts in leaf design.

Oxytocin attenuates alcohol consumption in a rat model of oxycodone+alcohol polysubstance use

Authors: Isabel Leon, Courtney Wilkinson, Lori Knackstedt

Most substance users engage in polysubstance use (PSU), the use of multiple drugs at a time. A common PSU pattern is combined opioid+alcohol use, with approximately 72% of opioid addicts reporting alcohol use. Oxytocin shows promise as a treatment for alcohol dependence in preclinical rodent models of alcohol seeking. This study examines the relationship between oxycodone and alcohol and determines the effectiveness of oxytocin as a treatment for alcohol+oxycodone polysubstance use. Twenty-three Sprague-Dawley rats (12 male, 11 female) were prescreened for anxiety-like behavior and trained to consume alcohol and oxycodone prior to polysubstance consumption. During oxycodone training, rats were given daily access to oral oxycodone (0.1 mg/ml) and water, or water only, for 6 hrs/day for 7 days. After, rats were trained to consume alcohol using the intermittent access to alcohol (IAA) paradigm where rats were given access to alcohol (20% v/v) and water, or water alone, for five 24 hr periods separated by 24 hrs with no access. Subsequently, rats began 12 polysubstance sessions where they were permitted two-bottle choice access to oxycodone only (OXY, n=7), alcohol only (ALC, n=8), or both oxycodone and alcohol (PSU, n=8). Rats were presented with oxycodone and water, or water only, for 3 hours, followed by ethanol and water, or water only, for 6 hours. Rats were then treated with oxytocin (0, 0.3 or 1 mg/kg) 30 minutes prior to alcohol access. Anxiety behavior in prescreening predicted later oxycodone intake. Anxiety-like behavior in females predicted alcohol intake and rats previously exposed to oxycodone consumed more alcohol than alcohol-only rats. Oxytocin (0.3 mg/kg) significantly decreased alcohol consumption in PSU rats. These results support the use of oxytocin as a treatment for alcohol dependence in polysubstance users.

The relationship between sociodemographic variables and romantic relationship quality during the COVID-19 pandemic

Authors: Naomi Youakim, Ryan McCarty, Danielle Cooke, Brittany Bailey, Joseph McNamara, Andrea Guastello

There are many factors that impact the health of romantic relationships, such as isolation, separation, loss, and adaptability to change. Lower socioeconomic status has also been associated with lower ability to cope with stressful events. The present study sought to investigate if this pattern of results would maintain during the early phases of the COVID-19. Specifically, it was hypothesized that lower socioeconomic status and COVID-19 related lifestyle factors (i.e. working from home, social distancing) would be associated with worse romantic relationship quality. This study is a secondary data analysis of survey data collected through Amazon's Mechanical Turk in June of 2020. The data was collected from individuals at least 18 years of age from across the United States who lived with a romantic partner but had no children in the house. The sample was made up of 103 adults, ages 22-73 (M = 39.79, SD = 13.09), with 58.3% identifying as male and 41.7% identifying as female. Relationship quality was measured using the Revised Dydadic Adjustment Scale (RDAS) and the Intimate Bond Measure (IBM). In regression analyses controlling for age and gender, a household income below $50,000 was associated with lower scores on the RDAS, while working from home and identifying as male were associated with lower scores on the IBM. Degree of reported social distancing did not have any relationship with intimate bonds or relationship quality. Lower income's negative association with relationship quality is consistent with findings suggesting that lower income is associated with decreased ability to cope with change or stressors due to reduced resources. Working from home's negative association with intimate bonds may be related to feelings of entrapment and boredom. A lack of association between social distancing and relationship quality may be because social distancing does not equate to isolation.

Attitudes Toward Dynamics of Political Discussion

Authors: Madigan Wilford and Dr. Hannah Alarian

Political discussion has been shown to significantly influence civic and political participation, with increased discussion frequency corresponding with increased levels of participation. Additionally, the specific attitude an individual has toward political discussion also impacts their participation. Those with an attitude aimed at understanding other people's opinions and reaching constructive agreements tend to be more politically engaged. As these effects are well-established, discovering the factors which change the attitudes people have toward political discussion would provide an understanding of the indirect link between these factors and political participation. By exposing people to different types of political discussion and then surveying their attitudes, I seek to answer the following research question: how does observing different political discussion dynamics change people's attitudes toward political discussion?

Catalytic Enantioselective Synthesis of 2-Pyrazolines

Authors: Moises A. Romero-Reyes, Minami Odagi, Andres M. Gonzalez Socorro, and Daniel Seidel.

The enantioselective synthesis of 2-pyrazolines was achieved using a new generation of chiral carboxylic acid catalysts. Such catalysts showed greater performance than the commonly used BINOL-based phosphoric acids while requiring less steps for their synthesis. Stabilization of the carboxylate conjugate base through anion-binding with a covalently linked thiourea moiety led to a higher acidity of the catalyst. Such acidity was further enhanced by the addition of electron withdrawing groups, in particular the pentafluorosulfanyl (SF5) functional group. Addition of the SF5 group was found to increase the levels of enantioselectivity and overall yield as opposed to the more frequently used CF3 group. Enantioenriched pyrazolines moieties are found in multiple biologically active molecules thus its enantioselective synthesis can provide a more efficient alternative.

Language Justice in North Central Florida

Authors: Hannah Townley and Laura Gonzales

The Civil Rights Act of 1964, among guaranteeing other freedoms, enshrines the right of individuals to access federally funded services in the languages they are most comfortable in. While such services in Florida have begun to offer translations in Spanish, this is not guaranteed, and many other languages are not ever even included. In this project, we interviewed community members and organizers throughout North Central Florida that speak a wide variety of languages, both to survey their experiences with language accessibility, but also to guide our creation of tools to improve accessibility. The result is a Language Access Toolkit, part of which is tools to help community members to access services in their preferred language, and the other part which is a guide for community partners to make their services more accessible across multiple languages.

Sexuality attitudes do not predict warmth toward gay male characters: An exploration of the Ozark series

Authors: Skye M. Speakman, Samantha B. Douglas, Jessica T. Campbell, & Colin Tucker Smith

The present study examined the relationship between attitudes toward gay men and perceptions of characters in the Ozark television series. Ozark follows Marty Byrde, a former financial advisor who relocates his family to the Missouri Ozarks after his money-laundering scheme fails, and his conflict with Roy Petty, the undercover FBI agent investigating him. Roy's obsessive pursuit of Marty, and Roy's status as a gay man, resulted in negative, homophobic comments from ostensible viewers. The present study collected data online from 763 people. Participants reported their attitudes toward characters, completed the Attitudes Toward Lesbians and Gay Men Scale (Herek, 1988), and the Sexuality Implicit Association Test. After controlling for participant demographics, the addition of explicit attitudes towards gay men (β=.05, p=.26) and implicit sexuality attitudes (β=-.09, =.04) did not explain a significant amount of additional variance in relative warmth ratings (ΔR^2=.01, p=.09). Similar findings emerged for the perceived competence and warmth of Roy compared to Marty and other heterosexual characters. This may be explained by Roy's non-prototypic portrayal of a gay man.

Accelerating BAO Scale Fitting

Authors: Matthew Hansen, Zachary Slepian

ThCurrently the Universe is undergoing accelerated expansion driven by dark energy. Dark energy remains mysterious in many respects, but one way to learn more about its nature is to measure the size of the universe at different times. One means of doing so is via correlations between pairs of galaxies, also known as the 2-point correlation function (2PCF). In order to fit our model of the 2PCF at different times to the measured 2PCF from large galaxy surveys such as DESI (30 M galaxies, 2020-2025), we dilate and contract our model with a scaling factor known as alpha. However the naive way of evaluating the likelihood of different alphas is to iterate over all values, compute the log likelihood, and then select the alpha with the highest likelihood. This iteration is an inefficient approach, and we propose a significant improvement in the current work. The process for finding the optimal alpha would be more efficient if we were to write down the model as an explicit, simple polynomial function of alpha, and then solve this equation for the best fit alpha. We show this method is 4,000-8,000X faster than the naive approach. We expect our new proposed method to be highly enabling for constraining the Universe's expansion rate, and thence the properties of dark energy, using upcoming large-scale structure redshift surveys such as Dark Energy Spectroscopic Instrument (DESI).

Differences in Coping Strategies Between College Students of Varying Ethnicities

Authors: Elizabeth D'Amico, Isabella Dewhurst, Anna Thodhori, and Feihong Wang, Ph.D.

The COVID-19 pandemic had a significantly negative impact on the mental health of college students (Wang et. al, 2020). College student minorities experienced more stress and depression during COVID-19 than majority peers considering additional challenges of racial injustice (Molock & Parchem, 2020). While effective stress coping strategies mediate negative impacts on mental health (Mushquash & Grassia, 2020), few studies have examined college students' use of stress coping strategies, or potential disparities across ethnicities. We conducted a secondary data analysis to examine types of stress coping strategies reported by college students and how these strategies differ between ethnicities.

184 students responded to an open-ended survey item regarding stress coping strategies and consented to research participation. A codebook developed by Wang and Sterghos (2021) guided data coding, with inter-coder agreements >86%.

We identified four major types of coping strategies: behavioral, cognitive, informational, and emotional control strategies. Independent t-tests indicated significantly more behavioral control coping strategies ($M=84.200$, $SD=86.242$) reported than other strategies (($M=2.267$, $SD=2.865$, $t(497)= 3.895$, $p= 0.001$). White participants ($M= 19.667$, $SD= 22.427$) reported significantly more strategies than non-White participants ($M= 5.056$, $SD= 8.789$, $t(184)= 3.276$, $p= 0.0020$), and than Asian ($M= 2.917$, $SD= 4.582$, $t(105)= 2.535$, $p= 0.0162$) and Black/African American ($M= 1.333$, $SD= 2.103$, $t(101)= 2.677$, $p= 0.0073$) participants in particular.

Our findings suggest that while many students alleviate COVID-19 stress using behavioral control strategies, White students utilize more coping strategies compared to non-White students and Asian and Black students. Educational programs may consider proactively increasing Asian and Black students' stress coping repertoires and encouraging relevant dialogue between White and non-White students.

Use Of Weight Control Strategies And Perceived Barriers To Healthy Eating: Predictors Of Weight Among Black Women Patients With Obesity

Authors: Mys, A., Klein, K., & Tucker, C. M.

In the United States, non-Hispanic Black women experience the highest rates of both obesity and being overweight in comparison to other racial and ethnic groups (CITE). Self-monitoring of weight-related behaviors and making healthy food choices have been shown to be effective methods for losing and maintaining weight loss (CITE). Existing weight loss studies have found that among the participants in these studies, non-Hispanic Black women lose less weight compared to the other racial/ethnic minority groups. The present study seeks to examine the association between the endorsement of different weight control strategies and weight status among Black women patients with obesity. It is hypothesized that the frequency of using each of three types of weight control strategies (i.e., dietary choices, self-monitoring of weight-related behaviors, and psychological coping) will predict weight, such that, as the frequency of use of these weight control strategies increases, weight will decrease. A sample of 633 Black women patients with obesity were recruited from among 20 university-affiliated primary care clinics in Jacksonville, Florida. Consenting participants completed an assessment battery (AB) that contained a Demographic Health Questionnaire and Weight Control Strategies Scale. Findings revealed that the most commonly endorsed weight control strategy among the study participants was dietary choices, while the least commonly endorsed weight control strategy was self-monitoring of weight-related behaviors. A linear regression model revealed that dietary choices had a significant negative association with weight status ($F(1,589) = 4.213$, $p = .041$, $R2 = .007$), providing partial support for the hypothesis. Findings from this study provide support for assessing weight control strategies endorsed by Black women with obesity before they participate in weight loss programs and then tailoring these programs for these women based on their endorsed weight control strategies.

How the Soviet Satellite States Influenced the Youth Case Studies: Hungary and East Germany

Authors: Virag Fehers

Today, in most countries of the world, who follow democratic values, the government has the power to regulate textbooks, but educators still have freedom of choice in teaching. They can assign required or recommend materials to their students and not face punishment for their decisions. In fact, the promotion of different ideas is celebrated today. However, back in the time of communism, the government had a much stronger grip on the education system. There was no academic freedom for teachers, and any material that did not promote the values of the system were strictly prohibited. After World War II, Europe was divided by two political and social systems. While the “classic” democratic system was restored in Western Europe, the People’s Democracy was introduced in Central Eastern Europe. Ideologies including communism, socialism, and Marxism greatly influenced life in the Satellite States. The education system, more specifically the textbooks used by the schools, were an easy tool for the governments to manipulate and present themselves and their ideologies in an advantageous light, knowing that they will reach their target audience and have the desired effect. During my research, I read and analyzed books and academic articles about communist ideologies in textbooks in Hungary and East Germany. My findings showed that there were certain time periods during communism that showed different trends in how party ideology was presented and marketed. The political ideologies are examined with respect to the education of the youth in the Hungarian and East German school systems.

Extended Similarity Methods for Efficient Data Mining in Imaging Mass Spectrometry

Authors: Nicholas Ellin, Colton hunter, Boone Prentice and Ramón Alain Miranda-Quintana

Imaging mass spectrometry (IMS) is a label-free imaging modality that allows for the spatial mapping of many biological molecules directly in tissue. In an IMS experiment, a raster of the tissue surface produces a mass spectrum at each sampled position, resulting in thousands of individual spectra that form pixels in the final ion images. Each spectrum contains several thousand compounds at discrete m/z values that result in unique ion images. The high dimensionality of IMS data makes data processing and analysis difficult and time-consuming. Post-processing techniques, such as principal component analysis (PCA), have emerged as useful tools for mining IMS datasets to identify biological regions of interest and more thoroughly understand tissue biochemistry. One challenge with PCA in IMS is the interpretation of the loadings and scores. For example, the loadings often contain negative peaks in the PCA-derived pseudo-spectra, which are difficult to ascribe to the underlying biology. We have recently developed novel extended similarity indices, which allow us to more efficiently compare large volumes of IMS spectra simultaneously. In this method, each spectrum is represented as a binary fingerprint and the extended similarity indices tally the number of coinciding 1's and 0's to determine the physical similarity of all selected spectra.

Simulation and experimental evidence of dielectrophoresis in manganite thin films

Authors: Nicole Burg, Ambika Shakya, Amlan Biswas

Manganite thin films of (La1-yPry)1-xCaxMnO3 (LPCMO) which have been grown on NdGaO3 (NGO) substrates exhibit a state where fluid-like ferromagnetic metallic (FMM) regions can coexist with a charge-order insulating background. It has been shown experimentally that these regions can be realigned by using both uniform and non-uniform electric fields; a process which could be used in practice to effectively manipulate extremely small ferromagnetic regions. One of the main physical principals which can explain this phenomenon is dielectrophoresis, that is when neutral particles in a fluid experience a net-force due to a non-uniform electric field. Thus, a C++ code was written to simulate the time dependent dynamics of the FMM regions. Electrodes and circular FMM regions are generated on a grid which uses the relaxation method to find the potentials of the configuration statically. Since the force on the regions is proportional to the gradient of the squared electric field, the regions can be repositioned and their movement over time can be observed. Our simulations support the effects we have observed experimentally, which show electric field induced percolation giving rise to the conditions for electron tunneling through the insulating regions separating neighboring FMM regions.

Accelerating BAO Scale Fitting

Authors: Matthew Hansen, Alex Krolewski, Zachary Slepian

Currently the Universe is undergoing accelerated expansion driven by dark energy. Dark energy remains mysterious in many respects, but one way to learn more about its nature is to measure the size of the Universe at different times. One means of doing so is via correlations between pairs of galaxies, also known as the 2-Point Correlation Function (2PCF). In order to fit our model of the 2PCF at different times to the measured 2PCF from large galaxy surveys such as DESI (30 M galaxies, 2020-2025), we dilate and contract our model with a scaling factor known as alpha. However the naïve way of evaluating the likelihood of different alphas is to iterate over all them, compute the log likelihood, and then select the alpha with the highest likelihood. This iteration is an inefficient approach, and we propose a significant improvement in the current work. The process for finding the optimal alpha would be more efficient if we were to write down the model as an explicit, simple polynomial function of alpha, and then solve this equation for the best fit alpha. We show this method is 4,000-8,000X faster than the naïve approach. We expect our new proposed method to be highly enabling for constraining the Universe's expansion rate, and thence the properties of dark energy, using upcoming large-scale structure redshift surveys such as Dark Energy Spectroscopic Instrument (DESI).

Automated Pulsed Valve Interface for Ion/Molecule Reactions in a Quadrupole Ion Trap Mass Spectrometer

Authors: Summerford, Clara; Prentice, Boone

Tandem mass spectrometry (MS/MS) methods allow for the in-depth structural analysis of a variety of molecular compounds in complex sample mixtures. Ion/molecule reactions are one form of MS/MS that utilize neutral gas collisions to selectively derivatize an analyte of interest once stored in the gas-phase inside of the mass spectrometer. The purpose of this project is to configure a system for introducing multiple reagent gasses into a quadrupole ion trap using a series of pulsed-leak valves. Computer control of the pulsed valves allows for precise admission of the neutral gas to the instrument vacuum system. Reagent gases of interest will selectively react with specific functional groups on analyte ions, providing a structural analysis of the analyte introduced upon fragmentation. Our work has involved configuring the series of signals and delays necessary to drive the pulsed valves using the transistor-transistor logic (TTL) capabilities built into the instrument (Bruker HCT Ion Trap). We implemented a buffer circuit in the TTL signal connection to get the necessary voltage to drive the pulsed valves, which require 12V. The leak-in system consists of 1/8-inch stainless steel tubing with a tee connector fitted with a rubber septum for direct injection of the reagent into the system before passing through the valves. The analyte is introduced by direct injection into the electrospray ionization (ESI) source on the instrument. Once completed, proof-of-concept of this instrument will be tested by performing a gas-phase Schiff Base reaction between a protonated leucine enkephalin ([YGGFL+H]+) analyte and acetone reagent.

Comparison of Common Cold Treatment Effectiveness Between Western Biomedicine and Ayurvedic Treatment

Authors: Pritham Pinni, Hannah Toombs

Through a systematic literature review and meta-analysis of existing research, this study asks: what differences are there between Western Biomedicine, particularly Acetaminophen (paracetamol) and Ibuprofen, and Ayurvedic Medicine herbs and spices like tulsi. This research provides much needed clarity on the differences between Ayurvedic Medicine and Western Biomedicine, specifically by answering the question of which mode of treatment is better for the common cold. The articles were based on research experiments or were papers made to explain herbs and medicines, like tulsi, and their effectiveness against the common cold. In summary, the results have indicated that Ayurvedic Medicine assesses the whole body in treating the disease, uses traditional herbs in the treatment of these conditions, combines yoga with the use of these herbs, and is effective in treating the symptoms of the common cold. A paper studying the effectiveness of Ayurvedic Medicine, compared steam inhalation with water with steam inhalation with water, tulsi, and turmeric. The steam inhalation used with Ayurvedic ingredients (water, tulsi, and turmeric) successfully treated the symptoms of cold, while the steam inhalation with water did not. Compared to Ayurvedic Medicine, Western Biomedicine focuses more on specific parts of the body and requires rest when sick instead of performing physical work. When used separately, both treatments are effective with treating the symptoms associated with the common cold. However, both practices do not cure the virus that causes the common cold. Neither proves to be conclusively advantageous over the other, but, some studies indicate that both treatments can be used alongside each other.

Social Dominance and Absence of Freezing Behavior in African Spiny Mice

Authors: Ashley Jenkins, Justin Varholick, and Malcolm Maden

The African spiny mouse (Acomys cahirinus) has been shown to display atypical patterns of dominance behavior. Typically, rodents will frequently chase and flee interchangeably until one individual establishes a chasing (dominant) or fleeing (subordinate) role. Eventually, the fleeing animal will no longer flee and instead display freezing behavior. Yet spiny mice rarely freeze in response to an offensive dominance behavior or predatory attack. But what behaviors may they be doing instead to reduce chasing and fleeing behavior? General observation suggests they may be avoiding one another. Here we attempt to measure social avoidance by evaluating the duration of time spent in each zone of the cage, as well as the duration of time spent together during 10-minute observation periods three times a week for three weeks. Additionally, we examine the difference between dominant and subordinate mice and their usage of space in the cage. Future research will investigate whether spiny mice display higher levels of avoidance behavior than rodents that do show freezing behavior, as well as what proximate causes can lead to freezing or avoidance.

Conformational Change of ET Domain of BRD3 in Response to Viral Peptide Bonding

Authors: Elizabeth Sebastian, Arup Mondal, Alberto Perez

BRD3 is a protein involved in gene expression within mammalian DNA (LeRoy et al., 2008). It contains an extraterminal domain (ET) that binds multiple other regulatory proteins, and it has also been hijacked by viruses to locate near the transcription start site. These protein-protein interfaces are mediated by peptide epitopes that adopt distinct, unique conformations, altering the conformation of BRD3 through the orientation of its beta pleat (Aiyer et al., 2021). Inhibiting these viral interactions and manipulating BRD3 for gene therapy approaches are two promising directions for drug discovery. Development efforts require a deeper understanding of the protein with and without the viral peptide to understand its effects on the overall stability of the protein-peptide complex, and how it can be manipulated. Molecular dynamics allows for the understanding of the change in stability with conformation. In conjunction with molecular dynamics, Principal component analysis allows for more robust study of conformational spaces as it observes the differences in the microstates of the protein-peptide complex, which have an outsized role in biological processes (Hess, 2000). Preliminary RMSD data suggests that the viral peptides did stabilize the protein-peptide complexes in comparison to the ET unbound protein. These states, in contrast to expectations, were less stable than simulations with the viral peptide artificially removed. These results were similar for all six of the viral peptides studies (BRG1, CHD4, JMJ6, LANA, NSD3, TP), indicating a need for adjustment of the PCA methodology to provide a more accurate estimate of the effects of the peptides on protein stability.

3,4-disubstituted piperidines synthesis via enantioselective Tsuji-Trost coupling and Cope rearrangement

Authors: Nilova, A., Mannchen, M., Noel, A., Semenova E., Grenning, A.

3,4-difunctionalized piperidines are privileged structures found in numerous pharmaceuticals and biologically active natural products such as the antidepressant paroxetine and the antihistamine levocabastine. Such drugs are notably enantioenriched, but the research field around the enantioselective synthesis of disubstituted piperidines has been underexplored. This study demonstrates that a variety of enantioenriched 3,4-difunctionalized piperidines can be easily accessed by an enantioselective Tsuji-Trost coupling followed by a Cope rearrangement. To form the Cope rearrangement products, Tsuji-Trost couplings were performed with piperidinone-derived nucleophiles and allylic electrophiles with a chiral ligand-palladium complex. Upon heating, the 1,5-dienes were observed to undergo diastereoselective Cope rearrangement. These studies show that this method can be performed enantio- and diastereoselectively and that it is applicable with a variety of electrophiles that include aliphatic, aromatic, and heteroaromatic allylic electrophiles. The studies of different (hetero)cycloalkyl nucleophiles are also ongoing. The Cope rearrangement products were derivatized by reduction and oxidative amidation demonstrating the importance of such substrates and presenting the type of products that can be access through this methodology. As such these products are of high value and will provide insights into stereoselective strategies related to the synthesis of 3,4-difunctionalized piperidines.

Undergraduate's Covariational Reasoning across Function Representations

Authors: Teegan Bailey, Konstantina Christodoulopoulou, Darryl Chamberlain Jr.

Covariational Reasoning is the mental actions, constructions, and processes used to coordinate two or more quantities and interpret the relation between them. While research has shown that covariational reasoning is critical in a variety of fields, there has been a lack of studies on three-dimensional covariational reasoning. This study utilizes the Action-Process-Object-Schema (APOS) Theory framework to analyze how a student applies covariational reasoning to a parametric representation to model a real-life three-dimensional scenario. Preliminary results suggest that students' focus on experiential time and a underdeveloped understanding of a function and derivatives may inhibit their ability to reason about two or three quantities relating to each other irrespective to time.

“The Jewish Danger”: An Exploration of Medieval Antisemitism in Der Stürmer’s Children’s Books

Author: Shannon Scott

In pursuit of their goal to control future generations, the Nazi regime attempted to insert its rhetoric and values within various aspects of young Germans’ lives. One notorious Nazi newspaper, Der Stürmer, contributed significantly to this effort with the publication of three children’s books from 1936 to 1940. Not only were these books written to instill in children what the Nazis considered positive values, such as loyalty to the regime, but they also went to extreme lengths to dehumanize Jewish people and cast them as existential threats both to the nation and to young Germans. But these antisemitic tropes and concepts did not develop in a vacuum, and so to understand them, this paper focuses on the history of the books’ antisemitic rhetoric and how it persisted from the medieval era to the modern one. The extensive body of antisemitic ideas that so influenced the way that Nazis sought to ideologically control their youth can also serve as a lesson for people in the modern day.

Fish Diet in the Mara River in East Africa

Author: Nicholas Wallis

This research project addresses the question of the dietary composition of three different taxa of fish – Labeo victorianus, Labeobarbus altianalis, and Barbus nyanzae – in the Emarti Bridge, located upstream the Mara River in Kenya. The method used to answer this question was gut content analysis of collected L. victorianus, L. altianalis, and B. nyanzae specimens. A microscopic examination allowed for determination of the stomach contents of each taxa and thus their respective diets in the hours to days shortly before death. The findings of this study are important as understanding fish diet will help us better understand how energy and matter move up the overall food web in the Mara River. This allows us to assess food web stability and the possibility of trophic cascades, helping us better prepare for possible events that may disturb this ecosystem and others similar to it. The Mara River is important because it provides water to nearly one million people, as well as to several protected areas in the Serengeti Mara Ecosystem; thus, it is vital that we understand how it functions, as well as potential threats that might compromise it, in order to make sure it remains healthy.

Feminicide as a Symptom of Democratic Backsliding in Mexico, 1995-2018

Author: Hannah Townley

Between 1995 and 2017, Mexico experienced both an increase in feminicides and a decrease in support for democracy With 93% of all feminicides going unreported or uninvestigated, I argue that the impunity of gender-based violence is a violation of the rule of law, therefore an aspect of and contributor to erosion of democracy. The negative correlation between feminicides and preference for democracy is shown by gender, in arguing that the insecurity of a marginalized group (in this case, women) increases that group's ambivalence towards democracy. By showing that higher rates of feminicide are associated with lower support for democracy, this research suggests that gender equality is a central component of security and democratization, and that without safety from violence democracy is impossible.

The Impact of Genome Doubling on Gene Expression Noise in Arabidopsis thaliana

Authors: Ethan Stolen, Shengchen Shan, Michelle Gaynor, Douglas Soltis, Pamela Soltis

A key question in biophysical investigations is how life arises from, and thrives in, the inherently random interactions of molecules. A consequence of this cellular environment is the stochasticity of gene expression, or noise, which is defined as the difference in the number of copies of a protein produced by genetically identical cells. Since stochastic gene expression affects the flow of information from DNA to the protein structure of an organism, we are especially interested in the effect of genetic redundancy on the noise of gene expression. Whole-genome duplication (WGD), or polyploidy, is one source of redundant genetic information, resulting in individuals with duplicated gene copies. To quantify the effect of WGD on gene expression noise, we designed an experimental setup using dual reporter proteins: yellow (YFP) and cyan (CFP) fluorescent proteins. We are currently cultivating Arabidopsis thaliana individuals from a line with these two proteins inserted into the genome. Colchicine will be used to induce synthetic autotetraploidy from Arabidopsis seedlings. We will quantify the level of gene expression using confocal laser scanning microscopy to measure the fluorescent intensity of the reporter proteins. We hypothesize that the synthetic autopolyploid individuals will be characterized by an overall increase in extrinsic noise, due to increased variation in cellular volume, but a decrease in intrinsic noise due to the redundancy of genetic information buffering gene expression. Experimental setups like this one may make clear the effects of WGD on gene expression noise and contribute to a better understanding of an important evolutionary force.

On-Tissue Derivatization of γ-aminobutyric acid in Pancreas Tissue for Imaging Mass Spectrometry

Authors: Alyssa M. Moore, Julia R. Bonney, Boone M. Prentice

Gamma-aminobutyric acid (GABA) plays an important role in the inhibition of glucagon secretion in the pancreas. While the distribution of GABA in the brain has been studied using imaging mass spectrometry, GABA remains difficult to detect in the pancreas due to significantly lower concentrations in comparison to the brain. Additionally, matrix-assisted laser desorption/ionization (MALDI) mass spectrometry can cause spectral interferences in the low m/z range, resulting in poor sensitivity for low mass analytes such as GABA. Instead, we have utilized the derivatization agent 2,4,6-triphenylpyrylium tetrafluoroborate (TPP-TFB) to combat these challenges. TPP-TFB selectively reacts with the primary amine functional group of GABA, providing a fixed positive charge and resulting in a higher m/z value in comparison to the non-derivatized GABA. The derivatization agent also acts as a matrix which allows for the suppression of chemical noise that could interfere with the GABA signal. Herein, a TPP-TFB derivatization method has been developed to detect GABA in mouse pancreas. Mouse pancreas is first sectioned on a cryostat (Leica Biosystems); the derivatization agent is then applied using an automated sprayer (HTX Technologies) and the slide is incubated with a 50% methanol solution. The derivatized GABA is detected at 394.198 m/z, allowing for imaging mass spectrometry to be performed to analyze the spatial distribution of GABA in the pancreas.

Imaging Mass Spectrometry Analysis of Cellular Respiration Metabolites Enabled by On-Tissue Chemical Derivatization

Authors: Yu Tin Lin, Chelsey Mertens, Manal Zabalawi, Lane Smith, Peter Stacpoole, Charles McCall, and Boone Prentice

Sepsis is known to disrupt mitochondrial adenosine triphosphate (ATP) synthesis due to inhibition of succinate dehydrogenase (SDH) by itaconate. Spatiotemporal alternations of sepsis-affected metabolites in normal versus septic conditions can be studied by conventional liquid chromatography-mass spectrometry (LC-MS) analysis. However, LC-MS does not provide any spatial context for metabolic activities in tissues, which may be heterogeneous in tissue substructures. Herein, we have used matrix-assisted laser desorption/ionization imaging mass spectrometry (MALDI IMS), which uniquely permits in situ and label-free metabolite mapping. However, highly abundant endogenous compounds and the MALDI matrix can cause ionization suppression and chemical interference, which challenges the detection of low m/z sepsis-affected metabolites. To detect metabolites with high sensitivity, we have herein adopted an on-tissue derivatization workflow for carboxyl-containing analytes using synthesized N,N,N-trimethyl-2-(piperazin-1-yl)ethan-1-aminium iodide (TMPA). TMPA both improves ionization efficiency by adding a quaternary ammonium functionality and increases the m/z of the metabolite analytes to an m/z range with less chemical noise. Our preliminary results replicate detection improvement of TMPA-derivatized fumaric acid and succinic acid and achieve IMS mapping of TMPA-derivatized itaconic acid, lactic acid, and alanine. Furthermore, our current data indicate the presence of spatiotemporal alterations of analytes induced by sepsis. Future experiments will focus on establishing statistical significance of the results, confirming the biological relevance of the imaged distributions of TMPA-derivatized analytes, and attempting more comprehensive IMS mapping of sepsis-affected metabolites.

A Review: Soluble Forms of CD163, CD36 and LRP1 as Biomarkers for Sickle Cell Disease

Authors: Trevi Perez, Josh Lua, Sylvain Doré

Sickle Cell Disease (SCD) is a genetic precursor to a wide array of life-threatening symptoms, such as stroke and vaso-occlusive crises. It is hypothesized that these outcomes may be dependent on or indicated by the presence of several receptor proteins, whose roles are implicated in inflammatory and oxidative pathways via the mediation of free, acellular hemoglobin. This literature review sought to investigate the correlation between levels of soluble forms of the cluster of differentiation 163 (CD163), the cluster of differentiation 36 (CD36), and lipoprotein-related protein 1 (LRP1) within the bloodstream and symptoms of SCD. Clinical and pre-clinical studies concerning the use of these three receptors as biomarkers were gathered using the search engines of PubMed, Dimensions, and Google Scholar. Research into the subject revealed a connection between higher levels of the soluble form and the most detrimental outcomes associated with SCD. The mechanisms by which these soluble receptors are generated, their physiological function, and their capacity to predict clinical outcomes are all subjects that remain to be elucidated by further research or validation.

Arts in Medicine: Systematic Review of the Effects of Therapeutic Dance on Children with Autism

Authors: Tiffany Gandhikumar, Megan Cushing, Neeva Seethi, Keer Zhang, Ajay Mittal, Ruchita Kachru

Purpose: Autism spectrum disorder (ASD) is a complex neurodevelopmental disorder that affects social interaction, bodily self-awareness, self esteem and expression, and general communication. Dance as a form of therapy has been proven to be remedial for multiple diagnosis due to the fact that it is a form of expression. The purpose of this study is to review the available knowledge on dance as a form of therapy for children with ASD. This paper will explore the scientific processing behind mirror neurons systems (MNS) and how they affect physical movement in children with ASD.

Methods: This study is based on data that focuses on factors that can improve symptoms for children with ASD through the use of dance movement therapy (DMT). DMT is a method that heavily relies on the MNS to improve these symptoms. We explore this connection by analyzing all of the studies made on DMT and children with ASD. A filtering process through Covidence, a systematic review management software, was used that was centered around categorizing the data on topics that highlight the study.

Results: Our findings reflect that DMT is a viable therapeutic option for children with ASD. Inclusion and exclusion criteria were applied to 122 studies, and ultimately, 58 studies met the criteria. Studies included were conducted in the United States, utilized patients diagnosed with ASD aged 5 to 33, and evaluated DMT as an intervention.

Conclusions: The culmination of literature highlights the relationship between DMT and positive growth in personal and interpersonal interactions for children with ASD. The field of DMT is becoming increasingly prominent as researchers advocate for more empirical evidence to be collected to prove its efficacy. In terms of future applications, DMT could be utilized not only as a therapeutic option for children with ASD but also as an early intervention technique.

Determining the Radiosensitizing Effects of OSR1/SPAK Inhibition in Glioblastoma

Authors: Lauren Driver, Alfredo Quinones-Hinojosa, and Paula Schiapparelli

Glioblastoma (GBM) is a primary, malignant, and heterogenous brain tumor with a devastating prognosis of only one to two years. Considering the aggressive nature of GBM, this study sought to decrease the capacity of GBM cells to proliferate and migrate by targeting the pathways that facilitate their invasiveness. Specifically, this study focused on (1) OSR1/SPAK inhibition to increase GBM cell radiosensitivity and (2) y-H2AX as an indicator of DNA damage potentially linked to increased radiosensitivity. The first experiment revealed decreased colony formation when YU566 was present and radiation increased. The second experiment showed greater DNA damage and prolonged recovery time in conditions with YU566. With all considered, the primary takeaway of this investigation was that YU566 may increase radiosensitivity by stimulating DNA damage, as indicated by y-H2AX concentrations.

Glycemic and extra glycemic benefits of continuous glucose monitoring during pregnancy and in the postpartum period

Authors: Louis, Robyn Elswick, CNM, Danielle Munoz-Pena, MD, Juan Abu-Rustum, MD, Reem Sylvester, MD, Kendra Reeder, MD, Callie Rodriguez, MD, Marcella Jennings-Coulibaly, MPH, Alexis Egerman, MD, Robert S.

Glucose monitoring is a critical aspect of care in a patient with diabetes, and in particular, in those who are pregnant. In pregnant patients with diabetes, glucose monitoring is important to avoid excess maternal glucose causing accelerated fetal growth and hypoxemia in utero. Additionally, as patients are placed on medications, there is an accompanying risk of maternal hypoglycemia. Historically patients have used a finger prick system and monitor device to measure glucose at home. More recently a continuous glucose monitoring system (CGM) has been employed to facilitate the assessment of glycemic control. The CGM device works by using a sensor within the subcutaneous tissue and transmits electrical signals to the skin surface and onto a smartphone. The glycemic benefits include low hemoglobin A1c and fewer episodes of hypoglycemia. The extra glycemic benefits such as greater patient adherence to medication, weight control, exercise, and diet have been less well studied. Our purpose is to demonstrate the extra glycemic benefits of continuous glucose monitoring during pregnancy and postpartum through means of a patient survey administered to women that use and do not use a CGM.

The impact of maternal pre-pregnancy body mass index on resilience to perinatal stress

Authors: Nisha Chachad, Dominick J. Lemas, PhD

Background: Obesity during pregnancy has been associated with child and maternal health outcomes; however, its impact on prenatal and postnatal resilience remains poorly characterized. The Connor-Davidson Resilience Scale (CD-RISC) is a validated questionnaire used to measure resilience to stressful events.
Objective: To examine the impact of pre-pregnant BMI on self-reported resilience as measured by mean CD-RISC scores.
Methods: Participants were recruited as part of the Breastfeeding and Early Child Health (BEACH) study, a longitudinal investigation of how breastfeeding impacts maternal-infant outcomes during the third trimester of pregnancy and one year postpartum. Pre-pregnant BMI was determined from self-reported pre-pregnant weight and maternal height collected at third trimester study visits. The primary comparison groups were normal weight (BMI < 26) versus participants with obesity (BMI > 29). Connor-Davidson Resilience scores were collected at third trimester, two week, and two month study visits. Mean CD-RISC scores were calculated for distinct study visits within each BMI group to examine trends. Participants with missing or incomplete questionnaires were dropped from the analysis. Statistical analysis included a t-test to determine significance.
Results: Of 72 consenting participants, 45 (62.5%) met qualifications for the main BMI groups and completed CD-RISC questionnaires for every study visit. Levels of completion were similar between groups. Of the remaining 45 participants, 31 (68.9%) were normal weight and 14 (31.1%) had obesity. Statistical analysis of mean CD-RISC scores revealed that differences between BMI groups for all three study visits were not significant; the calculated t-values were less than the corresponding t-critical values.
Conclusion: The results indicated that differences in mean resilience scores were not statistically significant on the basis of BMI. This information suggests that the impact of maternal obesity on perinatal stress may not be clearly reflected by CD-RISC scores alone and that further analysis of other resilience measures may be necessary.

Expression of Protein Serine Racemase In Different Aged Rat Groups and Its Association with Cognitive Decline

Authors: Naeliz Lopez, Brittany Yegla, Linda Bean, Asha Rani, Ashok Kumar, Thomas Foster

The expression and function of N-methyl-D-aspartate receptors (NMDARs) is important for synaptic plasticity and influences cognitive function, and these processes begin to decline as we age. Other research has provided evidence that NMDAR is located in the Prefrontal Cortex (PFC) and regions of the hippocampus: Dentate gyrus (DG), Ventral Hippocampus (VH), Cornu Ammonis (CA1) and CA3; these regions are involved in the cognitive processes that decline with age, suggesting that disruption of NMDARs may contribute to age-related cognitive decline. NMDAR function is modified through binding of co-agonist D-serine. Serine Racemase (SRR), found in astrocytes, is an enzyme that changes L-serine into its mirror image D-serine, leading to more activation of NMDAR. Our hypothesis is that SRR expression and synaptic function will be higher in young rats than aged rats. Therefore, the expression of SRR was quantified and compared in young (4 mo), middle age (12 mo) and aged rats (24 mo). Animals were defined by their performance in behavioral experiments of memory tasks (water maze) and NMDAR function was measured by examining the excitatory postsynaptic potential (EPSP) from the CA3 and CA1 regions. The experiment is ongoing but preliminary results suggest a difference in expression of SRR in young and aged rats in the mPFC and CA1 region, with the trend of young rats expressing more SRR.

Brain regional differences in functional connectome strength in subjects with subjective memory complaints, mild cognitive impairment, and Alzheimer's disease

Authors: Aéja Marie Pinto, Parker L. Kotlarz, Juan C. Nino, Marcelo Febo

Early behavioral signs of Alzheimer's disease begin years-to-decades before the clinical symptoms of mild-to-severe cognitive impairment and dementia. The objective of the study was to determine how functional connectivity (FC) between nodes located in distributed brain regions is modified at distinct stages of cognitive decline and AD. We applied graph theory analysis to graphs generated from FC data by investigating FC between 300 nodes embedded within 17 distinct networks in control elderly participants (n=51), and participants classified as having subjective memory complaints (n=18), early mild cognitive impaired (EMCI; n=34), MCI (n=11), late MCI (n=13), or AD (n=7). Subjects were part of the ADNI study (ages:61-96; n=134, 50% f) and all resting state fMRI scans were collected on a Siemens Prisma Fit 3-Tesla scanner. Graph theory-based calculations were applied to weighted undirected matrices constructed from 44,550 pairwise correlations between fMRI signals from 300 regions (Yeo parcellation). We identified a cluster of nodes in the somatomotor and dorsal attention networks that showed a gradual decline in node strength from controls to MCI and AD. A separate cluster of nodes located in default/dorsal attention network showed a transient increase in node strength. Pairwise permutation tests between each group vs controls indicated that differences in node strength varied rostral-caudally across the cortex from SMC to MCI and AD. In AD, significant differences in node strength were observed in occipital, temporal lobe, and superior parietal areas. Large-scale regional changes in node strength across pre- and postcentral gyri, superior parietal and occipital lobe appear to track differences from SMC, MCI and AD. Although the link to underlying synaptic function is unclear, the results suggest that the strength of communication across the cortex could vary over the course of progression of cognitive decline.

Investigating the stress counteracting effects of exercise in female mice

Authors: Charmi Desai, Maria Ortega, Samantha Vilarino, Jonah Juergensmeyer, Karina Alvina

Acute stress causes neuronal loss leading to anxiogenic behaviors and hippocampal-dependent memory impairment. Exercise induces the release of Irisin from skeletal muscles which has neuroprotective effects. Previous studies have shown that Irisin reverses the effects of acute stress reducing anxiety-induced behaviors and memory impairment in male mice. Our purpose is to determine if exercise suppresses stress-induced anxiety behaviors and memory impairment in female mice as well. We used 8-week-old adult wildtype female mice divided into two groups: control and exercise. The exercise mice swam for 20 minutes daily for 21 days, while the control mice remained sedentary. After this swimming protocol was completed, each mouse underwent a combined open field (OF) and novel object recognition (NOR) test with two identical objects. After this, half of the mice were then randomly selected to undergo an acute restraint stress protocol for 3h (stress group) or to be returned to their home cages (control group). After the 3h stress or home cage, each mouse completed the second session of the combined OF/NOR test with one different object. Mouse behavior was videotaped in this session and then a video tracking analysis software was used for quantification. Our results showed that the exercised female mice do not lose weight over time; furthermore, sedentary mice that were stressed spent less time in the periphery of the OF in comparison to the sedentary mice that were not stressed. Exercise mice also showed increased amounts of rearing, which coupled with less time spent in the periphery suggests reduced anxiety in exercised mice. Therefore, our study suggests that exercise does have anxiolytic effect in female mice when subjected to acute stress.

Effects of Blocking Corticotrophin Releasing Hormone on Cognitive Performance in Aged Rats

Authors: Sanjana Ravi, Sabrina Zequeira, Zachary Krumm, Todd Golde, Barry Setlow, Jennifer Bizon

Ageing increases basal hypothalamic-pituitary-adrenal (HPA) axis function and stress responsiveness, thereby affecting the regulatory aspects of the hippocampus and prefrontal cortex. Acute stress activates the HPA axis, resulting in normal and healthy acute stress responses that are limited by negative feedback mechanisms. Corticotrophin releasing hormone (CRH) is released from the hypothalamus in response to a stressor, which indirectly causes the release of controlled amounts of corticosteroid (CORT) hormones from the adrenal glands. CORT keeps the body on high alert in order to respond to challenges or threats; however, in aged rats, stress-induced hippocampal atrophy occurs and can lead to disinhibition of the HPA axis, higher levels of CORT, and impaired cognitive functions. In terms of hippocampal-dependent spatial memory, greater stress-induced CORT levels are associated with worse spatial memory performance in aged rats. Surprisingly, however, larger stress-induced CORT responses are associated with better prefrontal cortex-dependent working memory in aged rats. There is little known about the cognitive effects of suppressing such CORT levels in aged rats. The goal of this study is to determine whether age-related cognitive decline can be attenuated by reducing activity within the HPA axis via a high-affinity monoclonal antibody to CRH, CTRND05. The antibody can block activation of the HPA axis as well as any CORT-independent effects that CRH has on the brain. Aged (20-month-old) male (n=10) and female (n=10) Fischer 344 rats were divided into antibody (CTRND05) and control (IgG1) injection groups. They were then tested in a delayed response working memory task within standard operant chambers, followed by a spatial memory water maze task. Rats received their designated injection (CTRND05 or control) on a weekly basis throughout testing in both tasks.

Examining the Interactions between Loneliness, Intolerance of Uncertainty, and Psychological Symptoms

Authors: Chiara Spina, Ryan McCarty, Tannaz MirHosseini, Danielle Cooke, Brittany Bailey, Andrea Guastello

Intro: Loneliness has been shown to increase psychological symptoms. With stay-at-home orders, mandatory quarantine, and social distancing, COVID-19 has exacerbated feelings of loneliness. Intolerance of uncertainty (IU) has also been connected to psychological symptoms, often linked to higher levels of stress, anxiety, and depression. There is little research done on the interaction of these three variables. Therefore, this study aims to answer the question of whether intolerance of uncertainty is a moderator for the relationship between loneliness and psychological symptoms.

Method: A survey was conducted through Amazon's Mechanical Turk in June 2020. Participants answered questionnaires assessing psychological distress, IU, loneliness, and demographic variables. The sample was made up of 134 adults from the United States, ages 18-71 (M = 35.6, SD = 12.0), with 58.2% identifying as male and 41.8% identifying as female. All individuals in this sample identified as not living with a romantic partner or a child in the household.

Results: In a regression predicting psychological symptoms, 54% of the variance was explained by the predictors of loneliness, IU, and the interaction between loneliness and IU, while controlling for age and gender. Both loneliness (beta=.40) and IU (beta=.36) were positive predictors of psychological distress, as was the interaction between loneliness and IU (beta=.16)

Discussion: Loneliness and IU were significant predictors of psychological distress, with intolerance of uncertainty acting as a moderator. Individuals who scored higher for IU also demonstrated a stronger relationship between loneliness and psychological distress. A possible explanation could be that individuals with higher levels of IU do not cope with the negative impacts of loneliness as well as those with lower levels of IU, thus exhibiting more psychological distress. However, more research should be done on these interactions, perhaps including individuals living with other people as controls.

Investigating Possible Chronic Lung Disease Treatments for Preterm Infants

Authors: Daylin Crespo Perez, Dr. Helen Jones

Human surfactant protein (SP-D) is normally produced in healthy lungs to combat infection and inflammation but it is deficient in the lungs of preterm infants. Currently, preterm infants who lack this protein go through surfactant replacement therapy, but this therapy does not contain SP-D and other surfactant components. This causes infants to become more prone to chronic lung disease later in life. In mice, it has been found that a recombinant fragment of human SP-D including a short collagen stalk(c+rfhSP-D) reduces inflammatory markers and stabilizes the number of healthy alveolar cells. We will continue this investigation in guinea pigs because they have similar development to humans throughout gestation and following birth. By comparing guinea pigs who are deficient in SP-D with no treatment and those treated with c+rfhSP-D we hope to discover the potential of rfhSP-D as a treatment for lung disease. The guinea pigs will be treated with c+rfhSP-D intranasally beginning at 3 weeks of age for 5 days a week. Using light and electron microscopy we will compare and observe the lung structures, alveolar type II cells, and the airspaces in the offspring of the guinea pigs lungs. With these results we hope to further the investigation of possible treatments for chronic lung disease in preterm infants.

Geographical predictors of breastfeeding efficacy and maternal-infant health outcomes

Authors: Hailey Ballard, Nisha Chachad, Thu Kim, Chu Hsiao, Ke Xu, Dominick Lemas

Breastfeeding provides numerous health benefits for mothers and their infants, including lowered risk of infant obesity, maternal and infant diabetes, infections, and more. Access to care during and following pregnancy is critical to perinatal health outcomes, but many women do not have access to convenient and adequate health resources. The goal of this project is to investigate geographical distance and travel time to healthcare facilities and their associations with breastfeeding efficacy and maternal-infant health outcomes. Participants were recruited as part of the Breastfeeding and Early Child Health (BEACH) Study, an NIH-funded 12-month longitudinal study that follows pregnant mothers and their infants through the first 12 months postpartum. Health outcome data collected included pre-pregnant BMI, weight change and antibiotic and medication use at 12-months postpartum, and breastfeeding opinions. Participants' addresses were geocoded using ArcGisPro, where 5-kilometer and 15-minute travel time buffer zones were created. Statistical analysis was performed using R version 4.0.5 via the Rstudio interface 1.3.1056. For maternal health, a significant p-value ($p=0.018$) indicated that maternal antibiotic use at 12-months postpartum was higher for those living outside the 5-km radius. This trend was also found with the mothers not living within 15 minutes of their infant's pediatrician ($p=0.010$). Additionally, most participants who met or exceeded their breastfeeding goals lived within 15 minutes of their delivery hospital ($p=0.029$). This trend was similar with mothers who lived within 15 minutes of their maternal care and their infant's pediatric care ($p=0.031$, $p=0.039$). Overall, breastfeeding confidence and efficacy was the most strongly impacted by healthcare access. Therefore, it is suggested that healthcare facilities serving patients outside either buffer zone should identify patients at-risk for lack of breastfeeding confidence and efficacy and target interventions specific to these mothers.

Immunological Response Analysis of Traumatic Brain Injury in a Rodent Model

Authors: C. Davidson, S.M. Smith, E. Garcia, S. Zequiera, S.A. Johnson, A. Hampton, J.F. Abisambra, S.N. Burke

Using closed cortical impact (CCI), we modeled traumatic brain injury (TBI) in male and female rats with a mechanical deformation in the parietal lobe. After injury or a sham surgery, rodents were tested on Paired Associates Learning (PAL) within touchscreen chambers, which is a cognitive task that was adapted from neuropsychological assessment in humans. PAL therefore is a clinically relevant behavioral test, but it has not yet been examined in a rodent model of TBI to evaluate post-injury cognitive decline. During this touchscreen exercise, the rodent must correctly associate an object and a location to receive a reward. We found significant impairment in the injured rodents' accuracy on the PAL touchscreen task in the five days following their injury compared to the sham group. Also, we noticed an increase in the average days required by the injured rodents to reach the PAL criterion (defined as two consecutive days of 90 trials at 80% accuracy or better), and an increased susceptibility to interference weeks after injury. Furthermore, we performed two immunohistochemistry stains on each of the subjects' brain tissue: glial fibrillary acid protein (GFAP) and ionized calcium-binding adapter molecule 1 (IBA1) to quantity astrocytes and activated microglia respectively. Our preliminary analysis of optical density suggests increased density of GFAP staining in the ipsilateral (relative to injury) thalamic nuclei of injured rodents compared to control. Additionally, while no differences in ipsilateral vs. contralateral staining were seen in either stain for sham rodents, both IBA1 and GFAP staining were significantly denser in the ipsilateral thalamic nuclei of injured rodents compared to contralateral.

Creating a Standard Operating Procedure for iDISCO Antibody Validation

Authors: E. L. Garcia, S. M. Smith, S. N. Burkei

Whole rodent brain clearing, combined with immunohistochemistry and state-of-to-art light sheet imaging techniques, have the potential to vastly increase our ability to link behavioral data to cellular measures of neural activation in pre-clinical models of neurodegeneration and other brain disorders. Traditionally, correlations between behavior and neural activation have been measured by labeling the expression of immediate-early genes (IEGs) in thin tissue sections with specific antibodies. IEGs are a class of genes that do not require de novo protein synthesis for transcription. As such, they represent the first genomic event to modify circuit dynamics in response to behavior. While this is a powerful tool for inferring neural-behavioral relationships, analyzing 2-D tissue sections limits the systems-level approach for interrogating large neural networks that must coordinate to support cognition. This limitation can be addressed using 3-D whole brain immunohistochemistry using Immunolabeling-Enabled Three-Dimensional Imaging of Solvent-Cleared Organs (iDISCO) and light sheet imaging of intact brains. Moving to the 3-D realm could give researchers a deeper understanding of system interactions and has the potential to be correlated to in vivo within subject fMRI data in a rodent model. There is a disparity, however, between standard operating procedures for labeling proteins in thin sections versus the iDISCO tissue protocol. This study aimed to create a standard operating procedure to pilot IEG labeling and antibody compatibility with the iDISCO protocol. First, we piloted IEG and secondary antibodies in 2-D to validate the efficacy of the antibodies. Second, we tested the antibody combination with a methanol incubation in order to validate the antibody compatibility with the iDISCO protocol. Lastly, we incorporated the validated antibody combinations with half and quarter hemisphere rodent brains. Defining a standardized operating procedure in iDISCO antibody selection will optimize researcher's abilities to analyze intact rodent brains and broaden the utilization of antibodies in 3-D.

Understanding Auditory Categorization Functioning in People with Hoarding Disorder

Authors: Christina I Lagas, Carol A Mathews

Hoarding Disorder (HD) is a psychiatric condition that is characterized by excessive material possession caused by an inability to rid of items and/or a presence of considerable distress when discarding them. Through the use of neuropsychological tests, researchers can analyze how individuals with HD function cognitively in comparison to controls. A previous research study found that relative to national norms, HD participants demonstrated significant cognitive impairment in visual categorization, tested using the Delis-Kaplan Executive Function System (D-KEFS) Card Sorting Test (Mackin et al., 2010). Our current study is aimed at seeing if these impairments extend to auditory categorization, the ability to categorize items on a verbal-based task, through the use of the Controlled Oral Word Association Test (COWAT). The COWAT prompts participants to name as many words as they can think of within a certain category as fast as they can within a sixty-second time period. By comparing performance in the COWAT between HD participants and age-matched controls, we can hypothesize that the people with HD will perform significantly lower on the test than the controls. The COWAT is currently being administered to participants within a larger neuropsychological battery through a video communication program called Zoom. Assessing cognitive abilities can aid in future diagnoses and treatment for HD. For example, specific cognitive impairment can indicate brain areas that may be responsible for discrepancies and skill remediation may be incorporated into primary therapy.

Novel Bioinformatics Methods for Comparison of lncRNAs Dysregulated by KSHV to Cancer-Associated lncRNAs

Authors: Kavitha Vudatha, Daniel Stribling, Rolf Renne

Kaposi's Sarcoma-Associated Herpesvirus (KSHV) infects cells that line blood and lymphatic vessels and is the etiological cause of the cancer: Kaposi's Sarcoma (KS). KSHV causes host-cell immortalization via several cellular manipulation mechanisms, including alteration of gene expression, glucose metabolism, and cellular growth rate. Recent studies have shown that long non-coding RNAs (lncRNAs) play a vital role in KSHV's oncogenic potential. The purpose of this study is to better understand the role of KSHV-associated lncRNA dysregulation in genesis of Kaposi's Sarcoma. The study aims to compare lncRNAs previously identified as dysregulated by KSHV infection to lncRNAs recently-discovered to be associated with cancer. This analysis will be performed by developing a new bioinformatics technique to update and synchronize gene annotations from multiple lncRNA databases to allow comparison of previous and recent lncRNA datasets. For this study, Bowtie2, a bioinformatics tool for sequence alignment, and the Nextflow bioinformatics pipeline programming language will be utilized to annotate experimental sequence data using lncRNA roles from up-to-date repositories of sequence function information. The final product will be a new database providing identifiers and annotations for each lncRNA associated with KSHV. These KSHV-linked lncRNA will be compared to lncRNAs from other cancer research datasets that are demonstrated to have pro-cancer effect to better understand the role of lncRNAs in cancer development. This study will enhance understanding of the mechanisms of KSHV infection and oncogenesis. In addition, the resulting pipeline will be released as an open-source tool to allow researchers to create updated annotations for previous lncRNA datasets and aid in discovery of cancer-related lncRNA function.

Uncharacterized DNA Suppresses TDP-43-Mediated Toxicity

Authors: Joshua Lopez-Scarim, Lorena de Mena, Vanlalrichanni Varte, Diego E. Rincon-Limas

Background: Abnormal distribution, modification, and aggregation of TAR DNA-binding protein 43 (TDP-43) are the pathological hallmarks of a group of progressive neurodegenerative diseases which includes amyotrophic lateral sclerosis (ALS). While working to elucidate the mechanisms associated with TDP-43 pathogenesis in our recent large-scale RNAi screen, we discovered potent suppression of TDP-43-mediated neurotoxicity in our TDP-43 overexpression (OE) transgenic fly models when a random insertion of uncharacterized DNA (UD) was co-present.
Methods: We capitalized on the UAS-Gal4 expression system in Drosophila melanogaster to examine the biomolecular mechanisms by which UD alleviates TDP-43WT and TDP-43M337V toxicity in the fly eye. To this end, we used immunohistochemistry, qRT-PCR and western blot. The neuroprotective role of UD was also assessed in the eye of another fly model of ALS expressing mutant FUS, a different ALS-linked protein with similar functions to TDP-43. Sanger sequencing and bioinformatic analysis were performed to better characterize UD.
Results: Presence of UD suppresses TDP-43WT and TDP-43M337V toxicity in fly eyes; however, it does not alter FUS-induced neurotoxicity. In addition, UD presence appears to reduce the levels of pathologically cleaved TDP-43 while maintaining the full-length and phospho-TDP-43 unaltered. Sanger sequencing showed that UD sequence is of bacterial origin. Bioinformatic analysis revealed several theoretical open reading frames.
Conclusion: Here we describe uncharacterized DNA whose presence alleviates TDP-43 related toxicity in the Drosophila eye. We show that UD presence does not alter total TDP-43 protein levels and that rescue is not indiscriminate. It is possible that UD may encode neuroprotective proteins or that its random insertion disrupted an endogenous gene relevant to TDP-43 toxicity. Future work to determine the mechanism of UD-mediated protection will clarify its role as a modifier to TDP-43-related toxicity.

Assessing the Clinical Changes of Bronchiolitis After Easing COVID-19 Precautions

Authors: Nabil Chowdhury, Rohan Kommireddy, Jose Cardenas, Charlene Pringle

This study is investigating the changes that have potentially occurred for subjects who were admitted to the PICU at UF Health Shands Children's Hospital after the community COVID-19 restrictions were eased. Specifically, the study is assessing whether these subjects are having an increased length of stay in the PICU, increased hospital stay, increased viral co-infections, and/or more pronounced severity of illness compared to a similar pre-pandemic time frame. The primary question of the study is "Have clinical characteristics of bronchiolitis changed post-pandemic?" In order to conduct this study, a retrospective chart review of patients that were admitted to the PICU at UF Health Shands Children's Hospital is being conducted using ICD-10 codes encompassing bronchiolitis from December 9, 2019 through February 29, 2020 (12 weeks) and compared with same from March 29, 2021 through June 19, 2021 (12 weeks). The patient cases are being compared through a review comparing PICU length of stay, hospital length of stay, maximum respiratory support required, number and type of viral co-infections detected, and pSOFA/PELOD-2 score (severity of illness scoring system). Inclusion criteria are children under 18 years of age, admitted to the PICU at UF Health Shands Children's Hospital between December 9, 2019 through February 29, 2020 and March 29, 2021 through June 19, 2021 with a diagnosis of RSV bronchiolitis. There are no specific exclusion criteria for our study. To conduct proper data analysis, eligible patients enrolled into the study will be enrolled into the pre-pandemic cohort (admission date 12/9/19-2/29/20) or the post-pandemic cohort (3/29/21-6/19/21).

Loss of Progranulin Results in Increased Pan-Cathepsin Activity

Authors: Abigail Anderson, Malú Tansey

Introduction: Mutations in the progranulin encoding gene, GRN, cause familial frontotemporal dementia (FTD) and neuronal ceroid lipofuscinosis and is also implicated in Parkinson's disease. These mutations result in decreased PGRN expression. PGRN is highly expressed in peripheral immune cells and microglia and regulates cell growth, survival, repair and inflammation. As well, PGRN is implicated in regulating lysosome function, however, the exact role of PGRN in lysosomal function and how this contributes to inflammation and degeneration is not entirely understood. To better understand the role of PGRN in regulating lysosome function, I examined how loss of GRN impacts lysosomal and cathepsin activity.
Methods: Using mouse embryonic fibroblasts (MEFs), I performed immunocytochemistry and immunoblotting assays to analyze fluorescent signal from LAMP1 (lysosomal marker) and BMV109 (marker for cathepsin activity).
Results: GRN-/-MEFs exhibit increased expression of pan-cathepsin activity relative to GRN+/+ MEFs, and significantly impacts expression of LAMP1. Conclusion: The significant increase in pan-cathepsin activity in the GRN-/-MEFs confirms that PGRN loss does alter cathepsin expression, which may be a result of compensatory mechanisms happening within the cell. Further investigations will including assessing LAMP1 and BMV109 expression in microglia from GRN-/- mice, in the hopes to understand the role of PGRN in lysosomal function in immune cells of the central nervous system and the diseases in which it is implicated.

A collaborative approach to numerology in base 22

Authors: Michelle Rincones-Rodriguez, Connie Walker

The purpose of this presentation is to show how a collaborative evaluation was conducted to investigate the relationship between Numerology in Base 22 and personal characteristics of respondents. Numerology in Base 22 is a methodology that uses 22 numbers to show the psychological, behavioral, and evolutionary profile of individuals. The evaluation used a questionnaire and interviews to collect information from community members. Specifically, this poster will illustrate the collaborative design and lessons learned from the evaluation that are being used by the client to advance the knowledge of Numerology in Base 22 as an innovative toolkit in psychology, as well as other related fields.

Newly identified off-target effects of a compound designed for neuronal manipulation

Authors: Graylin M. Skates, Sang Eun Ryu, Daniel W. Wesson

Chemogenetic tools, specifically designer receptors exclusively activated by designer drugs (DREADDs), can modulate cellular pathways through the introduction of ligands. Neuroscientists use chemogenetic manipulation to selectively control neural pathways to understand their consequences on behavior. The original DREADD agonist clozapine-N-oxide (CNO) was initially deemed a suitable ligand, however, we have since learned it has many off-target effects. This has prompted the identification of novel ligands, one of which is Compound 21 (C21). The high potency and affinity for DREADD receptors by C21 make it a suitable drug for DREADD manipulation, yet reports are emerging that C21 also has off-target effects upon some behaviors/brain regions. In this study, we sought to test whether C21 in the absence of DREADD receptors influences learning and memory behaviors. We surgically implanted cannulae into the basolateral amygdala, a collection of brain nuclei important in learning and memory, to inject either C21 or saline into C57BL6J mice, and then used a Pavlovian olfactory fear learning paradigm to test for potential effects of C21. Our results show that both groups of mice had similar behavior throughout all trials during the training day, indicating that C21 has no off-target effects during the learning process. However, on the testing day, the mice treated with C21 demonstrated a significantly higher amount of freezing behavior with lower respiration, indicating that C21 has an off-target effect upon memory retrieval. Therefore, while C21 is an effective agonist, its off-target effects in amygdala-associated behavior may lead it to be a poor choice for studies investigating amygdala circuitry and possibly learning/memory in general.

The Tubular Striatum and the Effects of Cocaine on Reward Behavior in Mice

Authors: Jamie T. Wilson, Katherine N. Wright, Anamaria Cotelo-Larrea, Daniel W. Wesson

The Tubular Striatum (TuS, also known as the olfactory tubercle) is a brain structure that mediates the reinforcing effects of cocaine and is robustly recruited during reward-taking and seeking. It is comprised primarily of medium spiny neurons (MSNs) that can be classified based on dopamine (DA) receptor expression. Neurons with DA D1 receptors (D1-MSNs) have a 1-2 order of magnitude lower affinity for DA than D2 receptor-containing neurons (D2-MSNs). While in other regions these cell types play roughly opposing roles in reward-related behavior, the individual functional roles of these populations in the TuS are unclear. To understand the role of D1 and D2-MSNs in the TuS during cocaine reward administration, we implemented Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) to selectively manipulate TuS D1-MSNs or D2-MSNs in transgenic D1-Cre and D2-Cre mice. We delivered a Cre-dependent AAV viral vector into the TuS to induce expression of the hM4Di receptor followed by systemic administration of the ligand JHU37160 (J60) to selectively decrease activity of neurons expressing hM4Di. We administered J60 before behavioral testing to reduce activity of D1-MSNs and D2-MSNs during two behavioral assays: locomotor sensitization which assesses the locomotor-activating effects of cocaine, and conditioned place preference (CPP) which assesses the associative rewarding effects of cocaine. Further, to determine if J60 exerts off-target effects, we separately tested a cohort of mice that did not receive hM4Di, called “AAV-naïve”. Our results indicate that while J60 had no effects on sensitization or CPP in our AAV-naïve group, inhibition of D1-MSNs or D2-MSNs produced differing behavioral responses. Future work will focus on replicating these results and examining TuS cell type-specific contributions to cocaine-seeking within an operant self-administration context.

Associations between COVID-19-related stressors, psychological distress, and quality of life

Authors: Rachel Walton, Ryan McCarty, Seth Downing, Andrea Guastello, Joseph McNamara

COVID-19 has negatively impacted quality of life (QoL) and increased depressive symptoms in adults. While the stress associated with COVID-19 has been multifaceted (i.e. financial strain, getting COVID, social life disruption, loved ones getting COVID, economy strain, strain on healthcare systems), little is known about which COVID-19-related concerns impact psychological distress and QoL the most. This study examined whether COVID-19-related stressors associate with and/or predict psychological symptoms (depression, anxiety, and stress) and/or QoL. This study is a secondary data analysis of data collected through Amazon's Mechanical Turk (MTurk) investigating the psychosocial impact of COVID-19. Data was collected from adults across the U.S. in May 2020. This study analyzed the questions that discussed pandemic-related concerns, QoL (Q-LESQ-SF), and psychological symptoms (DASS-21). Analyses consisted of correlational analyses and hierarchical regressions. The final sample included 333 participants (M=40.60; SD=13.98 years). All the stress dimensions were positively correlated with psychological symptoms. Four of the stress dimensions were negatively associated with QoL. The regression analysis significantly predicted psychological symptoms (R2=.225, F[9,323]=10.434, p<.001) after controlling for age, gender, and income. Concerns of financial strain (t=3.469, p=.001, beta=.205) and getting COVID-19 (t=2.105, p=.036, beta=.147) were significant individual predictors. The regression analysis predicting QoL explained 17.0% of the variance in QoL after controlling for demographic variables. Financial strain (t=-3.588, p<.001, beta=-.219) emerged as a significant predictor. Concern of financial strain may be the biggest predictor of QoL and psychological symptoms due to data collection occurring in the context of a high unemployment rate and mandated stay-at-home orders. Future research should assess associations between concern variables, psychological symptoms, and QoL at different stages of the pandemic to examine if different predictors emerge.

Autoantibody Screening: A Pathway to Type 1 Diabetes Prevention

Authors: Chelsea Salmon, Robyn Louis, Jennifer Hosford, MPH, and Michael Haller, MD

In 2000, the Surgeon General's Report constituted Type 1 Diabetes (T1D) as a national heath objective for the United States – TrialNet is a byproduct of that initiative. With established sites nationwide, TrialNet clinical studies exist to screen, monitor, and connect participants currently at risk for developing Type 1 Diabetes with clinical trials designed to prevent the onset of clinical disease. Although T1D is known to have a genetic component (i.e. an identical twin has a 50% chance of getting T1D if the other twin is diagnosed), its particular immunological pathways are not fully understood. Here at the University of Florida, eligible relatives of patients with T1D are screened through TrialNet's Pathway to Prevention (TN01) study in order to identify family members at higher risk of disease onset. More specifically, participants are tested for certain biological markers (autoantibodies) that indicate progression of the autoimmune response. The JDRF, ADA and Endocrine Society now classify having two or more diabetes-related autoantibodies as early stage T1D. The screening process has been refined to be flexible and accessible for the general public. Participants between ages 2.5 and 45 years old are given the option to test at-home with a capillary draw kit or in person at their local laboratory. Bloodwork is processed through the TrialNet core lab and results arrive back to the university within 6-12 weeks. If the participant tests positive for one or more autoantibodies, they qualify for annual monitoring and targeted prevention trials within the TrialNet framework. Our mission at the University of Florida Diabetes Research Group, is to spread awareness by connecting families with a team that cares not only for the T1D patient, but also their relatives at risk.

Impacts of home cage tunnels on the behavior of mice with cranial implants

Authors: Marissa G. Castronovo, Daniel W. Wesson

Laboratory animal research must promote the humane treatment and welfare of research animals while at the same time allowing for scientific discoveries. Many strategies are used to promote animal welfare, including cage enrichment. One type of enrichment involves the placement of plastic tunnels in home cages which are thought to reduce stress and anxiety associated with handling of the mice. Importantly though, in some cases, mice may have surgical implants extending beyond their body, which could make inclusion of tunnels in the home cages problematic for their welfare. This study aimed to determine if the addition of a home cage tunnel impacted the behavior of mice with differently sized cranial implants, common to neuroscience research. The mice that were included in this study were both adult male and female and either had no implant yet underwent a cranial surgery (sham), an indwelling cannula cranial implant commonly used for drug delivery, or a ferrule cranial implant like that used for optogenetics or fiber photometry. All mice in this study were operated upon, and were part of other ongoing studies. Plastic tunnels were placed in the home cages of mice and the number of interactions with the tunnel were recorded over a 30-minute period. We found that sham mice interacted significantly more with the tunnels than mice with either cannulae ($p<.001$) and ferrule implants ($p<.0001$). On average sham mice participated more with the tunnel by walking through or over it compared to mice with either type of implant. While we have yet to test if tunnels are effective at reducing stress and anxiety in implanted mice, our results indicate that mice with implants likely benefit very little from their inclusion. The results raise an important question as to whether or not tunnels should be routinely used for mice with cranial implants.

Ferroptosis: A New Player in the Pathogenesis of Lupus Nephritis

Authors: Dhruv Desai, Annanya Agarwal, Sadat Kasem, Yogesh Scindia

Background: Iron accumulates in the kidneys of lupus nephritis patients and murine models of nephritis. Ferroptosis is an iron dependent, inflammatory form of cell death, but its occurrence in lupus nephritis (LN) has not yet been investigated.
Experiment: Class IV LN and control patients' biopsies were stained for markers of ferroptosis. Kidneys of female, non-nephritic and nephritic MRL/lpr mice were analyzed for markers of oxidative stress and ferroptosis. Proximal tubular cells were treated with human LN serum with or without Liporxstatin-2, an ferroptosis inhibitor.
Results: Compared to controls, kidneys of nephritic patients expressed higher levels of ACSL4 and 4HNE, the ferroptosis core proteins. The kidneys of nephritic MRL/lpr mice significantly upregulated the gene expression of Nqo1 and Hmox1 (oxidative stress), as well as Aifm2, Acsl4, and Gpx1 (ferroptosis). The nephritic kidneys also expressed significantly higher protein levels of ACSL4 (ferroptosis inducer) and lower level of GPX4 (ferroptosis inhibitor). Lower GPX4 levels were associated with decreased expression of SCL7a11, the cystine/glutamate antiporter. Proximal tubular cells treated with human LN serum with Liproxstatin-2 had reduced gene expression of ACSL4 and AIFM2.
Conclusion: Our data identify ferroptosis as a contributor to the pathogenesis of LN and suggest that ferroptosis inhibitors like Liproxstatin-2 may alleviate disease severity.

Impact of the IFIH1 Genetic Risk Variant in Type 1 Diabetes Pathogenesis

Authors: Aymee Rodriguez Tamayo, Edward Butfiloski, Clayton E. Mathews

Type 1 diabetes (T1D) is an autoimmune disease where the insulin producing pancreatic beta-(β)-cells are selectively destroyed. β-cell loss results in insulin insufficiency and persistent hyperglycemia requiring daily exogenous insulin administration. This disease results from a complex combination of genetic variants and environmental triggers (e.g. Viruses). We posit that genes involved in viral sensing play important roles in pathogenesis. A non-synonymous single-nucleotide-polymorphism (SNP) in Interferon-Induced With Helicase C Domain 1 (IFIH1) is an intracellular viral sensor that has been associated, through Genome Wide Association Studies (GWAS), with T1D. This SNP changes an alanine to threonine in the primary amino acid sequence. Our goal is to define the mechanisms whereby this risk variant of IFIH1 impacts T1D. To accomplish this goal, we have employed CRISPR-Cas9 technology to edit the T1D-linked SNP in IFIH1 using a human β-cell line. β-cells were edited to encode either the T1D-risk variant (IFIH1946T), the common allele (IFIH1946A), or to delete IFIH1 (IFIH1-/-). These cells were subjected to exogenous viral nucleic-acid-mimic at increasing concentrations and cellular responses determined. Endpoints included secretion of Type 1 interferons (T1-IFN) or Type 3 Interferons (T3-IFN) and changes in cell surface immune proteins (i.e. Human Leukocyte Antigens). We observed that IFIH1946T was associated with elevated basal levels of T1-IFN and increased HLA on the cell surface compared to cells with IFIH1946A or IFIH1-/-. Further, viral mimic treatment of these three cell lines resulted in rapid production of T1-IFN by IFIH1946T compared to the other cells, however T3-IFN was not induced in any of the cells. We conclude that the IFIH1 risk variant contributes to T1D by inappropriate production of T1-IFN leading to a hyperinflammatory environment that predisposes β-cells to autoimmune destruction.

Organization of Prefrontal Projections to the Tubular Striatum

Authors: Waseh Khan, Estelle E. in ‘t Zandt, Hillary Cansler, Daniel Wesson

Consciously or subconsciously, the brain is constantly filtering through the many stimuli that arise in our surroundings. Selective attention allows us to focus on and process only pertinent information. For example, a rat foraging for food selectively attends to the smell of its food while dismissing the auditory and visual cues bombarding its senses. Although the brain circuits underlying olfactory attention are unclear, the medial prefrontal cortex (mPFC), critical for attention, and orbitofrontal cortex (OFC), essential for polysensory processing, are both compelling candidates. The mPFC can be further divided into subregions including the prelimbic cortex (PrL), involved in selective attention, and the infralimbic cortex (IL), involved in behavioral flexibility, but their integration with the olfactory system is not well understood. Previous studies have noted connectivity between the prefrontal cortext and tubular straitum. The tubular striatum (TuS), commonly referred to as the olfactory tubercle, is an olfactory cortex implicated in complex behaviors, and its activity is particularly modulated when attending to, versus ignoring, odors. To identify prefrontal brain structures that might influence selective attention to odors, we injected a retrograde adeno-associated virus (AAV) encoding green fluorescent protein (GFP) into the TuS (n=8 rats). We quantified the GFP-labeled neurons within prefrontal cortex subregions to determine which most densely project to the TuS. We found that the PrL, IL, and medial orbital regions of the PFC contained the most labeled neurons. Within the PrL and IL, layer 5, a primary output layer of the neocortex, contained the most fluorescent neurons. Our results show that the densest inputs to the TuS arise from the PrL and IL, suggesting that a major neural pathway for odor attention is from the mPFC to the TuS.

Should Carbon Monoxide Donors Be Considered a Therapy for NeuroICU Patients?

Authors: Shruti Patel, Hannah Pamplin, Alexandra Mazur, Madison Fangman, Rani Ashouri, and Sylvain Doré

I**ntroduction:** Acute brain injuries are a leading cause of medical related deaths and often result in complex outcomes that are difficult to treat. This paper outlines the use of carbon monoxide (CO) as a possible therapy for various acute brain injuries. While CO is commonly thought to be toxic, when administered in low doses, it can act therapeutically and is shown to be neuroprotective after the onset of acute brain damage.
Trial Design: This paper is a comprehensive review of the existing pre-clinical literature regarding the use of carbon monoxide (CO) as a potential cytoprotective treatment for acute brain injury.
Methods: Studies were examined from a variety of databases (PubMed, Embase, Web of Science, etc.) and details were collected in an excel spreadsheet used to aid the writing process. Topics and search words included: “carbon monoxide”, “ischemic stroke”, “Neonatal Hypoxic-Ischemic Encephalopathy (HIE)”, “Subarachnoid Hemorrhage (SAH)”, and “Traumatic Brain Injury (TBI)”. Data collection occurred over the course of approximately three months. Only articles studying acute brain injuries, rather than long-term neurological diseases, were included. Papers considered were limited to pre-clinical animal studies exclusively.
Results: Existing literature forms a consensus that CO is a neuroprotective agent against acute brain injury. CO has a vasodilatory effect as it binds to heme. CO also has an anti-inflammatory effect at low doses, upregulating the Nrf2 pathway by increasing Nrf2 translocation, thus increasing expression of other anti-inflammatory proteins such as HO-1, Glutathione Reductase, and NADPH Quinone Dehydrogenase-1. Administered after the onset of stroke symptoms, CO can act against apoptosis and thrombosis while increasing cerebral angiogenesis. After stroke, high amounts of heme released after brain injury are degraded by heme oxygenase (HO-1) associated with CO which slows glucose oxidation and protects against the effects of ischemia. Ischemic stroke outcomes improve after low-dose administration of CORM-3 due to its anti-inflammatory nature, and mitochondrial biogenesis also improves with the administration of CORM-2. CO plays a neuroprotective role in neonatal hypoxic ischemic encephalopathy by regulating apoptosis. CO also protects against the effects of subarachnoid hemorrhage by reducing vasospasm and neuronal apoptosis and regulating microglial erythrophagocytosis via CD36 expression which aids in the clearance of RBC. In traumatic brain injury (TBI), low doses of CO lower apoptosis and improve blood flow in the amygdala and facilitate neurogenesis, improving neurological and behavioral consequences after TBI.
Conclusions: CO delivery via CORM is a promising therapy against the poor outcomes of brain damage, neuronal death, and neurological deficits following brain injury. While low doses have been ideal in pre-clinical settings, targeting the ideal dose is a limitation in clinical practice, as doses too low may be ineffective while doses too high may be toxic. However, it must be noted that CO does not show toxicity at therapeutic doses and is safe to administer in human clinical trials. Further research is required to apply this treatment to humans to aid in recovery following brain damage events. Funding: This work was supported in part by grants from the Brain Aneurysm Foundation, the American Heart Association, and the National Institutes of Health (R21NS095166, NS103036, NS110008), and the Department of Defense (AZ180127).

An analysis of social media platforms to identify COVID-19 vaccine hesitant groups

Authors: Gabriela Garcia1, Lorna Bittencourt, MS1, Vinita Sharma, MPH, PhD1, Linda Cottler PhD, Catalina Lopez-Quintero, MD, MPH, PhD1

Results: Seven groups were identified: 1) Anti- Government group (i.e., individuals who disagree with the government instructions); 2) Freedom group (i.e., individuals who believe that vaccine policies sacrifice individual liberties to an extent that will not be restored); 3) Hierarchical believers (individuals who tend to give more importance to the opinion of non-scientific leaders, such as priests, local officials, and political leaders); 4) Misconstrued Science group (i.e., misinformed individuals); 5) Adverse effects group (i.e., individuals who fear adverse effects in the long term); 6) Skeptics (i.e., individuals who believe that covid is a hoax); and 7) Health Compensatory Beliefs group (i.e., individuals who believe a healthy lifestyle is enough to be protected).

Modulating Intramuscular Fat Infiltration by Small Molecules

Authors: Lylybell Zhou, Alessandra Norris, and Daniel Kopinke

Skeletal muscle has a remarkable ability to regenerate upon injury. However, in age and diseases such as muscular dystrophies and diabetes, muscle tissue is replaced by fibrotic scar and fat tissue in a process called fatty fibrosis. Our lab has shown that the Hedgehog (Hh) signaling pathway is key in regulating intramuscular fat infiltration after injury, offering a potential therapeutic target in preventing fatty fibrosis. However, the cellular and molecular mechanisms by which Hh controls fatty fibrosis is unclear. In this project, we use small molecules as a novel approach for modulating intramuscular fat infiltration after injury. qRT-PCR analysis of the injured muscle for the expression of key Hh target gene Gli1 confirmed that a Smoothened agonist (SAG) successfully activates the Hh pathway, while a Smoothened antagonist, vismodegib, inactivates the pathway. Excitingly, by modulating the Hh pathway, SAG and vismodegib decreased and increased fat infiltration, respectively. SAG surprisingly showed an increase in fibrosis and hindered early muscle regeneration, while there was no difference with vismodegib. Future experiments will focus on using small molecules to modulate the Hh pathway at different time points after injury, as well as looking to therapeutic applications in treating fatty fibrosis in conditions such as Duchenne muscular dystrophy. Together, the results of my project will help uncover

Ryr1 is Associated with Heart Failure Progression in a Preclinical Model and with Mortality in a Patient Cohort

Authors: Leonardo Guerra, Christelle Lteif, Julio D. Duarte

Background: Heart failure (HF) is a highly prevalent disease affecting roughly 6 million Americans. Our previous transcriptome-wide analysis showed that Ryr1 was upregulated in HF patients with severe pulmonary hypertension (PH). Currently, the role of Ryr1 in HFpEF is not known; however, it has been shown to modulate calcium signaling cascades, which may play a role in the pathophysiology of HF. Therefore, we aimed to further characterize the role of Ryr1 in HF progression and mortality.

Method: A murine model of PH-HF was used. Ryr1 gene expression levels were measured in lung and heart tissue and compared between PH-HF mice and control mice. To further understand the role of Ryr1 in patients with HF, a survival analysis was performed on a previously studied polymorphism rs2960321 (in Ryr1) using a Cox proportional hazard regression model adjusting for clinical variables associated with differential survival in HF patients.

Result: For our pre-clinical model, we found significantly higher expression of Ryr1 in heart tissues of HF mice compared with control mice (FC=1.92, P=0.01, N=8-10/group). For clinical outcomes, we found a significant association with rs2960321, with addition of each variant allele associated with decreased risk of death HR=0.66 (CI:0.44–0.97), P=0.033; (N=327).

Conclusion: Ryr1 had higher expression in hearts of HFpEF mice, and a putatively functional polymorphism in Ryr1 was associated with decreased mortality in HF patients. Further understanding the role of Ryr1 may help in identifying factors which may contribute to the severity of HFpEF and offer a potential new therapeutic target.

In Vitro Pharmacological Characterization of Novel Fentanyl Analogs

Authors: Maria P. Guerrero Calvache, Samuel Obeng, Victoria LC Pallares, Justin A Helmes, David A Henderson, Marco Mottinelli, Christopher R. McCurdy, Lance R. McMahon, and Takato Hiranita

Fentanyl analogs appear to have contributed to the rapidly increasing opioid overdose cases. Here, the in vitro pharmacological effects of fentanyl were compared to those of six analogs of fentanyl [acryl fentanyl, β-hydroxythio fentanyl, cyclohexyl fentanyl, 4-fluoroisobutyrfentanyl (FIBF), furanyl fentanyl, and tetrahydrofuranyl fentanyl]. Using cell membranes expressing human opioid receptors, the affinity and efficacy were determined by radioligand receptor binding and [35S]GTPγS functional assays, respectively. The affinity of fentanyl at mu-opioid receptor (MOR, [3H]DAMGO) was 7.96 nM. Affinities of furanyl and acryl fentanyl at MOR were 3.8- and 1.6-fold higher than that of fentanyl, respectively. Among the six analogs of fentanyl tested, affinity of cyclohexyl fentanyl was the lowest at MOR (Ki values 1,030 nM). The Emax value of fentanyl at MOR (%DAMGO) was 107%. All of the fentanyl analogs except furanyl (69.8%) and cyclohexyl (13.3%) fentanyl were full agonists at MOR (87.0% to 105%). With the exception of cyclohexyl fentanyl, these results suggest that the relatively high affinities and efficacies of the fentanyl analogs at MOR could contribute to opioid overdoses.

Novel Detection Methods of ATP-Grasp Enzymes

Authors: Alivia Ishee, Garret Rubin, Yousong Ding

Ribosomally synthesized post-translationally modified peptides (RiPPs) are a diverse class of natural products with medicinal properties, e.g., anti-cancer and antimicrobial activities. graspetides are a family of RiPPs in which a precursor peptide is modified by an ATP-grasp enzyme, which use ATP hydrolysis to catalyze ester/amide linkages, generating unique cyclized peptide scaffolds which have yet to be reproduced synthetically. Microviridin J is a graspetide RiPP which demonstrates nanomolar inhibition against serine proteases; these enzymes are involved in countless biological pathways including viral pathogenesis, antimicrobial resistance, and a multitude of functions in human health and disease. While these natural products have great biomedical and biotechnological potential, lack of effective genome-mining methods have hindered their full exploitation. The development of powerful new genome mining technologies has eased the search for promising natural products, however graspetides remain largely unexplored through these methods due to a wide variety of peptide substrates and low level of primary sequence similarity of the modifying ATP-grasp enzymes. To explore methods of detecting graspetides, a program was developed to scan Open Reading Frame (ORF) databases, comparing overall hydrophobic sequence alignment as an estimate for similar tertiary structure with known ATP-grasp enzymes in both primary and secondary metabolism pathways, as well as alignment of key active-site residues to label an ORF as a probable ATP-grasp enzyme. This program will be supplemented with natural language deep learning to further enhance ATP-grasp detection power, then coupled with a simple search for genetically local, probable graspetides to rapidly and accurately locate these important medicinal compounds.

Socio-demographic factors associated to being asked about alcohol use behaviors by primary care physician among individuals diagnosed with an alcohol use disorder

Authors: Amir Zafaranian, Vinita Sharma, Lorna Bittencourt, Catalina Lopez-Quintero

Objective: To explore socio-demographic differences in rates of being asked on Alcohol Use Behaviors (AUB) by a primary care physician (PCP) among a nationally representative sample of individuals diagnosed with Alcohol Use Disorders (AUD) in the year prior to the survey.

Methods: We analyzed data from the 2015- 2019 National Survey on Drug Use and Health. The analytic sample included adults (18+ years old) who had a past 12-month diagnosis of a DSM-IV or DSM-5 AUD and visited a PCP in the past 12-months (n=16,167). Adjusted logistic regression models assessed the relationship between self-reported socio-demographic factors and having been asked about AUB.

Results: More than half of the participants self-identifying as male (63.3%), non-Hispanic White (66.9%), had health insurance (86.2%), and had high income (65.3%). Residence in large (aOR=1.28, 95% CI= 1.10, 1.47) or small metropolitan (aOR=1.27, 95% CI= 1.01, 1.35) areas, and having insurance (aOR=2.06, 95% CI= 1.83, 2.31) were factors associated with being more likely to be asked about AUB. Being male (aOR=0.73, 95%CI=0.65, 0.81), a racial-ethnic minority, being 18-23 years of age (aOR=0.82, 95% CI= 0.70, 0.97) and having low (aOR=0.80, 95% CI= 0.72, 0.89) or middle income (aOR=0.80, 95% CI= 0.71, 0.89) were factors associated with being less likely to be asked about AUB.

Conclusions: Increasing physician's awareness on the need to ask their patients about their drinking behaviors, particularly those serving racial-ethnic minorities, might help provide appropriate referral and treatment and reduce the individual and societal burden of alcohol.

Keywords: alcohol use disorder, socio-demographic differences, disparities, advice, primary care

What lessons can we learn from effective influenza vaccine interventions among pregnant persons that apply to COVID-19? A narrative overview of Influenza vaccine trials.

Authors: Gabriela Diaz, Lorna Bittencourt MS, Sonja A Rasmussen, M.D., M.S., Vinita Sharma, MPH, Catalina Lopez-Quintero, MD, MPH, PhD

Background: According to the CDC, only about a third of pregnant persons in the United States are vaccinated against COVID-19. This narrative overview aims to analyze initiatives that have been successful in increasing influenza vaccination rates in pregnant persons, in the hopes that they can prove useful in increasing COVID-19 vaccine uptake.

Methods: Using a systematic search of three electronic, we identified 12 randomized controlled trials of interventions for increasing Influenza vaccine uptake among pregnant persons. Effectiveness of interventions was assessed by comparing vaccination rates across interventions.

Results: The largest change in vaccination rates was found when pregnant persons received a pamphlet and a benefit statement compared to usual care (39.2% increase). Compared to standard care, there was a 34% increase when a standing order was implemented, allowing nurses to vaccinate patients without a clinician or clinician order present; a 17.5% increase when patients were given an educational pamphlet and education from their obstetrician; a 12% increase when a physician education program was combined with heightened accessibility to the vaccine; or an 11.1% increase when participants received a briefing by a nurse. Pregnant persons who received websites with interactive components (21% increase) or website information alone (19% increase), showed higher vaccination rates than those in the usual care group. Minimal or no effect was observed when educational videos addressing vaccination health beliefs were shown, or when text messages were sent to participants.

Conclusions: Although most interventions showed some improvement in vaccination uptake, influenza vaccination rates remain suboptimal. This overview highlights the need of making COVID-19 vaccines as accessible as possible, this yielded a significant change. The source of education was also important; patients were more receptive to messages provided by health care personnel than to text messages.

Are US parents talking with their adolescent children about drugs?

Authors: Aditi Thorat, Vinita Sharma, Lorna Bittencourt, Alyssa M Falise, Catalina Lopez-Quintero

Background: Adolescent substance use is recognized as a growing public health issue, and parents can influence the adolescent's likelihood to engage in drug use behaviors. These analyses estimated the prevalence and correlates of having talked with their parents about the dangers of alcohol, tobacco, and other drugs.

Methods: Data from the 2017-2019 National Surveys on Drug Use and Health were analyzed in this report. The sample included 12- to 17-year-olds, who have never used drugs (n=24,176), used drugs, but not in the prior 12-months (n=3,528) and used drugs in the prior 12 months (n=11,805). Logistic regressions models assessed the associations between the variable of interest and multiple covariates across the three subgroups.

Results: More than half of adolescents have talked with their parents about the dangers of drugs. Among never users, male sex (aOR=0.83, 95% C.I.=0.77, 0.90), and being a racial-ethnic minority (non-Hispanic Blacks aOR=0.66, 95%C.I.=0.60, 0.73, Hispanics aOR=0.89, 95%C.I.=0.81, 0.98, relative to Whites) were associated with talking with the parents about drugs. Among past 12-month users, being a racial-ethnic minority (non-Hispanic Blacks aOR=0.59, 95%C.I.=0.50, 0.70, Hispanics aOR=0.87, 95%C.I.=0.76, 0.99, relative to Whites) and a past-12-month diagnosis of a drug use disorder (aOR=1.31; 95% C.I.=1.08, 1.60) were associated with talking with the parents about drugs.

Conclusions: Despite high rates of drug use among US adolescents, four out of 10 adolescents have not talked about the dangers of drugs with their parents. The lower rates among racial-ethnic minorities suggest the need to support parents from these groups in educating their children.

Family Chaos on Asthma Control for Younger versus Older Youth

Authors: Farah Contractor, Manuela Sinisterra B.A., David Fedele PhD, ABPP

Objective: Family chaos describes a disruptive environment that in a household, and appears to have an inverse relationship with asthma control. Since parents have greater involvement in asthma management for younger youth, family chaos may differentially impact asthma control for younger versus older youth. The current study examines how age influences the relationship between family chaos and asthma control.

Methods: Participants included 56 youth (M_age=12.89 SD=2.86) with asthma and parents, who reported demographic information, including child age. Youth completed the Asthma Control Test (ACT) and the Confusion, Hubbub, and Order Scale (CHAOS).

Results: The overall moderation model, including family chaos and age as predictors, explained 13% of the variance in youth asthma control. There was a significant interaction effect of age and family chaos on asthma control (b=.08, p=.04), illustrating that the negative linear relationship between family chaos and asthma control was stronger for younger than for older children. Simple slopes analysis further illustrated the differential relationship between family chaos and asthma control across youth age groups, with a negative linear relationship in the youngest age group (1 SD below mean; beta= -.36, p=.01) and the mean age group (beta=-.11, p=.25), but a positive linear relationship in the oldest age group (1 SD above mean; beta=.13, p=.47).

Conclusion: Findings demonstrate that, for younger children, the presence of family chaos may negatively influence asthma control. This particular study discusses how the effect of family chaos on asthma control changes with age. Future directions include understanding how family chaos may affect adherence to daily controller medications or asthma-related quality of life, as well as how economic and cultural factors affect family dynamic, in order to better understand potential barriers to asthma self-management.

Factors Associated with Psycho-social Distress Among Pregnant Women in the US

Authors: Ayomide David, Vinita Sharma, MPH, PhD, Lorna Bittencourt, MS, Kelly Gurka, MPH, PhD, Catalina Lopez-Quintero, MD, MPH, PhD

Background: Psychological distress during pregnancy is associated with adverse birth and postpartum outcomes such as fetal distress, preterm birth, impaired mother-child relationship, and behavioral and cognitive problems in the child. Few studies investigate the social factors resulting in psychological distress in pregnant women. This study aims to estimate the prevalence and correlates of psycho-social distress among pregnant women in the US.

Methods: Data from 2,043 adult pregnant women (18 to 44 years old) surveyed for the 2017-2019 National Study on Drug Use and Health (NSDUH). Multiple logistic regression models were implemented to assess the association between distress and multiple socio-demographic factors. The analyses account for the complex survey's design.

Results: About 6.6% (95% CI=5.5, 7.9) of the study population reported being distress in the past 30 -days. Factors associated with experiencing distress include living in a large metropolitan area, (aOR=2.36, 95% CI= [1.37, 4.07]), past month cigarette use (aOR=3.03, 95% CI=[1.71, 5.34]), being in the 1st trimester of pregnancy (aOR= 2.66, 95% CI= [1.46, 4.89]), being in the 2nd trimester (aOR=1.99, 95% CI= [1.13, 3.5]), and pregnant women between the ages of 18 to 25 (aOR=2.38, 95% CI= [1.05, 5.39).

Conclusions: From 2017 to 2019, young pregnant women ages 18 to 25 and pregnant women using cigarettes experienced the most distress. Targeted interventions during prenatal care should be implemented towards this population in order to reduce distress in this population. A better understanding of these factors will be beneficial for more effective programs and treatments to combat psychological distress.

Effect Of The Intersection Between Sexual Identity And Attraction On Patterns Of Alcohol Use Among Young Adults: Analyses Of The National Survey On Drug Use And Health, 2015-2019.

Authors: Rayaan Ali, Vinita Sharma, MPH, PhD, Lorna Bittencourt, MS, Catalina Lopez-Quintero, MD, MPH, PhD

Background: Drinking patterns among sexual orientation groups need to be studied multidimensionally. Sexual identity and attraction are different approaches to understanding and measuring sexual orientation. This study aims to identify groups at risk for hazardous drinking across 24 young adult population subgroups based on their sexual identity and attraction.
Methods: Data from 88,464 US young adults (18 to 29 years old) from the 2015-2019 National Survey on Drug Use and Health were analyzed. Adjusted predictive probabilities were estimated from logistic regression models that included an interaction term for the covariates of interest. All estimates accounted for the survey's complex design.
Results: The highest adjusted rates of binge drinking were among bisexuals only attracted to the same sex (61.4%, 95% CI 30, 92.9). The highest adjusted rates of heavy alcohol use were among gays or lesbians mostly attracted to the opposite sex (16.6%, 95% CI 1.6, 31.5). The highest adjusted rates of a past 12-month diagnosis of alcohol use disorder were among bisexuals only attracted to the same sex (32.5%, 95% CI 2.2, 62.8).
Conclusions: Alcohol use varies substantially across sexual orientation. This report examining alcohol use behaviors among 24 subgroups might contribute to a broader understanding of sexual orientation and inform alcohol use intervention efforts among sexual minorities. Supported by: This research was supported by the National Institute on Drug Abuse T32 training grant at the UF Substance Abuse Training Center in Public Health from the National Institutes of Health (T32DA035167, Cottler, PI) and Mentored Research Scientist Development Award (K01DA046715, Lopez-Quintero, PI). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Intersectionalities of Tobacco Use in the U.S.

Authors: Anthony Pistella, Lorna Bittencourt, MS, Vinita Sharma, MPH, PhD, Cristina Bares, PhD, Catalina Lopez-Quintero, MD, MPH, PhD

Background: Recognizing the high degree of heterogeneity of tobacco use behaviors across intersecting social systems in the U.S. is essential for tobacco control and prevention. In other words, the recognition that multiple dimensions of identity affect tobacco use is vital to its understanding and analysis. That being said, this paper examines intersectionalities regarding daily use of tobacco in the U.S. **Methods:** In this study, the data assessed arises from the 2017-2019 National Survey on Drug Use and Health (NSDUH). An intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) is utilized. Multilevel models of individuals (N = 127,005) give insight into the intersectionalities of daily tobacco use regarding age, sex, race, and poverty level. **Results**: Upon analysis, the groups with the greatest rates of daily tobacco use included individuals 30- to 49-year-old males (69.3%) and females (64.3%) Non-Hispanic White (NHW) who were living in poverty. The groups with the lowest rates were 18- to 29-year-old Non-Hispanic Black (NHB) females with an income greater than 2 times the federal poverty threshold (8.5%) and incomes up to 2 times federal poverty threshold (11.3%). Conclusions: Overall, this study uncovers the risk of daily tobacco use based on certain intersectionalities. Traditionally, studies regard daily tobacco use as an issue in young white males. However, by analyzing intersectionalities, it can be determined that the probability of daily tobacco use is influenced by multiple factors working together in a complex manner. Keywords: (3-5) daily tobacco, intersectionalities, race-ethnicity, smoking.

Correlates of medical cannabis use among US adults who report misuse of prescription opioids for pain relief.

Authors: James D Cury, Alyssa M Falise, MSPH, Vinita Sharma, MPH, PhD, Ellen L Terry, PhD, Yan Wang, PhD, Robert Cook, MD MPH, Catalina Lopez-Quintero, MD, MPH, PhD

Objectives: This study uses a nationally representative sample of adults to investigate racial-ethnic differences in reasons for cannabis use among those reporting past 12-month misuse of prescription opioids for pain relief.
Methods: Data from the 2015-2019 National Surveys on Drug Use and Health were used to study 3,083 adults 18 to 49 years old reporting past 12-month pain-related prescription pain reliever (opioid) misuse. Logistic regressions assessed the association between past 12-month cannabis use – (non-medical vs. any medical) – and multiple socio-demographic, psycho-social and drug use correlates. NSDUH analysis weights were applied to accommodate for the sampling design.
Results: Half of individuals who reported misuse of prescription opioids for pain relief used cannabis in the past 12-months. In this sample of cannabis users, 87.6% (95%CI = 86.1, 88.9) used non-medically, and 12.4 (95%CI = 11.1, 13.9) used for both medical and recreational reasons. Individuals with past 12 months diagnosis of opioid use disorder were 1.8 (95%CI = 1.3, 2.6) times as likely to be medical cannabis users compared to those without a disorder.
Conclusions: The findings indicate that medical cannabis might be an alternative for nearly one in eight individuals misusing pain relievers to alleviate their pain, primarily those with an opioid use disorder. Despite increased rates of cannabis use among males and non-Hispanic Whites in the general population, no gender or racial-ethnic differences were found in the selected sample. Future studies should investigate simultaneous use and the analgesic effects of co-use in this sample.

COVID-19 Vaccination and Hesitancy Among Healthcare Providers

Authors: Jesus Sevillano, Lorna Bittencourt, MS, Vinita Sharma, MPH, PhD, Catalina Lopez-Quintero, MD, MPH, PhD

Background: Early in the development of the vaccine against COVID-19, healthcare providers (HCP) were given the opportunity of vaccination due to long-term exposure to the virus via infected patients. The following narrative overview analyzes results from studies that assess COVID-19 vaccine hesitancy among different HCP around the world.

Methods: An analysis of six studies identified in PubMed from different countries and conducted before the development of the COVID-19 vaccine compared vaccine hesitancy attitudes among healthcare workers. The surveys displayed results and influencing factors among the different workers and specific groups inside the healthcare environment.

Results: Physicians displayed the highest yield of general vaccine acceptance. Nurses displayed the highest level of vaccine hesitancy, and physician trainees reflected the highest level of vaccine refusal. Results exhibited higher rates of acceptance among HCP (40% in Hong Kong and 76% in France) who suffered from chronic conditions, worked in the private sector, and were recently/consistently exposed to the virus. Furthermore, one of the six surveys (Hong Kong) saw a higher vaccination intention among nurses who had a younger, more confident disposition. Most HCP refusal derived from “suspicion on efficacy and safety,” or a belief that the vaccine was unnecessary

Conclusion: In order to decrease vaccination hesitancy, the two principal HCP groups to target are nurses and physician trainees. The results also suggest that additional awareness on how vaccines were developed and how efficacy and safety are determined might help reduce hesitancy among HCP who are not familiar with these procedures.

Keywords: COVID-19, vaccine, hesitancy, Influenza, vaccine campaign, healthcare, physicians

COVID-19 and Physical Activity in University of Florida Students: A Survey Study

Authors: Noah Towbin, Danielle Jake-Schoffman

Background: COVID-19 has impacted many lifestyle behaviors, including physical activity (PA). COVID-19 disruptions may have decreased aerobic and strength-building exercise, especially among undergraduates relying on campus resources. This project's objectives were to investigate how the first period of COVID-19 disruptions impacted PA in University of Florida (UF) undergraduates and to assess their interest in digital PA interventions.

Design: Full-time, residential UF students aged 18-24, without physical limitations to PA, were eligible to participate in this online survey. The survey asked about PA levels at three timepoints: before COVID-19 (February 2020; T1), during the initial period of disruptions (June 2020; T2), and at the time of participation (December 2020; T3). Participants reported their PA enjoyment, interest in digital PA interventions, and demographic characteristics.

Results: In total, 200 participants had complete data and were included in analyses. Participants were on average 19.8 +/- 1.2 years old with a BMI of 22.9 +/- 3.9 kg/m^2; 71.0% were female, 70.0% white, and 77.0% non-Hispanic. A higher percentage of participants met PA guidelines at T1 (52.0%) than at T2 (49.5%) or T3 (43.5%). Over half of participants maintained similar PA levels across all timepoints. At T2, most participants transitioned to independent (89.0%), at-home (82.5%) workouts. Participants reporting high PA enjoyment were more likely to meet the guidelines than those with low enjoyment at each timepoint (ps<0.05). Participants reported a preference for app-based (78.2%) digital PA interventions containing workout ideas (71.9%) and maps of local trails (76.1%).

Conclusions: While the average participant's PA levels remained relatively consistent during COVID-19, characteristics of this activity changed. Additional research could explore the impacts of vaccination and COVID-19 variants on undergraduate PA levels or implement digital PA interventions to replace in-person resources.

Examining the viral diversity present in North American bat populations

Authors: Abdias Alexis, Kurtis Feng, Andrew Allison

Bat species have played a key role in zoonotic diseases like Ebola, Nipah, and severe acute respiratory syndrome-related coronaviruses (SARS-CoVs)- most notably SARS-CoV-2 – have become a global public health threat. Discovering how bats can alter these viruses to have effects on the human population has become more relevant. Bat-related research is important because understandings of bat-borne virus diversity, evolution, ecology, and pathogenesis is extremely significant in developing accurate models of how epidemic viruses emerge from bats. The diversity of bat viruses in the USA is limited knowledge which is very alarming as we are unprepared to potentially diagnose and combat viruses if they are to emerge into the human population. To address this, we are investigating such viruses within two bat populations- Florida, and Pennsylvania. In our initial studies on Pennsylvania bats, we screened spleen, liver, kidney, heart, lung, and gastrointestinal tract samples from 46 bats by RNA-Seq (RNA sequencing). After discovering a variety of RNA viruses including coronaviruses, picornaviruses, vesiculoviruses (rhabdovirus), and orthoreoviruses within the bat samples through RNA-Seq (RNA sequencing) we suspect that the viral diversity present in Pennsylvania bats is far greater than currently reported and that previously unrecognized zoonotic viruses are in current circulation in the USA. We expect that our Florida bat population samples with be equally fruitful. Importantly, our initial metagenomic analyses provides a baseline foundation for more in-depth biological studies, such as reverse genetics, to functionally characterize new bat-borne viruses found in the USA.

The classification of prophages associated with tRNA gene locations and their impact on the diversity of Burkholderia pseudomallei

Authors: Iris Irby, Pacharapong Khrongsee , and Apichai Tuanyok

The bacterium Burkholderia pseudomallei is the cause of Melioidosis, a severe tropical disease endemic to Asia and northern Australia and is resistant to most forms of antibiotic treatment. One factor that contributes to the virulence and diversity of B. pseudomallei is the frequent instances of insertions of temperate phages, viruses that are found within bacterial DNA, through phage transduction. These temperate phages can be identified at tRNA genes associated with tRNA site-specific recombination, specific regions of DNA where these prophages insert themselves into the bacterial genome. Previously, we isolated the regions between all tRNA genes and their repeat sequences and found prophages at tRNA genes encoding for Phenylalanine, Arginine, Cysteine, Methionine of family Myoviridae, and Proline and Selenocysteine of family Siphoviridae from all 120 complete bacterial genomes. To expand the understanding of prophages found in B. pseudomallei, we identified all prophages in 1,800 incomplete bacterial strains. We generated prophage profiles, the presence or absence of known prophages, for all B. pseudomallei genomes. These profiles include information about their bacterial hosts and host geographic origin, as well as which bacterial strains contain prophages from which tRNA gene. We found that 46% of bacterial strains with prophages were isolated from humans, and 54% were isolated from the environment. We also found that Thailand, Australia, and China were the most common origins of bacterial strains containing prophages, and that prophages found at tRNA genes encoding for Cysteine, Methionine and Selenocysteine were unique to Australia. By investigating this prophage diversity, we are accomplishing two aims: firstly, to study the diversity of the prophages, and secondly to aid in tracking the geographic distribution of B. pseudomallei based on their prophage profiles.

Investigating a Brain Growth Factor's Role in Airway Disease

Authors: Angelina Bonilla, Leah Reznikov

Cystic Fibrosis causes abnormal, thick mucus, leading to recurring lung infections. The cause is unknown, but the overproduction of mucin glycoproteins that compose mucus has been implicated. Here we test the hypothesis that mucin production is regulated by brain derived neurotrophic factor (BDNF), a protein associated with airway disease. To test this, normal airways and airways without BDNF were studied using genetically modified mice bred to allow deletion of the BDNF gene (BDNF "knockout"). A wild-type strain with intact BDNF genes served as a control. Mice were randomly assigned to receive either IL-1β treatment or saline control intranasally for 4 days. IL-1β is a proinflammatory cytokine that increases mucin production. The effects of treatments were examined using histological stains that allowed detection of mucin-forming cells, called goblet cells. The number of goblet cells were counted and compared across treatment groups. Our preliminary data show that wild-type IL-1β females (n = 5) had a higher average number of goblet cells than wild-type saline control (n = 3). In contrast, wild-type IL-1β males (n = 2) did not show an increase in goblet cells compared to wild-type saline controls (n = 2). Knockout IL-1β females (n = 3) also had a higher goblet cell count compared to knockout saline control (n = 2). Knockout IL-1β males (n = 4) showed no difference in goblet cells from the knockout saline control mice (n = 3). Though preliminary, the data do not support the hypothesis, so additional study is needed to make definitive conclusions.

Research Networks in CGIAR Collaborative Research Programs

Authors: Lejla Ramic, Amogh Agarwal, Valentina De Col, Berea A. Etherton, A. Plex Sulá, Yanru Xing, and Karen A. Garrett

The CGIAR is a global agricultural research and development organization. It supports research collaborations among an international team of scientists and national agricultural research programs. We evaluate networks of co-authorship among CGIAR researchers and their collaborators in the research programs for Roots, Tubers, and Bananas (RTB), and for Grain Legumes and Dryland Cereals (GLDC). Our objectives are as follows. First, we evaluate the roles of institutions in the co-authorship networks representing the RTB and GLDC research programs over the past five years. Second, we evaluate the clusters of researchers and the extent to which clusters reflect a focus on specific crops species. We evaluated the networks using tools in the igraph package in the R programming environment. Changes in the networks across the years were compared to determine how new collaborations formed during the progress of the program. As CGIAR develops its next phase of programs, these results can be used in project planning to consider the potential for building new types of collaboration.

Ancient DNA extraction of New World cow Y chromosomes

Authors: Arod Polanco, Nicolas Delsol, Robert Guralnick

European colonists did not arrive alone to the New World. They brought along non-native domesticated animals. Perhaps the most important of these non-native animals are cows. We know that cattle were bred for their ability to survive in the New World, but their exact ancestry is unknown. We aim to study the origins and breeding practices of New World cows by studying archaeological remains. Previous work has already been done to extract, and sequence, the mitochondrial DNA (mtDNA) which is inherited from the maternal side. In order to obtain a more complete story, we are focusing on extracting the Y chromosome from our samples to obtain the paternal ancestry. We have (n = 8) ancient cow samples from Mexico, Haiti, and the Yucatan Peninsula dated between 300-500 years-old. After DNA extraction and library preparation, we used custom RNA baits to target the Y chromosome. We are currently sequencing the resulting libraries and will then re-assemble the resulting reads. After assembly, we will compare the Y-chromosome data from archaeological samples to current cow Y-chromosome data to trace movement of bulls from Old to New World. This provides key insight into what varieties of cattle were introduced in the post-Columbian Americas. One question we aim to answer is the potential African origin of some New World cows. Our mtDNA study showed that some individuals could have an African ancestry and we expect to see the same signal in the Y-chromosome.

Geographic and Taxonomic Occurrence R-Based Scrubbing (gatoRs): An R Package and Reproducible Workflow for Processing Biodiversity Data

Authors: Natalie N. Patten, Michelle L. Gaynor, Douglas E. Soltis, and Pamela S. Soltis

There is ongoing debate concerning best practices in obtaining and processing biodiversity data for use in the diverse research applications that are now feasible. Which repositories to use, how to identify and deal with duplicate specimens, and the appropriate downstream processing steps all remain unclear. Thus, I created gatoRs: an R package to help researchers navigate through these critical data processing steps. Additionally, I produced a step-by-step workflow with graphics to help researchers employ this new package. This workflow includes functions that streamline downloading records from GBIF, iDigBio, and BISON. I also developed a function that will graphically display flagged (potentially problematic) data points and allow these points to be manually reviewed and removed from the dataset. Additionally, I developed functions to identify records that need to be georeferenced. Functions related to cleaning specimen records were also developed, including those to remove duplicate data points, check locality precision, and retain only one occurrence point. All of these functions are also included in the R package. To demonstrate the application of this workflow, I will obtain and process data for 25 endangered plant species from Florida. Specifically, I will use herbarium records and available environmental data to generate ecological niche models for these species. Overall, my research will enable the scientific community to process biodiversity data for analysis, thus contributing to our overall knowledge of Florida plants, their current distributions, and possible future response to climate change.

MISC

“The Circular Nature of COVID-19”: An Innovative Undergraduate Course about One Health.

Authors: Selin Kavak & Sara Agnelli, One Health Center of Excellence at the University of Florida

This past year, we collaborated on an interdisciplinary undergraduate course project about the COVID-19 pandemic and One Health at the One Health Center of Excellence at the University of Florida (UF). This course, titled “The Circular Nature of COVID-19” is designed for undergraduate students with diverse backgrounds and ambitions who desire to learn a systems-thinking approach to better understand this global event and how we move forward. Students learn different social and behavioral science methods to understand the complexity of the current pandemic and learn about tools for resilience, preparedness, and management of the current pandemic as an investment for future global crises. The following areas of study are explored to address this pressing question: anthropology, religion, history, language, economic and sociological aspects, epidemiology, the human/animal interface and zoonotic diseases, public health, health behavior and healthcare systems. Crisis communication, the role of media including social media and the concept of an infodemic are also addressed with a particular focus around the issue of trust.

In this presentation, we will address the challenges of teaching and learning about global health in the midst of the COVID-19 pandemic (i.e., transition to online learning, traumatic personal experiences, politically polarized views, xenophobia, etc.) and show how a COVID-19 new course with a focus on One Health was effective in achieving interdisciplinary expertise and global learning outcomes for students.

Fungal Pathogen Detection Ability of Strawberry Poison Frog

Authors: Jennifer Villate, Rachel Prokopius, and Alessandro Catenazzi

Batrachochytrium dendrobatidis, hereafter Bd, is a fungal pathogen that has been known to cause amphibian population declines worldwide for nearly half a century. Many amphibians are susceptible to negative effects such as mouth deformities in tadpoles and death in juveniles and adults. Recently scientists have become interested in the avoidance behaviors toward Bd in amphibian species, and though it has been detected in some, the focus has not been on species that exhibit parental care. Oophaga pumilio, commonly known as the strawberry poison frog, is a Central-American frog whose offspring experiences care from both parents at different intervals of its development. We used this study species to run behavioral experiments on chytrid detection and avoidance. We first tested the experimental apparatus to determine if the frogs chose to retreat to corners and/or preferred the presence of a hide in the tank, then ran volatile experiments to determine if O.pumilio preferred to be on the side of a chamber with the scent of dead Bd zoospores (treatment) present or on the side with broth media alone (control). Our results showed that our individuals preferred to stay away from the corners and did not have a preference to have a hide present. Additionally, the frogs did not show a preference when it came to the side of a container with Bd zoospores present versus not. Further avoidance experiments could be performed using live versus dead Bd and if avoidance behavior is found, and could be further researched through observational studies in the field which would analyze avoidance linked to parental care strategies.

Innovative Methods to Mitigate Heat Stress in Wisconsin Dairy Calves in a Hutch Environment

Authors: Valerie Lantigua, Bethany Dado-Senn, Jimena Laporta

Heat stress (HS) in pre-weaned dairy calves negatively impacts performance, welfare, and future productivity. Negative impacts include elevated thermoregulation and reduced feed intake. The application of fans has not been widely studied for HS abatement in pre-weaned calves raised in hutch environments. This research aims to evaluate an untested method for abating heat stress in pre-weaned calves housed in outdoor hutches in Wisconsin. We hypothesize that improving hutch ventilation will lower HS and improve calf performance. From three to six weeks of age, 12 pre-weaned Holstein heifers were enrolled into forced ventilation (FVH, rear hutch fan), passive ventilation (PVH, open hutch window), and control (H, no ventilation) hutch treatments for 4 consecutive days during July in a replicated 3x3 Latin-square design (3 blocks, n=12 per block, n=4 per treatment). We measured calf respiration rate (RR), rectal temperature (RT), skin temperature (ST), and sweating rate (SR) from 1200h to 1400h after a 30-minute external hutch restriction (EXT) and after 30-minute internal hutch restriction (INT). Data were analyzed as the difference between EXT and INT measures. Environmental temperature, humidity, and temperature-humidity index (THI) were recorded hourly, and hutch airspeed and air quality were recorded during EXT. The average THI across the experimental period was 69.9 ± 3.8. Calves provided FVH or PVH had a greater decrease in RR when moved from EXT to INT when compared to calves provided no ventilation. There were no differences between treatments for RT, ST, and SR. The FVH provided greater hutch airspeed (1.74 m/s) relative to PVH (0.21 m/s) and H (0.05 m/s), though PVH was also greater relative to H. These results indicate that ventilation in calf hutch housing can improve internal hutch airspeed and lower thermoregulatory responses in pre-weaned calves.

Bilateral testicular adrenal rest tumors in a patient with nonclassical congenital adrenal hyperplasia

Authors: Erica C Roberts, Samantha W Nealon, Jasreman Dhillon, John B Tourtelot, Bryan McIver, and Wade J Sexton

Introduction: Solid testis tumors in post-pubertal males usually represent germ cell malignancies; however, other uncommon or rare histologies must be considered.
Case presentation: We present a case of an 18-year-old male undergoing attempted bilateral partial orchiectomies for suspected germ cell tumors. Tumor pathology, laboratory results, radiographic studies, and post-surgical elevated adrenocorticotropic hormone levels supported the diagnosis of testicular adrenal rest tumors secondary to previously undiagnosed nonclassical congenital adrenal hyperplasia.
Conclusion: Testicular adrenal rest tumors are rare in patients with nonclassical congenital adrenal hyperplasia and may be accompanied by adrenal insufficiency and hypogonadism, which can be treated with glucocorticoid therapy and testosterone replacement. Differential diagnosis of tumors is challenging but necessary for proper symptom-based management.

Extracting Domain-specific Concepts for Legal Contract Understanding

Authors: Caijun Qin, Yi Yang, Haihua Chen, Junhua Ding

Employing professional legal counsel to analyze legal documents pose a costly barrier to researchers, companies, and educators in law. Mining important details in lengthy, complex English texts may demand too much time even for a dedicated team of lawyers. The time and financial costs are unacceptable for applications especially involving heterogeneous and unstructured legal data. Automated legal text classification has become a prominent research topic in the legal domain to resolve the aforementioned problem. However, relatively little research has been produced on U.S. legal text compared their international counterparts. In this study, we seek to uncover one or more high-performance classifiers for U.S. legal contracts and clauses. We compare several machine learning and deep learning models and conduct experiments on the CUAD dataset to achieve this purpose. Our results show that traditional feature-based machine learning models outperform our deep learning models, given limited training data. Moreover, we show that state-of-the-art pre-trained language models, including BERT, were trained on the general domain and could hardly classify legal text. This study additionally provides strategies from existing research to improve models for legal text classification.

The Effect of Listening to Music on the Academic Performance of University Students

Author: Michelle Rincones-Rodriguez

The current research examines university students' music habits in relation to their academic performance, specifically, if listening to music while studying affects their grades. This research involved a total of 82 university students who were surveyed at a Florida university in several locations. Students were surveyed on the grades they regularly receive and the types of music they prefer to listen to while studying, if any. Results showed that there was no substantial difference between undergraduate students that listen to music while studying and who regularly get A, A/B, B, or A/B/C grades. However, additional findings within graduate students revealed that more students with A grades listen to music than those that do not, while more graduate students that do not listen to music while studying receive A/B and B grades. These mixed results support the hypothesis that the music habits college students possess will not affect their overall grades, since the effectiveness with which they study is a more influential factor.