Barry University

15th ANNUAL S.T.E.M.

RESEARCH SYMPOSIUM

April 21, 2023

15th Annual
S.T.E.M. Research Symposium

This research symposium is aimed at engaging the Barry community in learning about and sharing in the excitement of ongoing discoveries and research within the Science, Technology, Engineering, and Math disciplines (S.T.E.M.), Medicine, Humanities and Social Sciences. Undergraduate students will present posters related to their past and current research in biology, chemistry, computer science, sports and exercise science, health science, humanities, mathematics, music, medicine, social sciences, psychology, and physics.

Friday, April 21, 2023

9:00 - 11:45 am	Poster Presentations
10:00 -10:30 am	Opening Ceremony
Noon -1:00 pm	Keynote seminar
1:00 – 2:00 pm	Award Ceremony

We gratefully acknowledge:

The dedication of research mentors, support staff, and undergraduate and graduate student researchers.

Sigma Xi, The Scientific Research Honor Society for sponsoring
Dr. Teresa Petrino-Lin Memorial Award for Outstanding Student Presentation

Sponsors from Barry University: Department of Biology, Department of Math and Computer Sciences, Department of Chemistry and Physics, Department of Psychology, and College of Health and Wellness

Special thanks for assisting with Symposium to:
Department of Brand and Marketing, Department of Information Technology, Ms. Beth Culverson, and Dr. Stephanie Bingham

Organized by Member of Barry University's STEM Committee:
Sabrina Des Rosiers PhD, Maurizio Giannotti PhD, Christoph Hengartner PhD, Ricardo Jimenez PhD, Peter Lin PhD, Zacharias Papadakis PhD, Michael Robinson PhD, Zuzana Zajickova PhD, and Anita Zavodska PhD

Exploring Other Worlds

Presented by

Dr. Anjali Tripathi

Astrophysicist
NASA's Jet Propulsion Laboratory (JPL)

Abstract

How many planets are there? Growing up, I was taught there were nine planets. Today, the number stands above 5,000, with knowledge that there are hundreds of billions more in the Milky Way Galaxy, alone. This stunning discovery of exoplanets (planets beyond our Solar System), has transformed our understanding of what it means to be a planet, our place in the cosmos, and what else is possible. In this talk, I will tell the expanding story of exoplanet exploration and how this mirrors the broadening of my experience as a scientist. When going into STEM, it can seem simultaneously narrow, with an emphasis on specialization, and yet so broad, with its principles underlying the natural world. As an astronomer, who left academia to serve society more directly, I will discuss my diverse experiences and how they have contributed to my expanded view of what it means to be a scientist. I will focus on how science communication and policy, not just research, fit into a broader, more inclusive understanding of the value of STEM, how they allow us to impact our worlds, and how they might be the springboard for your own exploration.

Biography

Dr. Anjali Tripathi is an astrophysicist at the intersection of science and policy at NASA's Jet Propulsion Laboratory (JPL). She serves as NASA's inaugural Exoplanet Exploration Science Ambassador, and she previously led JPL's government affairs office focused on climate change. Her research has explored how exoplanets form and lose their atmospheres, and she is currently studying how communities can adapt to sea level rise. Dr. Tripathi is a Research Associate of the Smithsonian Institution and a science communicator for PBS and the National Academy of Sciences. Featured by the BBC, HBO, and TED.com, she has contributed to multiple books, including Science and Cooking and The Tech that Comes Next. Dr. Tripathi serves on the Los Angeles County Department of Public Health COVID data and epidemiology team, and she chairs the UK Foreign, Commonwealth & Development Office's Marshall Scholarship Selection Committee, Southwest US Region. She previously served in the White House Office of Science and Technology Policy and the US Department of Agriculture, as acting director of the National Science and Technology Council and as a White House Fellow. Dr. Tripathi earned her PhD in Astrophysics at Harvard, her MPhil in Astronomy as a Marshall Scholar at the University of Cambridge, and her SB in Physics, with a Minor in Applied International Studies, at MIT.

Barry University College of Arts and Sciences
Department of Biology

1. **The effects of red light on cell proliferation of murine fibroblasts**

Chiara Brambilla, Christina Diaz, Ana Jimenez, and Laura Mudd
(Department of Biology, Barry University, Miami Shores, FL)

The inability of some wounds to heal is a significant issue with severe consequences, and few options for treatment (Eming, et. al, 2014). Poor regulation of wound healing and lack of solutions cause numerous problems for people with chronic illnesses or who are recovering from medical procedures (Eming, et. al, 2014). Different wavelengths of light, such as red light, have been proposed to affect the rate of cell proliferation (Nui, et. al, 2015). NIH 3T3 murine fibroblasts were plated on fibronectin at three different concentrations and exposed to red light (~640nm) for ten minutes. Proliferation was measured using a cell counting kit (CCK-8, Sigma-Aldrich) 48 hours after light exposure. Preliminary results show a decrease that is concentration dependent, with higher cell concentrations having a greater decrease. These results are interesting because they suggest possible treatments for wound healing which could decrease fibroblast proliferation, and consequentially scar formation following surgical procedures.

This research was supported by the Department of Biology at Barry University.

2. **Effects red light exposure has on proliferation of murine fibroblasts**

Raquel Castillo, Christina Diaz, Ana Jimenez, and Laura Mudd PhD
(Department of Biology, Barry University, Miami Shores, FL)

Millions of people in the United States experience chronic wounds and have complications with skin regeneration (1). This could be caused by underlying conditions like diabetes, vascular diseases, or old age. The purpose of this experiment is to develop a method that may improve the process of wound healing during treatment. Recent studies have shown that exposure to red light improves the proliferation of fibroblasts, which are important for healing wounds (2). To create our cell proliferation assay, we treated murine fibroblasts with red light at 620nm. There was a slight trend that supports that red light may increase cellular proliferation. However, more experiments need to be conducted to further support the data. Studying this low cost and simple method may later improve the healing process for patients.

This research was supported by the Department of Biology at Barry University.

3. **Using an in vitro scratch assay to assess murine fibroblast migration**

Christina Diaz, Raquel Castillo, Laura Mudd, and Ana Jimenez (Department of Biology, Barry University, Miami Shores, FL)

Poor wound healing affects millions of people worldwide and is not far from reaching epidemic proportions (Eming, et. al., 2014). Underlying clinical conditions such as diabetes mellitus, cancer, and other comorbidities are linked to chronic wounds and poor skin regeneration, consequently leading to mortality. Thus, there is an essential need to improve therapeutic strategies to enhance skin regeneration. To that end, this study used murine fibroblasts to assess migration as part of the normal mechanism of wound healing using an in vitro scratch assay (Liang et. al., 2007). Cell migration was assessed by comparing pre- and post-scratch images at 40x magnification using an inverted microscope. By inspecting the images, it was clear that by a week post-scratch cells had lost

contact-inhibition resulting in several layers of non-attached cells. Unattached cells moved into the scratch area obscuring visual inspection with the inverted microscope. Images showing pre- and post-scratch results indicate the feasibility of using the in vitro scratch assay using another cell line that exhibits contact-inhibition and forms a monolayer.

This research was supported by the Department of Biology at Barry University.

4. **The effect of ethanol on embryogenesis, neuronal development, and morphological differences in danio rerio and caenorhabditis elegans**

Fanny Herrera-Carreon, Zaidon Cange, and Stephanie Bingham (Department of Biology, Barry University, Miami Shores, FL)

Fetal alcohol spectrum disorders (FASDs) are disorders attributed to ethanol exposure during embryonic development. These disorders can vary in phenotypical characteristics such as a small head, distinctive facial features, height and weight that are below average, cognitive effects such as poor memory, coordination, and hyperactivity. The purpose of this study was to examine and correlate the effects of ethanol on neuronal development from pharyngeal neural crest cells in zebrafish (Danio rerio) as a proxy for fetal alcohol syndrome (FAS) in humans. The embryos, at an incubation temperature of 28.5 degrees C, were incubated in 1%, 2%, or 3% ethanol beginning at 5.25 hours post fertilization (hpf) for a duration of 20 hours. Throughout the incubation period up until 66 hpf, embryogenesis was examined every 12 hours. Pharyngeal crest cell density and neuronal development were also measured after 72 hpf. In addition, morphological differences in eye length, eye width, head length, and head width were also recorded periodically to monitor effects of ethanol exposure on developmental rates. Similar studies were performed in C. elegans to examine the effects of ethanol exposure on development, including progression from one stage to the next of the life cycle.

This research was supported by the Department of Biology at Barry University.

5. **A comparison of median paired fish swimming kinematics across different species and sizes of tetraodontidae**

Diere Hodges, and Janne Pfeiffenberger (Department of Biology, Barry University, Miami Shores, FL)

Fish have different swimming modes or gaits that can be effective or ineffective depending on their size, shape, and velocity. Fish used in this study are Median paired finned swimmers, which are not typically the fastest fish, but they have high maneuverability. This is beneficial in their environment, which can be turbulent, as well as full of predators which need to be avoided. Pufferfish use all of their fins and their body when swimming at slower speeds. At faster speeds, puffer fish lock their pectoral fins to their sides and avoid using them. In this study we characterize the changes in swimming mechanics in pufferfish ranging in different sizes and species. For this study, a flow tank was built with two windows, allowing for lateral and ventral high speed camera recordings and analysis of the speed, fin oscillations, and overall body kinematics in median paired fish swimmers across different sizes. Using modern video digitizing methods, we analyse wedetermine the transition speeds at which pufferfish alter pectoral fin usage, as well as other behaviors, such as jaw gaping width at increasing speeds, and body orientation while swimming.

Funded by startup funds to Janne Pfeiffenberger and laboratory funds by the Biology Department at Barry University

6. **UV-reflectance and sexual dimorphism in damselfish**

Kendall Hovius, Tykeedrien Burris, and Michael Robinson (Department of Biology, Barry University, Miami Shores, FL)

Color is an important component of communication in marine fishes, many of which use color to identify different species, sexes, life stages, and individuals. The damselfishes (Pomacentridae) are a family of fishes with a range of coloration (from bright and gaudy to drab), and they have evolved a diverse array of social systems and color patterns. Despite this great variety, one area in which damselfishes lack diversity in color is sexually dimorphic color. Males and females appear indistinguishable to the naked human eye. Many, but not all, damselfish species undergo ontogenetic color change (OCC) over the course of their maturation. In addition, many, but not all, species also display a complex pattern of UV-reflecting patches on the faces of juveniles and adults. Both OCC and UV-reflectance appear important in social dynamics, including the mediation of aggression, and possibly individual recognition, but their roles are mostly unclear. One role that UV-reflectance might play is not only the identification of individuals but of sexes. We examined the sexual dimorphism of UV-reflectance patterns in damselfish. We used an ultraviolet-sensitive camera system and a spectrometer to test for differences in the facial UV-reflectance patterns with regards to sex and report our results here.

This research was supported by the Department of Biology at Barry University.

7. **Can guppy fish (Poecilia reticulata) help to untangle the mysteries of magnetic sensing in vertebrates?**

Verna Liburd, Zoraida Delgado, Libertad Gonzalez, Michael Robinson, and Michael Painter (Department of Biology, Barry University, Miami Shores, FL)

Animals rely on a diverse suite of cues to accomplish a range of spatial behaviors varying in complexity and spatial scale. It is well established that the Earth's magnetic field provides an omnipresent global reference used by a broad range of animals, including several invertebrate taxa and all major vertebrate classes, for orientation and navigation behaviors. While laboratory and field studies have provided unambiguous evidence for magnetic orientation behavior in animals, the sensory receptors and underlying biophysical mechanisms mediating magnetic sensing are not fully characterized. Furthermore, the adaptive significance of some forms of magnetic orientation behavior, such as spontaneous magnetic alignment (SMA), where animals passively align the body axis relative to the magnetic field, remains unresolved. Our current research aims to determine if guppy fish (Poecilia reticulata) express SMA behavior under laboratory conditions, as has been observed in diverse vertebrate groups, including fish. Previous attempts to establish SMA in guppies from our lab have proven difficult and fish exhibited robust alignment responses relative to non-magnetic (i.e., topographic) features of the test environment that have yet to be identified. Modifications to the previous experimental design have been implemented to determine if guppies exhibit reliable SMA behavior in laboratory conditions. Guppies are placed individually in transparent arenas centered inside orthogonally aligned Helmholtz's coils used to rotate the alignment of the magnetic field into one of four topographic alignments (i.e., North, South, East and West). Fish are tested overnight in one of the four magnetic field alignments and filmed continuously using an infrared camera. Video records are then analyzed using automated tracking software to determine mean alignment, position, and activity for each individual. Mean bearings from a balanced test series are then pooled relative to magnetic and topographic North to determine if the overall distributions are indistinguishable from random using a Rayleigh test ($p = 0.05$). Preliminary analyses suggest that the topographic bias observed in previous experiments has been eliminated and trials are currently underway to determine if guppies exhibit SMA using the modified protocols. This work will not only help to characterize the physiological and biophysical basis of magnetic sensing in vertebrates but will likely shed light on broader aspects of guppy sensory ecology.

Funding provided by the Biology Department at Barry University, the Barry STEM Student Research and Creative Activities Award, and the Barry College of Arts and Sciences Faculty Stimulus Grant.

8. Turtlegrass seedlings (Thalassia testudinum) are resilient to increased ocean temperatures

Olivia Marita, Ariel Alibocas, and Silvia Macia (Department of Biology, Barry University, Miami Shores, FL)

Seagrass ecosystems provide food and shelter for numerous marine organisms as well as storing carbon and providing coastal protection. This study investigates the possible effects of global warming on turtlegrass (Thalassia testudinum) by tracking growth and survival of seedlings in increased temperatures. Thalassia testudinum is the climax seagrass species in Florida, and its fruits and seeds often wash up on shorelines, allowing for nondestructive collection. We collected seeds (both loose and from intact fruits) from Key Biscayne, Florida from July 27 to August 10. The seedlings were raised hydroponically in laboratory aquaria (70 liters volume) which were maintained on a 12:12 hour lightdark cycle. Four tanks were kept at a water temperature of 28°C, the current average summer temperature, and four at 30°C, simulating the predicted summer temperature by the end of the century. Seedling survival was monitored, and leaf growth measured every two weeks. On most sampling dates, 20-25 seedlings were randomly selected from each tank and the longest leaf measured. Seedlings increased in size for the first 15 weeks, then growth plateaued. There were no consistent effects of temperature on leaf length. Survivorship was higher in the elevated temperature tanks. Our study suggests that turtlegrass seedlings may be resilient to predicted increases in ocean temperatures.

This research was supported by the Department of Biology at Barry University.

9. The effect of a keto diet on Lactobacillus casei

Valentina Montagna, Thurna Baronville, Ashley Palacios, Christoph Hengartner, and Leticia Vega (Department of Biology, Barry University, Miami Shores, FL)

The human microbiome is the array of microorganisms, such as bacteria, fungi, archaea, and viruses that are naturally found at the surface of various human tissues. These microorganisms can be roughly classified into two large groups based on their disease-causing (pathogenic) or benign (non-pathogenic) properties. A common example of non-pathogenic microbe include members of the Lactobacillus family. Lactobacilli are rod shaped bacteria — found in the gut, vagina, mouth, and certain dairy products —that serve as protective agents against pathogens such as varieties of E. coli. Lactobacillus casei is a lactic acid producing bacteria that is able to colonize natural and artificial-manmade-environments. Various studies have shown that L. casei are associated with promoting health within the human body, mainly in the gastrointestinal tract (GIT). Oftentimes, these bacteria are themselves influenced by alterations and/or dysfunctions of the GIT, including disorders such as Irritable Bowel Syndrome (IBS). Diets have also been shown to alter the species composition of the human microbiome. The ketogenic diet, referred to as the ”keto” diet, is a diet that consists of lowering carbohydrate intake while maximizing fat consumption and thus, triggering ketosis. Ketosis occurs when the body does not produce enough carbohydrates such that lipids (fats) are used as its main source of energy. An excessive use of this diet over prolonged period of time is bound to alter the gut microbiota, possibly affecting the proportional levels of L. casei. This study aims to investigate the possible influence of a keto diet on L. casei by examining how the bacteria’s growth is affected by the presence of key molecules: glucose, inulin, and ketones. Glucose is used as a non-keto sugar control, inulin is used as a keto diet sugar replacement, and ketones are molecules that tend to be produced as a result of the keto diet.

This research was supported by the Department of Biology at Barry University.

10. An investigation of metabolic responses to glucose overconsumption

Gisela Regalado, Celia Burgos, Kyle Edwards, and Stephanie Bingham (Department of Biology, Barry University, Miami Shores, FL)

The increase in sugar consumption in the American diet has led to a rapid increase in the prevalence of diabetes and other health complications. With two-thirds of the US population being either overweight or obese, weight gain and body fat accumulation has led to greater awareness of the negative effects of high sugar consumption. However, in 2009, sugar consumption in the United States was an estimated 9.9 million metric tons and by 2017, the annual consumption estimate was 11.18 million metric tons. Although glucose is crucial for development, fertility, and organism life span, an overconsumption has been linked to many risk factors for harmful diseases. In this study we are using C. elegans and D. rerio to explore the effects of high glucose consumption at the cellular level. Nematodes and zebrafish have been used as models for human diseases for decades. Our goal in this study is to use D-glucose, the naturally occurring carbohydrate in living organisms, to evaluate physical changes experienced by both C. elegans and D. rerio. Oil-Red-O (ORO) staining will be used to visualize the increase in fat content in both C. elegans and D. rerio exposed to high glucose concentrations. Fat content analysis and physical characteristics will be used to determine the effects of high glucose exposure. We expect to see larger and thicker worms for the high glucose concentrations in C. elegans and for D. rerio, a higher density of adipocytes and/or any increase in the size of embryos.

This research was supported by the Department of Biology at Barry University.

11. Behavioral effects of food dyes in juveniles

Valerie Villegas[1], and Stephanie Bingham[2] ([1]Department of Chemistry & Physics, Barry University, Miami Shores, FL, [2]Department of Biology, Barry University, Miami Shores, FL)

Red food dye is consumed daily without a second thought. It hides in the most innocent of foods, including vitamins, medications, and snacks marketed to children. This raises the question of whether these dye-containing foods we consume are affecting our lives and that of our children. Previous studies have suggested negative behavioral and neurological effects of red food dye on children, making them more hyperactive, yet these dyes are still found in attention-deficit disorder medication such as Vyvanse. Red food dye, Red 3, chemically known as erythrosine, is a suspected carcinogen and has been banned from beauty products in the United Stated for more than 30 years by the Food and Drug Administration (FDA). Surprisingly, it remains approved by the FDA for use in food. By contrast, in Europe, warning labels are required on food products containing this dye. In this study, our goal was to use the model system C. elegans to examine behavioral changes in response to red food dye consumption, specifically, the body bend frequency which is an indicator of neurological response. To assess this, worms were administered three different red food dyes: Red 40, Red 3, and store-bought red food coloring, in their growth media at different concentrations; recordings and measurements of their movements were then collected. Testing on models like C. elegans gives researchers better insights into how these dyes might be affecting our everyday lives.

This research was supported by the Department of Biology at Barry University.

DEPARTMENT OF CHEMISTRY & PHYSICS

12. Synthesis of biased muscarinic agonists as a smarter class of analgesics with lower adverse effects

Christina Diaz, Herleyd Remi, and John Boulos (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

An alternative route to finding selective agonists for use as painkillers devoid of the side effects of opioids is through a downstream signaling pathway associated with the activation of M2 and M4 muscarinic receptors. Like the analgesia mediated by opioid receptors, activation of M2 receptors leads to activation of Gio G-proteins and consequent decrease in cAMP which causes attenuation in the activity of tetrodotoxin-resistant voltage-gated sodium channels. The βγdimers released from activated Gio G-proteins activate inwardly- rectifying potassium channels. A decrease in the activity of sodium channels and activation of potassium channels results in a decrease in the excitability of nociceptive sensory neurons. Preliminary data from both heterogeneous expression systems and ex vivo studies for several efficacious agonists, which caused substantial inhibition of cAMP and little stimulation of inositol phosphate accumulation, will be presented. Data strongly indicates that these compounds have much greater efficacy for M2 and M4 Gio signaling than for M1, M3, and M5 Gq signaling. These compounds, in contrast to carbachol, only inhibit the production of cAMP at M2 and M4 receptors displaying absolute Gio bias. Similarly, at M1 and M3 receptors, these compounds only inhibit cAMP production. Simulation of molecular dynamics has revealed specific interaction of these biased agonists in the orthosteric binding site and specific conformation of the M2 receptor. In comparison with balanced agonists carbachol and Iperoxo, these agonists bind deeper in the orthosteric binding site. The most striking difference is the absence of hydrogen bonding to N404 in TM6. Instead, they interact with W400 one turn deeper in TM6 via a combination of various weaker interactions

This research was supported by the Department of Chemistry and Physics at Barry University.

13. **Bodipy-elabela conjugates as fluorescent probes to investigate apj-mediated cardiovascular signaling pathways**

Jakub Ettrich, and Conrad Fischer (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Elabela peptides (ELA) have only been elucidated in 2013 as the second endogenous ligand after apelin that binds to the APJ receptor, a G-protein coupled receptor (GPCR). Both peptides are heavily involved in the development and regulation of the cardiovascular system and water metabolism. Despite comparable binding motifs of both peptides with the receptor, the amino acid sequence of apelin and elabela peptides is quite different. This also translates to differences in binding affinity and downstream G-protein activation. In addition, it has been shown that shorter (Elabela-10) and longer (Elabela-14) isoforms of the same peptide show biased G-protein activation patterns. We designed two elabela peptides of different lengths along with a BODIPY fluorophore and a polyethylene glycol (PEG) chain spacer. These serve as bioconjugates in order to explore their use as activity-based probes for disease related tissue imaging. We successfully synthesized the BODIPY fluorophore in a good yield (32%) and characterized it using nuclear magnetic resonance (NMR), mass spectrometry (MS), and infrared spectroscopy (IR). Using solid-phase peptide synthesis (SPPS), we further synthesized the two differently long elabela peptides, Elabela-10 and Elabela-14, and coupled the PEG chain and BODIPY to both isoforms. Upon purification, these probes can be tested in APJ-expressing cell lines for receptor affinity. If the receptor affinity is not compromised by fluorophore conjugation, BODIPY-elabela conjugates could further be used for the development of a fluorescence-based APJ receptor affinity assay.

Supported by Barry University Department of Chemistry and Physics and CAS Faculty Stimulus Grant awarded to Dr. Conrad Fischer.

14. Comparing the effectiveness of alcohol-free antiseptics in mouthwash.

Nathaly Feliz, and Kimberly Simmons (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Alcohol is a common ingredient found in most mouthwashes. However, dentists have found that overuse causes stripping of the enamel and instead have been incorporating different compounds with antiseptic purposes. In this study, the similarities and differences between three alcohol-free active ingredients in mouthwash will be observed with regard to their chemical and antiseptic properties. In addition, infrared spectroscopy (IR) will be utilized to identify the chemical structure of each compound. Through IR spectroscopy, the results show that all three compounds contain a benzene ring with substituents, that when mixed with water, undergoes an acid-base chemical reaction. This reaction produces benzoic acid, which prevents the growth of bacteria by lowering the pH of the environment to an acidic level. Chlorhexidine, CPC monohydrate, and sodium benzoate all have a positive charge and are selective against gram-negative bacteria due to their chemical structure. Alcohol remains the leading antiseptic in mouthwash due to its effectiveness at a much lower concentration compared to alcohol-free antiseptics.

15. Engineered peptide aldehydes as potent antiviral drugs against SARS-CoV-2

Jenson Feys, and Conrad Fischer (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

While seasonal outbreaks of viral respiratory diseases like flu are common and manageable every year, COVID-19 has been the exception to the rule, having disrupted the lives of humans across the globe. COVID-19 is caused by a β-coronavirus (SARS-CoV-2) and characterized by a high mutation rate, that, when combined with public distrust of vaccines, prompts a necessity to develop drug-based treatment options. Possible drug targets include the main protease (Mpro), which is vital in cleaving segments of the viral polypeptides. Inspired by a potent feline coronavirus drug (GC376), novel peptide aldehydes have been recently developed that inhibit SARS-CoV-2 Mpro in nanomolar concentrations. Synthesis of the original GC376 aldehyde and its analogs involves peptide conjugation, elaborate redox reactions, and sophisticated column purifications. This study optimized the peptide aldehyde synthesis, incorporating amino acid surrogates that facilitate product purification to aim for increased yields. Use of sodium borohydride-LiCl allowed a full reduction to the various inhibitor primary alcohols that were then selectively oxidized to the target aldehydes by Dess Martin Periodinane. The obtained inhibitors were characterized by 1H-NMR, 13C-NMR, IR, and LCMS. Utilizing an in-vitro FRET based assay, the aldehyde analogs show nanomolar Mpro inhibition. If successful in cell-based studies, these compounds show promise as a drug-based treatment option for COVID-19 and future coronaviral diseases.

This research was supported by the Department of Chemistry and Physics at Barry University.

16. Extraction of CBD from different strains of hemp flowers and analysis by HPLC, TLC, and NMR for educational purposes only

Gabriela Frontanez, and John Boulos (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

The enthusiasm and interest in cannabidiol (CBD), well known for its anti-inflammatory and pain-relieving properties, have increased the need for more practical and efficient extraction methods. Several studies have contributed to our understanding of the anti-inflammatory and analgesic effects of CBD in various models, including neuropathic and osteoarthritis pain. The research aims to compare three varieties of industrial hemp: CBD White Flower, CBD Cherry Abacus Flower, and 78 Llamas Hawaii (Indoor) Hemp Flower. Hemp flowers are soaked in ethanol at low temperatures for several days, filtered, and concentrated to afford crude CBD extracts. The extracts are then analyzed by thin-layer chromatography (TLC), gas chromatography (GC), and high-performance liquid chromatography (HPLC) for their chemical compositions and purity. Pure CBD samples are

characterized by nuclear magnetic resonance spectroscopy (NMR). The CBD content of each of the three Hemp flowers is reported as follows: White Flower (_%), Cherry Abacus Flower (_%), and Llamas Hawaii Flower (_%). Based on the results, it is found that ethanol extraction is both a practical and efficient method for extracting CBD from Hemp flowers.

This research was supported by the Department of Chemistry and Physics at Barry University.

17. Testing unification, dark matter and neutrino masses with gravitational wave detectors

Kassandra Garcia, Erika Pierre, and Bartosz Fornal (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Two of the most pressing unanswered questions in particle physics concern the nature of dark matter and the origin of neutrino masses. These mysteries can be explained within the framework of a new theory unifying baryon number and color into an SU(4) symmetry, and by promoting lepton number to an SU(2) gauge symmetry. The spontaneous breaking of this new symmetry may also offer a solution to the matter-antimatter asymmetry problem. The model predicts a unique gravitational wave signature, including the simultaneous presence of a first order phase transition signal and a domain wall signal, all within a similar frequency range. The aim of the project was to determine the expected spectrum of gravitational waves emitted in the early Universe and predicted by this new model. The work involved analytical calculations investigating various parameter choices for the model, with emphasis on the location of the signal's peak frequency and its intensity. Using the software Mathematica, computer simulations were developed and run within the framework of the model, and parameters were calculated. Once the best fit parameters were determined, plots were made of the expected gravitational wave signatures and overlayed with the sensitivity of future gravitational wave experiments. In the near future, these experiments, specifically DECIGO, Big Bang Observer, Einstein Telescope and Cosmic Explorer, will be utilized to search for these novel signatures. If found, this would serve as evidence confirming the validity of our model, proving the existence of domain walls in the early Universe, and furthermore, suggest that this is how neutrino masses were generated and explain why there is a predominance of matter over antimatter. The finding of these signals would also provide evidence for a partial or full grand unification theory, which postulates that electromagnetic, weak, and strong forces are combined into a single force at high energies. Overall, the confirmation of these signals would advance our understanding of the Universe.

This research was supported by the National Science Foundation under Grant No. PHY-2213144.

18. Solvoselective succinimidylation of alcohols using disuccinimidyl carbonate

Alejandra Leon, and Conrad Fischer (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Chemoselective reactions, i.e. a preferred outcome of a particular reaction product over a range of possible alternatives, are very desirable in organic and biomolecular syntheses. They increase product yield, eliminate side reactions and overall contribute to higher economic and ecologic effectivity. Succininimidyl esters constitute powerful transfer reagents for the N-carbamoylation of amines that, for example, have great utility in the N-terminal modification of peptides. They can be obtained quantitatively by reaction of an alcohol with disuccinimidyl carbonate in a polar, non-protic solvent. Although various solvents including dichloromethane and acetonitrile have been documented in the literature for this chemical transformation, we noticed a different reaction outcome based on the solvent used. In case of using acetonitrile as solvent, 1H-NMR and mass analysis revealed that instead of the carbamate an N-alkoxy succinimide was obtained. On the contrary, using dichloromethane as solvent following the same reaction conditions yields the desired carbamate.

Here we present a condition variation study (i.e. solvent, reactant concentration, presence vs. exclusion of light) to identify the parameters that govern this chemoselectivity. A combined approach of TLC, 1H NMR and mass spectrometry is used to characterize reaction outcome. This might potentially explore a new route to N-alkoxy succinimides that have numerous applications including their use as potent protease inhibitors.

Barry University's Provost Catalyst Grant is gratefully acknowledged.

19. Probing the origin of neutrino masses via gravitational waves from cosmic strings

Alejandra Leon, Jessica Bosch, and Bartosz Fornal (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

The Standard Model of elementary particles does not explain the origin of neutrino masses nor the nature of the dark matter in the Universe. One of the most elegant extensions of the theory providing solutions to those problems involves postulating the existence of heavy right-handed neutrinos and a new U(1) gauge symmetry, leading to the seesaw mechanism for neutrino masses. The breaking of this U(1) symmetry triggers the emission of gravitational waves in the early Universe via cosmic strings, domain walls, or a first-order phase transition, potentially detectable today. Moreover, if there are two U(1) symmetries at the high scale, one of which is broken via two scalars, a novel and unique gravitational wave signal arises, involving a simultaneous presence of cosmic string and domain wall signatures. The shape of the spectrum predicted by this theory was determined through analytical and numerical calculations, and the corresponding plots were created using the software Mathematica. This type of signal has not been considered before, and it can be searched for in near-future gravitational wave experiments such as LISA, Big Bang Observer, DECIGO, Cosmic Explorer, and Einstein Telescope.

This research was supported by the National Science Foundation under Grant No. PHY-2213144

20. Gravitational wave signals from domain walls as tests of the seesaw mechanism

Jessica Bosch[1], Alejandra Leon[1], and Bartosz Fornal[2] ([1]Department of Biology, Barry University, Miami Shores, FL, [2]Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Neutrinos are the least understood particles of the Standard Model; the mechanism behind their nonzero masses is unknown and requires postulating the existence of new particles and interactions. Given that the measured neutrino masses are very small, the physics behind their generation is naturally set at a high scale (via the seesaw mechanism), very difficult to probe in conventional particle physics experiments. However, this is perfectly suited for being tested in gravitational wave experiments via early Universe domain wall and cosmic string production, as well as first order phase transitions. The simplest UV complete realization of the seesaw mechanism is via a U(1) gauge symmetry broken at a high scale. To narrow down the possibilities, the case when there are two U(1) gauge symmetries will be considered: baryon number and lepton number. If any of the symmetry breaking steps proceeds via more than one scalar, this may lead to the production of domain walls. Thus, one can expect a new type of gravitational wave signal involving a domain wall peak overlaying a cosmic string spectrum. This novel type of gravitational wave signature can be searched for in upcoming experiments, such as the Cosmic Explorer, Einstein Telescope, DECIGO, Big Bang Observer, and LISA.

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21. The effect of cross-linkers on formation of organo-silica hybrid monolithic columns for applications in capillary liquid chromatography

Zach Money, Montaha Abdallah, Aurora Burkus-Matesevac, and Zuzana Zajickova (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

Monolithic chromatography uses a monolithic column consisting of a singular porous material, typically made of silica or an organic polymer. Monolithic columns in comparison to traditional particle-packed columns allow faster separations at lower pressures which can be advantageous to a large variety of industries. This study focuses on preparation of organo-silica hybrid monoliths utilizing 3-methacryloxypropyltrimethoxysilane as a starting monomer. In our previous work we have shown how addition of ethylene dimethacrylate as the cross-linker enhanced column stability and resulted in prolonged retention, better selectivity, and resolution of alkylbenzenes. Here the attention is on implementing multithiols as cross-linking monomers. The multithiols selected were 2,2'-(ethylenedioxy) diethanethiol, ethylene glycol bis(3-mercaptopropionate), trimethylolpropane tris(3-mercaptopropionate), and pentaerythritol tetrakis(3-mercaptopropionate). First, optimization of polymerization mixture composition is performed in vials and is followed by FTIR analysis to assess incorporation of various functionalities into the structure. Subsequently, capillary liquid chromatography is used to evaluate the suitability of monolithic column (100 μm ID) as separation media of small analytes in reversed-phase mode. Of the four multithiols, pentaerythritol tetrakis(3-mercaptopropionate) shows the most viability as capillary columns produced peak efficiency of toluene upwards of 50 000 plates per meter.

22. Dark matter and matter-antimatter asymmetry of the universe from gravitational waves

Erika Pierre, and Bartosz Fornal (Department of Chemistry & Physics, Barry University, Miami Shores, FL)

We investigate the prospects for probing asymmetric dark matter models through their gravitational wave signatures. We concentrate on a theory extending the Standard Model gauge symmetry by a non-Abelian group, under which leptons form doublets with new fermionic partners, one of them being a dark matter candidate. The breaking of this new symmetry occurs at a high scale and results in a strong first order phase transition in the early Universe. Using the parameters of this model, we predict a gravitational wave signal from the model, which, if discovered, would help us understand the nature of dark matter and the origin of the matter-antimatter asymmetry. Analyzing such a scenario required analytical calculations and simulations using computational software (Mathematica); professional software for manuscript preparation was also used (LaTeX). We demonstrated that for certain choices of model parameters, a gravitational wave spectrum is expected to be within the reach of future stages of space-based gravitational wave detectors. Therefore, our model constitutes an example of a theory that accommodates baryogenesis in an asymmetric dark matter setting and predicts a gravitational wave signal from a first order phase transition in the early Universe within the reach of near-future experiments. If such a signal is indeed discovered, our results would provide a breakthrough in expanding our understanding of the nature of our world.

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23. Bringing astronomy, math, and physics to schools and local communities

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The telescope advanced our understanding of the world, enabling human exploration to reach billions of light years away from Earth. Thanks to this we can dive far into the past, witnessing phenomena that happened billions of years ago. This experience should be available to everyone, as it triggers our deepest questions about the world and, as Copernicus said, keeps the human mind away from vices and directs it to better things. Unfortunately, astronomy, math, and physics, in general, are not

taught well in schools, especially in under-resourced areas. Such unequal access to science education is a social injustice that we want to combat. The Astro-Math-Physics (AMP) Club aims to invite and include everyone in pondering on the wonders of the Universe and seeking the truth, through Barry's core commitments of Collaborative Service, Inclusive Community, and Social Justice. We commit to collaborative service with local elementary, middle, and high schools to bring awareness and appreciation to the sciences of astronomy, mathematics, and physics, and address the applications of these sciences in our community through active discussions and projects. We also commit to an inclusive community by introducing all students of science and non-science disciplines at Barry University to celebrate these sciences, encourage student interest, and inspire a brighter generation that will take advantage of the scientific advances and discoveries of our modern era. To this end, we are working within the Scientist in Every Florida School (SEFS) program to inspire school students to think about the science around us. We also visited the Pierre Toussaint Leadership and Learning Center through Barry's Community Science Academy, where with primary and secondary school students we measured pollution levels and discussed ways to reduce the carbon footprint in our communities. We also held successful AMP Club presentations about stars and the physics behind them, recognized powerful and influential women in physics, discussed the importance of scaling in our world, and more projects to come. Continuing outreach activities and engagement with our local and academic communities will contribute to reducing social injustices in education, and will generate appreciation for the sciences that aim at deepening our understanding of the Universe.

DEPARTMENT OF MATH & COMPUTER SCIENCE

24. A dynamic data visualization tool for the spread of the COVID-19 pandemic

Rickson Costa, David Henry, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

COVID-19 was an unexpected whirlwind that caused massive damage to our world. No country around the globe was prepared for this pandemic. To get an insight on the parameters of the pandemic, we have developed a data visualization tool using Python and Jupyter Notebook that shows a choropleth map of the entire world to examine the spread of COVID-19. The goal of this tool is to identify countries that effectively controlled the spread of COVID-19 and to demonstrate how such success can be replicated in future pandemics. To create this tool, we collected data on COVID-19 cases, deaths, and recoveries from multiple sources, including the World Health Organization and various government agencies. We then used Python to clean and process the data and Jupyter Notebook to create interactive visualizations that enable users to explore the data in detail. Our visualizations allow users to compare the spread of COVID-19 in different countries over time, examine the impact of interventions such as lockdowns and mask mandates, and identify factors that may have contributed to success or failure in controlling the spread of the virus. Our tool provides a valuable resource to policymakers and public health officials to learn from the successes and failures of different countries in their efforts to control the spread of COVID-19. By identifying common factors among countries that successfully and unsuccessfully controlled the spread of the virus, we hope to provide insights into how we can better handle future pandemics. Overall, our data visualization tool offers a powerful and informative way to understand the global impact of COVID-19 and provides valuable lessons for future public health crises.

25. Complexity considerations for password recovery

Herve Jean Baptiste, Wilyn St-Armand, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

Password complexity is a crucial aspect of digital security. A strong and complex password can prevent unauthorized access to sensitive information, while a weak password can easily be guessed or hacked. Therefore, it is essential to understand the elements that make up a complex password. A complex password consists of a combination of upper and lowercase letters, digits, and symbols. The longer the password, the more secure it is, as it takes longer for an attacker to crack it using a brute force method. Passwords that are easy to guess, such as "password" or "123456," should be avoided, as well as those that contain personal information, such as birth dates or names. Password complexity may be further enhanced using multifactor authentication (MFA), which requires additional forms of identification beyond the password itself. The complexity of passwords is calculated using a wide range of word lengths and character sets. Permutations with duplications are used to determine the possible order or arrangement of password characters. The formula is as follows, $\sum_{r=1}^{n} P_{n,r} = \sum_{r=1}^{n} \frac{n!}{(n-r)!}$, where n refers to what is usable, and r refers to what is used. The resulting asymptotic complexity is $O(n^{r+1})$. Character sets examined include alphabetic letters, alphanumeric characters, and finally all printable ASCII characters. Data shows that the complexity of a password increased as the number of choices increased. The results suggested, for instance, the difference between an 8-character password made up entirely of lowercase letters and one made up of alpha-numeric characters and symbols is a 99.998714715734% difference.

26. Monitoring traffic of people using Wi-Fi devices

Luis Perez Cipollitti, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

In current society most people carry a mobile device on them, one of the technologies widely used by these devices is Wi-Fi. A feature one can see when accessing Wi-Fi through a phone is that it

displays the name of the available networks around the device, but how does the phone know the name of these networks? There must be communication between the phone and the wireless access point (WAP) before the phone user even tries to connect to a Wi-Fi network. Hence, the question arises if there is a method to catch these communications and detect the presence of mobile devices through their Wi-Fi capabilities; even if they are connected to a different network to which one doesn't have access. According to the Wireless Fidelity (Wi-Fi) protocol described in the IEEE 802.11 standards, this initial communication is conducted by Management Frames, specifically, probe request frames. Consequently, this research evaluates the possibility of monitoring the traffic of people in a designated area by capturing and logging the probe requests sent automatically by phones as part of the Wi-Fi protocol. This will be achieved using Wireshark and a wireless adapter in monitor mode to capture Wi-Fi traffic and log the probe requests at a given location.

27. How likely can a program recognize you?

Snowbird Rubio [1], Maighen Chavez [2] and Ricardo Jimenez [1] ([1]Department of Math & Computer Science, Barry University, Miami Shores, FL, [2]Department of Biology, Barry University, Miami Shores, FL)

Facial recognition is increasingly becoming a part of everyday life. Some examples of how it is being used include: individual identification, system access authentication, surveillance (both private and public) and unlocking mobile devices. Facial recognition, like all biometrics, have error rates. The artificial intelligence, (AI), algorithm that are used for facial recognition are prone to bias and inaccuracy based on the data inputted in the algorithm; the more information put into the algorithm, the more the AI is able to learn and adapt for more accurate results. Unfortunately, the data could still be biased even after all the inputted data. If a sizable portion of the data is from a particular ethnic group or gender, inaccurate recognition may occur. To determine whether the recognition biases are caused by bias from inputted data, the accuracy of a facial recognition program was put to the test to prove if it would be able to correctly identify individuals when compared to other individuals with similar facial features. Additionally, more photos were added to the facial recognition software with each trial to see if sample size improves accuracy.

28. An ai-based career planner for computer science specializations

Lola Umarova, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

We are developing a web-based career planner for the selection of a specialization within the field of Computer Science. While many students have a clear idea about mainstream Computer Science, they may need assistance determining which field within the discipline is more suitable as a career choice. The application helps students self-discover characteristics that lead to specific career recommendations. The three specialization areas explored here are: Cybersecurity, Data Analytics, and Digital Media. The system is modular and can be easily expanded to include additional specialization areas or modified to support additional disciplines. The planner is structured as a multiple-choice quiz with each answer assigning different weights to each of the three specialization areas. Questions are categorized in relation to the specializations and can be labeled as ”pure” if they belong to one category, or “hybrid,” if they belong to more than one category. The purpose of each question is to identify student preferences that either explicitly or implicitly match one of the specialization areas. A question is selected dynamically, using a combination of probabilistic processing with the support of a random number generator, and an AI component that learns from the preferences that have already been provided through a weighted point system. The webpage is implemented using an underlying HTML and CSS structure. The algorithmic component is designed using PHP. Questions are structured as database tables and are accessed using MySQL as the database management system. The non-deterministic behavior of the system allows for multiple runs of the quiz resulting in increased user confidence with respect to its reliability.

29. Using wearable to smartphone device synchronization and music therapy to manage autism

Jorge Vera, Abrihana Rivera, Roger Osorio, Luis Perez, and James Haralambides (Department of Math & Computer Science, Barry University, Miami Shores, FL)

We are developing an event-driven application to establish a connection between a smartwatch running on Wear OS and a smartphone running on the Android operating system. The application will automate the process of data transfer between these devices by handling health monitoring events generated on smartphones such as the heart rate, sleep quality, or blood pressure for select devices. The app is developed using Java and the Android Studio IDE focusing on device compatibility. An initial setup connects the devices via Bluetooth, a standardized protocol for sending and receiving data at 2.4 GHz. Subsequent data transfers occur when specific events are generated on the smartwatch device. During the first stage of the project, we concentrate on events related to pulse rate measurements. High or low pulse rates or rapid fluctuations are communicated to the smartphone devices instantly. An event handling program running as a background process on the smartphone collects transmitted data and creates alerts and notifications. Depending on the intended use of the application, the handler may activate a series of programs that provide appropriate responses to the event. An immediate use of the application is to manage autism through automated music therapy. Music intervention is used as an evidence-based clinical approach that helps improve social interaction and communication reducing stress in autistic children and adults. An elevated heart rate that may be associated with behavioral or attentional difficulties will trigger the event handling mechanism. As a result, soothing music that may have a calming effect will start playing.

DEPARTMENT OF PSYCHOLOGY

30. Differences in perceived discrimination between immigrant college students of diverse national origin.

Sadia Campbell, Daryle Pyles, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

Beyond 2030, the U.S. population is projected to be more diverse ethnically and racially. As of September 2022, the United States immigrant population was 47.9 million of which 19.6 million are college students (McHugh, 2022). The U.S. has more immigrants than any other country therefore understanding the negative characteristics associated with immigration can help with identifying the best path to growth for immigrant college students. Perceived discrimination, a person's perception of how they have been judged with a negative attitude or received unfair treatment, is associated with negative outcomes in immigrant college students (Jang, 2008). Various studies of college student samples found perceived discrimination to be a cultural stressor (Lorenzo-Blanco et al., 2021) that interfere with the academic success of immigrant college students. The experience of cultural stressors can come from direct interaction with the environment as well as individual-level characteristics. The present study was conceptualized within a cultural stress framework (Lorenzo-Blanco et al 2011) to describe differences in perceived discrimination by immigrant college students' national origin and the location of the university they attended. The sample consisted of 988 first-generation immigrant college students; their mean age was 20.77 (SD = 4.23). Most participants self-identified as female (72%), most were in their first year of college (31%), the others were sophomore (25%), Juniors (22%) and Seniors (14%). A 5x3 factorial design was used to explore the question regarding immigrant national origin (Afro Caribbean, European, East Asian, Hispanic Central and South American, South Asian) and university location (urban, suburban and college town) would be associated with mean differences in perceived discrimination. Results revealed a statistically significant interaction effect of the two variables immigrant national origin and university location on perceived discrimination $F(8, 807) = 4.56$, $p < .001$ The interaction effect was small ($\eta^2 = 4\%$). Findings indicated perception of discrimination depended on whether the immigrant student was Afro Caribbean, East Asian, European, Hispanic, or South Asian and whether they attended a university located in an urban, suburban or a college town. Afro Caribbean reported more perceived discrimination in college town, Hispanic reported more discrimination in suburban. This study suggests that immigrant college students may report differing levels of perceived discrimination depending on how they identified based on national origin and where they attended college.

31. A descriptive study of regional differences in school bond and family relations in a sample of immigrant adolescents.

Kiarra Harris, Jaden Beckles, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

According to the most recent US Census report (2021), children who identify with a racial or ethnic minority group will represent most of the youth population in the United States. By 2030 children under 18 who are Hispanic is expected to be about 27% of the US youth population. Pew Research Center report (2019) indicates the population of Hispanic adolescents increased by 22% from 2000 to 2016. Given the size and growth of the Hispanic adolescent population it is important to study factors associated with the development of Hispanic immigrant adolescent. According to ecological models of child development (e.g., Bronfenbrenner, 1965) the cultural context or macrosystem although distal, influences the way more proximal context like the family and the school that is, the microsystem provides support that contributes adolescents' healthy development. The present study used a survey design to describe differences in school connectedness and family functioning by the adolescent immigrant region of settlement. Participants included 301 Hispanic immigrant adolescents. They ranged from 13 to 16 years of age. Their region of settlement was southeast and western of the United States. Measures included a demographic questionnaire, a measure of school connectedness and family functioning. Independent t-test analysis indicated immigrant adolescents who settled in the southeast ($M = 20.82$, $SD = 3.31$) reported significantly higher mean levels of school connectedness

compared to immigrant adolescents who settled in the west (M = 19.15, SD = 4.24). The mean difference between the two groups was statistically significant t(299) = 3.82, p < .001, 95% CI for the mean difference [.81, 2.54]. Similarly, adolescents in the southeast reported higher mean levels of family communication (M = 50.86, SD = 8.01), t(280) = 3.09, p < .001, 95% CI for the mean difference [1.12, 5.05] and family cohesion (M = 14.45, SD = 2.58) t(300) = 4.82, p<.001, 95% CI for the mean difference [1.01, 2.41]. As conceptualized by ecological models of child development, the results of this study suggest differences in the microsystem such as the school and the family may be related to differences in the larger cultural context or macrosystem.

32. Association between parental history of alcohol and other drug use (aod) and problem behavior in a sample of immigrant college students

Shania Howard, Jaden Beckles, Kiarra Harris, Campbell Sadia, Sabrina Des Rosiers, and Guillermo Wated, (Department of Psychology, Barry University, Miami Shores, FL)

American College students with a parental history of substance use are at a higher risk of substance use and problem behavior themselves compared to immigrant college students (Salas-Wright et al., 2014). Studies show in general the prevalence of substance use disorders was highest among native-born Americans, slightly lower among second-generation immigrants, and markedly lower among first-generation immigrants (O'Malley, et al., 2002). However, studies have shown for both immigrants and non-immigrants parental substance use increases the likelihood of their children abusing substances in adolescence or young adulthood. Young adults who abuse substances are more likely to engage in risky sexual behaviors, experience violence, and are at greater risk for mental health problems and suicide, according to the CDC (2021). Homes of substance-using parents also face environmental and psychological challenges such as poverty, family dysfunction, and violence (Lam et al., 2004) which make their college students at increased risk of academic difficulties and other maladaptive behaviors (Ammerman et al., 1999; Lam et al., 2004). Challenges associated with immigration in addition to negative family circumstances may prevent immigrant college students from succeeding in college (Cadenas et al., 2022). Based on empirical evidence demonstrating exposure to parental substance use is positively associated with youth substance use, the present study took a correlational approach to describe patterns of relationship between parental alcohol and other drug use and problem behaviors among first-generation immigrant college students. Participants were N = 936, mean age = 20.81 (SD = 4.24). They self- identified as Afro Caribbean (9%), European (17%), East Asian (28%), Hispanic Central and South American (36%), and South Asian (10%). Most were attending universities in urban (42%) and college town (43%). Most self-identified as female (72%). Most were in their first year of college (31%), sophomore (25%), Juniors (22%) and Seniors (14%). Among those who reported exposure to parental substance use 15% had encouraged their parents to quit alcohol use, 9% reported hiding alcohol from their parents, 16% reported wishing their parents would stop drinking. A demographic questionnaire collected family history and their involvement in alcohol and other drug use and related-problem behaviors. Independent t-test results showed immigrant college students with a parental history reported more car-related risk behaviors (M = .85, SD = 1.45) compared to immigrant college students who did not. The mean difference between the two groups was statistically significant different, t(716) = 2.76, p <.01 and it was a large effect (Cohen'sD = 1.1), 95% CI for the mean difference [.10, .61]. Similarly higher mean levels of social aggression (M = 26.50, SD = 8.28) was statistically different between the two groups t(720) = 2.76, p <.01, (Cohen's D = .24), 95% CI for the mean difference [.19, 4.07]. This pattern was maintained for physical aggression (M = 21.71, SD = 7.71), t(722) = 2.20, p <.01, (Cohen'sD = .25), 95% CI for the mean difference [.21, 3.73]. Differences between the two groups regarding total involvement in problem behaviors M = 5.68, SD = 6.36), t(912) = 1.54, ns. These findings inform exposure to family history of substance use is enduring through the college years among immigrant college students. Future research should examine culturally relevant factors associated with this pattern in first-generation immigrant college students.

33. **Association between parental monitoring, helicopter parenting and academic achievement in immigrant college students: a retrospective study.**

Rebecca Lampert, Isabel Santana, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

According to Higher Ed Immigration Portal (2023), over 33% of college students in the United States are first- and second-generation immigrants. Recent studies (e.g., Moreno et al 2022) indicate immigration status is associated with overall health and achievement outcomes. A large landscape of developmental research has shown contextual attributes such as the family play a crucial role in academic achievement. Family functioning such as parental monitoring, the degree to which parents provide supervision without taking charge of the youth moment-to-moment decisions was associated with higher levels of academic performance (Nelson et al., 2011) . On the other helicopter parenting characterized by parental overinvolvement albeit well-meaning was associated with negative outcomes (e.g., Pistella et al., 2022) including lower academic performance (e.g., Schiffrin & Liss 2017). Few studies have examined perceived family functioning in college students despite recent evidence that such family experiences may be enduring when youth are in college. There is even less research describing perception of family functioning among immigrant college students. The present study is grounded within Bronfenbrenner conceptualization of the family as a microsystem that has immediate impact on individuals' development to explore patterns of association between perceived parental monitoring, perceived helicopter parenting and academic performance among immigrant college students. A sample of first-generation immigrant college N = 938 of diverse national origin was drawn from a larger study of development during emerging adulthood. Most participants self-identified as female (72%), mean age = 20.77 (SD = 4.23) of diverse college levels, first-year (31%), sophomore (25 %), Junior (22%), Seniors (14%), few were post graduate (8%). Measures included a demographic questionnaire in which students reported their GPA, as well as parental monitoring α= .76), overinvolvement (α= .74) and control (α; = .78) subscales of the Parental Behavior Scales (Schaeffer, 1965). Internal consistency analyses showed acceptable to good reliability. Results of Pearson bivariate correlations indicated GPA was positively associated perceived parental monitoring (r = .10, p <.01) and negatively associated with helicopter parenting (r = - .38, p <. 01). A statistically significant association was not observed between helicopter parenting and GPA (r =-.07, ns). Findings suggest the higher perception of monitoring was related to higher academic performance. Although the results regarding helicopter parenting are inconclusive it is noteworthy that pattern of directionality appears to be inverse. Such descriptive findings highlight perception of family functioning has relevance for first-generation immigrant college students.

34. **A descriptive analysis of the dark triad of personality and perceived employability in college students: is narcissism the best predictor?**

Daryle Pyles, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

The purpose of this study was to investigate whether individual differences in the Dark Triad (three different but related socially aversive personality traits) predict perceived employability (self-view on job hunting and/or maintenance). Prior research indicates that the Dark Triad predicts counter-productive behavior in the workplace. Currently, there is cursory research regarding the relationship between different levels of the specific traits composing the Dark Triad (DT) and perceived employability. Studies have shown that individuals who are high on DT are least likely to be cooperative in the workplace (Jonason, et al., 2015). They are also more likely to emphasize their own needs, devalue others, engage in insubordination, and be non-compliant (Mia, 2018). Studies that have explored the relationship between DT and work-related outcomes adopted a personality theoretical approach to define DT. Generally, DT includes these traits: (1) Narcissism, which encompasses grandiosity, (2) Psychopathy, being related to impulsivity along with a lack of empathy, and (3) Machiavellianism, showcasing manipulative behavior. The present study was based on the Paulhus and Williams conceptualization referred to as the interpersonal circumplex (Jones &Paulhus, 2014). Through this, we hypothesized that individuals who exhibit high levels of Narcissism, Psychopathy, and Machiavellianism will showcase high levels of perceived employability. The present study took a correlational approach to describe relationship between the Dark Triad personality traits

and perceived employability. Participants were N = 83. Their age ranged between 18 and 29 years. Most (57%) were born in the United States. Most participants self-identified as Hispanic (59%) and female (76%). The majority (78%) were currently employed and were in their last year in college (40%). Measures included a demographic questionnaire, the Dark Triad of Personality (D3-Short; Paulhus, 2013), the Perceived Employability scale (Rothwell, 2008). Reliability analysis indicated acceptable to good internal consistency for all measures. Multiple regression analysis revealed narcissism was a moderately strong positive predictor (β = .46, p <.001), whereas psychopathy was a negative predictor (β = -.24, p < .05) of perceived employability. Machiavellianism was not observed to be a statistically significant predictor of perceived employability. These findings suggest while the dark triad personality traits are related they are differentially predictive of perceived employability such that higher levels of narcissism was associated with higher levels of perceived employability whereas an inverse association was observed between psychopathy and perceived employability.

35. Relationship between parental monitoring, emotion regulation and sexual risk behaviors in emerging adults.

Isabel Santana, Sabrina Des Rosiers, and Guillermo Wated (Department of Psychology, Barry University, Miami Shores, FL)

Risky sexual behavior (RSB) is a public health issue among emerging adults (18-29 years). According to the CDC (2020), in the United States, people between the ages of 15 and 24 account for half of all STDs, almost half of unprotected sex during last sexual intercourse, 20% of HIV diagnoses and over 150,000 of babies were born to teen girls in 2019. These negative outcomes are related with involvement in RSB including early sexual initiation, sexual experiences under the influence of substances, and unprotected sex with one or more partners (YRBS, 2021). According to Bronfenbrenner bioecological systems model (1986), family functioning notably parental monitoring is a microsystem that proximally predict outcomes including RSB (e.g., Jones, et al 2017) as well as emotion regulation (ER), the process by which individuals engage in strategies to adjust the intensity of emotions so they can effectively attain their short and long-term goals (McRae &Gross,2020). Specifically, studies show parental monitoring increases optimal ER and decreases likelihood of RSB. Whereas optimal ER skills are negatively associated with RSB (e.g., Hadley, 2015) difficulties with ER are positively associated with RSB (e.g., Singh 2022). Given the importance of parental monitoring on development, some researchers have highlighted the need to explore the relationship between emerging adults' perception of family functioning and outcomes in emerging adulthood (e.g., Parra et al., 2019). Utilizing Bronfenbrenner conceptualization of the microsystem, the present correlational study described the association between perceived parental monitoring, ER and RSB. A sample of sexually active emerging adults (N = 318), Mean age = 20.12 (SD = 1.99) was drawn from a larger study on development during emerging adulthood. Participants were ethnically diverse. A majority (68%) self-identified as White, 63% self-identified as female and 67% were from intact families. Measures included a demographic questionnaire, the Parental Monitoring Scale (Davis, 2011) α= .82; The Emotion Regulation Questionnaire (Gross & John, 2003), α = .78. Findings from Pearson bivariate correlations indicated perceived parental monitoring was positively associated with optimal ER (r = .18, p <.01). The correlation coefficient between perceived parental monitoring and difficulties with ER was not statistically significant (r = -.08, ns). Optimal ER was negatively associated with casual sex (r =. - 13, p<.01). Difficulties with emotion regulation was positively associated with number of RSB in the last 30 days (r = .14, p <.01); sexual intercourse under the influence of substances (r = .12, p <05) and casual sex (r = .14, p <.01). Additionally, post hoc tests revealed statistically significant differences by gender in optimal ER t(314) = -2.25, p <.01 , difficulties with ER t(315) = 3.74, p <.001 and number of RSB in the past 30 days t(315) = 3.38, p <.001. Statistically significant differences were observed by ethnicity in optimal ER F (5,316) = 2.26, p <.05, perceived parental monitoring F (5,303) = 2.88, p <.01 and casual sex F (5,307) = 3.48, p <.01. Overall, findings indicate the more emerging adults perceived parental monitoring the more

likely they used optimal emotion regulation strategies. In addition, emerging adults who used optimal strategies to regulate emotions were least likely to engage in RSB whereas those who had difficulties with emotion regulation were more likely to report RSB. While an association between perceived parental monitoring and RSB was not observed. Post hoc results indicate that perceived parental monitoring may differ for specific ethnic groups of emerging adults. Future studies should examine group differences in perceived parental monitoring and other domains in perceived family functioning of relevance to RSB in emerging adulthood.

36. The impact of cognitive training and exercise on attentional resources in college athletes

Josephine Wiles, and Justin Lauro (Department of Psychology, Barry University, Miami Shores, FL)

Cognitive functioning, particularly executive functioning (e.g., online decision-making) are necessary for high level sports performance. Competing in athletics requires usage of precious cognitive resources, such as attention, decision making, and working memory. General Cognitive Training (CT) has emerged as an area of interest to improve core cognitive processes which may fundamentally underlie performance. One training method, the Episodic Specificity Induction (ESI) has been observed to improve performance in the general population on divergent thinking, problem solving, and imagination tasks. The present study examines the impact of an ESI as a CT method of improving vigilance and visual attentional processes in college athletes. 30 college athletes participated in the present study. A 2 (Exercise vs Control) x 2 (ESI vs control) mixed-subjects design was implemented to examine 1) the effects of exercise, 2) the effects of cognitive training, and 3) the potential interaction between exercise and cognitive training on cognitive functioning. A measure of signal detection accounting for hits (correct responses) and false alarms, was calculated for each of the three dependent measures. Three dependent measures of cognitive functioning were used: 1) the Mackworth Clock measure of vigilance, a visual search task, and a sustained attention to response task (SART2). All experiments were conducted in-person, using PSYToolkit software. In the exercise condition, participants rode an exercise bicycle for 20 minutes. Preliminary findings suggest that both cognitive training and exercise increase attentional processes in college athletes. However, further research is necessary, with different attentional demands, to determine the efficacy of ESI as a cognitive training method for athletes.

DEPARTMENT OF HEALTH PROMOTION & CLINICAL PRACTICE

37. Testing the Self-Verification Theory in Female Rowers Using Mental Toughness: Implications for Positive Sport Psychology

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Testing the Self-Verification Theory in Female Rowers Using Mental Toughness: Implications for Positive Sport Psychology Mental toughness (MT) and self-verification (SV) are constructs within Positive Psychology that have been related to well-being. A key attribute for success in sports is MT, which is under-investigated in females rowing. The SV theory proposes that individuals seek to confirm and maintain their existing self-views by selectively interacting with others who validate their beliefs. Although the relevance of this theory to Positive Sport Psychology has yet to be explored, it holds the potential to elucidate the dynamic between athletes and coaches. PURPOSE: Examine whether SV theory could explain the choices made by female rowers in selecting coaches to interact with, specifically in terms of MT. METHODS: All Division II rowers (n = 12) completed the Mental Toughness Index (MTI) to assess their own MT levels. They also completed the MTI twice more, based on their perception of how their coaches (n = 2) viewed them. Finally, the rowers indicated which coach they would prefer to interact with. A chi-square test in Jamovi vs.2.3.21 ($p < .005$) was conducted to examine potential differences between the coach they chose (Condition A) and the coach they were expected to choose based on the SV theory (i.e., the coach whose perceived MTI scores were more similar to the rowers' self-assessments; Condition B). RESULTS: The McNemar paired-samples test revealed no significant difference in the proportions of success between conditions: $x^2(1) = 1.80$, $p = .18$. The log odds ratio (OR) was -1.39, indicating a large effect size ($p = .375$). CONCLUSION: Our results are the first to reveal that the SV theory appears to be relevant in the domain of MT among female rowers and their coaches. Specifically, the investigation has shown that there were no significant disparities between the coaches that the athletes selected to engage with and the coaches that they were expected to choose, based on the theory. These findings suggest that individuals may seek out associations and exchanges that are consistent with their self-views, even in the context of sports performance and MT. In conclusion, the study contributes to a better understanding of the potential implications of the SV theory in the realm of Positive Sport Psychology and underscores the significance of comprehending how self-views and relationships can impact one's performance and overall well-being.

38. Using the military training mental toughness inventory on firefighters: preliminary evidence on inter-rater reliability

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BACKGROUND: Mental toughness (MT) research is predominantly cross-sectional and based on self-assessment. MT has been consistently positively associated with performance metrics when investigated in stressful and demanding environments, such as sports and tactical. The Military Training Mental Toughness Inventory (MTMTI) is used to measure MT from a tactical athlete perspective. Like military personnel, firefighting action requires firefighters to perform under intense pressure in highly stressful environments, characterized by fear, fatigue, and anxiety caused mainly by risk to one's life. MT in firefighting research is scarce. There is no firefighting-specific MT instrument. This study examined the inter-rater reliability of MTMTI in firefighters via a repeated-measure design. METHODS: Fourteen male firefighters (Age: 29.0 ± 7.0; BMI: 26.3 ± 2.7) were recruited from two fire departments. Data collection took place over two days (one administration per day). The level of the MT of the participants was assessed via the MTMTI, which was administered to two of their officers (peer-rating). The MTMTI includes six items rating on a 7-point Likert scale (1: Never; 7: Always) how well an individual can maintain a high level of performance when confronted

with stressful situations in their tactical occupation (e.g., “when the conditions are difficult”, “when he has been reprimanded or punished”). Inter-rater reliability was assessed by Cohen’s κ, Cronbach’s α, McDonald’s ω, and interclass correlation coefficient (ICC) using R statistical packages in Jamovi version 2.3 ($p < .05$). RESULTS: Kappa coefficient of inter-rater reliability was none to slight (.04, $p = .38$) with 7% of agreement between the two raters. Alpha, omega, and inter-rater coefficients of inter-rater reliability were poor (.51, .53, .51, $p = .1$, 95%CI [-.24, .81], respectively). Inter-rater correlation was .36, $p > .05$. CONCLUSION: Our results do not indicate agreement between the two raters. Therefore, the inferences of the MT scores of these two different raters are not in agreement, either. Reasons could include the unsuitability of MTMTI for firefighters and/or raters having a different perception of what constitutes MT. Regardless, practitioners should be cautious when interpreting the scores of the MTMTI on this specific tactical population.

39. Predicting Firefighters’ Physical Ability Test Scores From Anaerobic Fitness Parameters

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BACKGROUND: The physical ability test (PAT) evaluates firefighters’ (FF) fitness to execute occupational tasks. The aerobic system’s contribution to PAT performance is extensive; however, research is inconclusive regarding the involvement of the anaerobic system during PAT. This study aimed to identify relationships between specific anaerobic fitness (AF) tests’ and PAT’s time scores and to create a model to best predict PAT using these AF parameters. METHODS: A preliminary convenience sample of 14 male FFs (Age: 29.0±7.0yrs; Height: 1.7±0.1m; Weight: 79.9±13.0kg; Occupational-Weight: 102.6±13.0kg; BF%: 17.9±5.6%) from two fire departments was used. Data collection took place over two separate days. On day one, FFs completed a PAT composed of occupationally-specific tasks in full gear. On day two, FFs performed a series of anaerobic fitness assessment in full gear: handgrip-dynamometry, maximal vertical-jump, Margaria-Kalamen staircase test, and 300-yard shuttle run (300YD). Pearson-product moment correlation coefficients were used to examine associations between dependent variables and PAT. Multiple backward regression analysis was used to model the PAT using AF parameters (i.e., HG: Handgrip dynamometer absolute strength; VJAPP: Vertical jump absolute peak power; MKAP: Margaria-Kalamen staircase test absolute power; 300YD: 300-yard [274 m] shuttle run test). All statistical analyses were performed with IBM SPSS 27.0, with a significance level of $p < 0.05$. RESULTS: PAT was significantly correlated with HG ($r = -0.71$, $p < 0.01$), VJ ($r = -0.73$, $p < 0.01$), MK ($r = -0.75$, $p < 0.01$), and non-significantly with 300YD ($r = 0.60$, $p < 0.05$). A 78% proportion of variation observed in PAT was explained by the aforementioned AF parameters ($F_{2, 13} = 20.2$, $p < 0.05$). CONCLUSION: The examined anaerobic subsystems significantly contribute to PAT performance. FFs should optimize AF training, which would allow for potentially enhanced occupational performance in PAT. Further investigation into anaerobic physiological determinants of FFs with larger sample size is recommended.

40. Differences in standard upper quarter y-balance test and two modified versions between an elderly demographic

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The Upper Quarter Y-Balance Test (UQYBT) is often used to measure shoulder mobility and stability and screen for upper extremities musculoskeletal disorders in the physically active and athletic population. Shoulder injuries are typical among older adults, often decreasing the quality of life. There are no studies investigating the functionality of the UQYBT on older adults. PURPOSE: To examine the functionality of the UQYBT and two variations on the older population, 50 years old and older. METHODS: Eight individuals (2 males and 6 females) 50 years old and older participated in this study (56.8±3.9 years, 166.0±10.0 cm, 69.6±13.5 kg). Each participant completed a five-minute warm-up on an arm ergometer followed by an arm length measurement. Participants completed the three UQYBT variations in a randomized order; Standard push-up position (SUQYBT), Modified push-up position (MUQYBT), and Wall push-up position (WUQYBT). In each variation, participants completed three

reaches in the medial, inferolateral, and superolateral directions for the right and left hands. Highest score for each reach from the different UQYBT variations and supporting hand were saved to further analysis. Relative reach scores were calculated using the length of the right arm as the reference. Composite scores were also calculated by summing up the reach scores in each direction. Repeated measured ANOVAs were used to compare between the reaching direction and the UQYBT variations in the older population. This analysis was followed by post-hoc analysis, alpha level was set to 0.05. RESULTS: significant main effects were identified in the Medial Reach (p-value<0.01), Superolateral reach (p-value<0.01), and Composite Score (p-value<0.01) between the test variations. No significant differences were observed in the inferolateral reach (SUQYBT 84.3±12.4; MUQYBT 80.8±9.5%; WUQYBT 83.5±14.4%), p-value=0.710. Post hoc analyses identified that in the Medial reach, on average, the scores were lower in the SUQYBT (99.7±7.9%), than in the MUQYBT (111.1±14.5%), and WUQYBT (121.5±10.9%), p-value<0.01. MUQYBT had lower scores than the WUQYBT, p-value=0.02. In the Superolateral reach, on average, WUQYBT scores (81.1±9.5%) were higher than MUQYBT (70.1±10.1%) and SUQYBT (58.3±7.5%), and MUQYBT scores were higher than SUQYBT, p-value<0.01. Similar results were identified in the composite scores, on average, WUQYBT scores (95.4±9.3%) were higher than MUQYBT (87.3±10.7%) and SUQYBT (80.8 ±7.7%), and MUQYBT scores were higher than SUQYBT, p-value<0.02. CONCLUSION: Several differences were observed between the three reaches. WUQYBT and MUQYBT showed a much higher outcome than SUQYBT, specifically Medial reach. WUQYBT and MUQYBT, with further study, could be used to evaluate the shoulder dynamics of an elderly individual without the constraint of supporting one's weight.

41. Prognostic validity of professional soccer status by anthropometrics and repeated jump testing

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BACKGROUND: Soccer is characterized by intermittent high-intensity actions interspersed with lower intensity ones. Soccer clubs invest time and money to early identify and nurture potential professional players in the premise to maximize the return of their investment. Multidimensional talent identification models are proposed as best practice but are difficult to be implemented in the field. Explosive lower limbs strength assessment by vertical jumping (VJ) is used as a single predictor for future player status. Alternative to VJ, the repeated vertical jump test (RVJ) has been proposed, but its prognostic ability is still unexplored. PURPOSE: To analyze the prognostic validity of the RVJ obtained variables within professional (PRO) and under 19 years old (U19) male soccer players. It was hypothesized that anthropometric and performance related variables modeled on U19 will fail to predict the PRO status. METHODS: Forty-four participants (PRO=24, U19=20), after the end of the preseason, performed 15 RVJ aiming for highest jump (h_{JUMP}) with the minimum possible ground contact time. Group differences examined by t-test, binomial logistic regression (BLR) calculated the likelihood of each individual to be categorized as PRO or U19 and receiver operating characteristic (ROC) for prognostic validity of anthropometric and performance derivative values in predicting PRO status were used at $p < 0.05$. Statistical analyses were performed using the R-based software Jamovi version 2.3.3.0. RESULTS: PRO and U19 significantly differed in body height, mass, body mass index (BMI), h_{JUMP}, average jump height, and relative jump power. The prediction model was significant ($x^2(2) = 17.12$, $p < 0.001$). From the examined variables, only height and BMI were positive predictors of the PRO status ($b = 21.66$, $SE = 8.20$, $p = 0.008$ and $b = 0.94$, $SE = 0.38$, $p = 0.014$, respectively). The model was 73% accurate, 75% specific, and 71% sensitive, with excellent area under the curve (AUC = 0.82). CONCLUSION: The RVJ test demonstrated exceptional discriminating prognostic validity between PRO and U19 soccer players. Until the applicability of the multidimensional models in predicting future player status is further established, field practitioners may use the simplistic and single dimensional RVJ testing to predict future status among male soccer players.

AMERICAN HERITAGE SCHOOL

42. Investigating the Efficiency of Constructed Wetlands for the Phytoremediation of Nanosilver and Microplastics

Anagha Iyer *(American Heritage School)*

As a result of the COVID-19 pandemic, the amount of pollution that enters waterways has increased greatly. Such pollutants include microplastics and nanosilver escape into waterways. Thus, the use of constructed wetlands, a form of water treatment that utilizes microorganisms and plants to remove pollutants, has become increasingly popular. Plant growth promoting bacteria specifically alleviate stress of plants and make essential biofilms that can catch small waste. This study employed L. minor, an aquatic floating plant, and 3 plant growth promoting bacterias to see whether these bacterias can be used in combination with L. minor to effectively remove more pollutants. When all 3 bacterias were added, L. minor's potential to accumulate nanosilver increased from 382ug/g to as much as 440ug/g. Similarly for microplastics, these numbers significantly increased from 0.011ug/g to 0.012ug/g. In addition, the bacteria that created the best biofilm was directly correlated with the increase in the amount of pollutants removed. When L. minor was exposed to just the pollutants, chlorophyll content significantly decreased from 4.17mg/mL to as low as 2.86mg/mL; however, with the addition of the bacterium, these numbers increased back to regular levels ranging from 3.41-4.15mg/mL. These forms of constructed wetlands provide insight into how exactly treatment plants can effectively remove pollutants from wastewater with the addition of bacterium, by increasing uptake abilities and promoting plant growth. This method can be utilized in primary wastewater management to remove these particles before chlorination.

43. A Microwave-based Machine Learning Approach to Predict Eyewall Replacement Cycles

Lorenzo Pulmano *(American Heritage School)*

Eyewall replacement cycles (ERCs) occur in mainly intense tropical cyclones (TCs), during which a secondary outer eyewall forms around the primary inner eyewall. The primary eyewall weakens and is replaced by the outer eyewall. The intensity of a TC decreases because of associated structural changes and a reduction in maximum wind speed (MWS). However, TCs often re-intensify into stronger storms after an ERC is complete. These events are visible on satellite microwave imagery, notably on the 89-95 GHz microwave band, as concentric circles. The objective of this project was to create a proof-of-concept convolutional neural network (CNN) to predict ERCs using the aforementioned microwave band for training and testing. The training set is comprised of North Atlantic basin (NATL) storms from 1999-2009. The testing set includes NATL storms from 2017-2021. Six models were created, together known as the Prediction of Eyewall Replacement Cycles using CNN Ensemble (PERCCE). Using a rudimentary methodology for PERCCE, the results and ability of the ensemble was compared to the Automated Rotational Center for Hurricane Eye Retrieval (ARCHER) Microwave-based Probability of Eyewall Replacement Cycle (M-PERC), an existing logistical regression model that uses 89-95 GHz microwave imagery and MWS to predict ERCs. PERCCE predicted 15 ERCs, of which 8 were correct, but missed 9 events whereas M-PERC predicted 34 ERCs, of which 11 were correct, but missed 6 ERCs. PERCCE produces few false positives compared to M-PERC and does not suffer from dry and sheared environments. This project effectively demonstrates the potential of CNNs for ERC prediction.

44. The Effect of Overnutrition on Mediated Collagen in Drosophila Melanogaster Physiology

Nicholas Kwok *(American Heritage School)*

Obesity affects approximately 13% of the adult population, resulting in excessive fat cell deposition and metabolic dysfunction. Collagen, a protein that supports skin regeneration, muscle building, and pain relief, is studied in Drosophila melanogaster under different diet conditions. This experiment

aims to test whether overnutrition affects physiology and collagen due to any anatomical changes in Drosophila Melanogaster, more commonly known as fruit flies. The research conducted over several weeks utilizes two diets: an obesity-inducing diet containing excessive glucose and coconut oil and a traditional diet of blue food medium, yeast, and water. The study groups include a wild-type, collagen-mutated, and obesity-mutated group, with multiple assays measuring how the obesity-inducing diet affects each population and their collagen levels. The results reveal that the obese group experienced higher food consumption levels but had lower locomotive ability than the other test groups. Hydroxyproline, the building amino acid for collagen, and collagen levels were higher in the obesity mutant than in the wild-type and collagen mutated group. The study shows that anatomical changes in organisms are influenced by both diet and movement. The obesity group, on an obesity-inducing diet, experienced decreased movement related to increased food intake and decreased neural activity. The high-fat and high-sugar diet suppressed neuronal autophagy, created inaccurate hunger and satiety perceptions, and increased collagen deposition. Anatomical changes were observed in collagen-heavy tissue areas, whereas decreased neural activity and increased feeding rates were behavioral changes. The study emphasized the importance of a healthy diet and exercise in promoting overall health.

45. The Use of the Crude Extract of Immuno-activated C. Elegans as Treatment for Inflammation

Malcolm Owusu *(American Heritage School)*

Helminth Therapy is the practice of infecting oneself with parasites to cure ailments. The hypothesis was formed in the 20th century and experimentation began around 10 years ago. The main mechanism is the idea that infection causes a shift in immune response from Th1 (inflammation promoting) to Th2 (inflammation reducing) as the body uses Th2 response to fight against the helminth. However, self-infection comes with side effects. This study aims to exploit the anti-inflammatory response whilst minimizing the risks of helminth therapy. C. elegans contain the same secretory proteins responsible for responses in conventional helminths. Moreover, the malleable innate immune systems of C. elegans allow their genomes to be altered. By using bacterial and fungal pathogens (S. aureus, P. aeruginosa, and C. albicans). This change in genome alters the secretory proteins which help fight inflammation. Crude extracts of the immuno-manipulated C. elegans proteins can be obtained and used to cause the helminth Th balance switch without the negatives of being actually infected. Inflammation will be induced in zebrafish embryos via the use of TNBS and Dextran sodium sulfate; gut architecture, goblet cell count, and leukocyte migration will be used as measures of inflammation. Results show promise for C. elegans crude extract as a treatment for inflammation as well as support for immuno-regulating the C. elegans to fight specific types of inflammation. This study explores the experimental field of helminth therapy to validate it as an alternative inflammation treatment, especially in autoimmune diseases where the Th1 cytokine levels are so prevalent.

46. Transgenerational effects of the college epidemic on food addiction and obesity using Caenorhabditis elegans as a model

Melodi Fugate *(American Heritage School)*

Obesity is a common condition worldwide, it is garnering more concern as it comes with a myriad of problems: diabetes, heart disease and cancer. Food addiction is another common condition that has gained attention as a potential contributor to obesity. Food addiction describes an addictive eating pattern with cravings for foods high in fat and sugar. Today's college epidemic can be used to describe experiences of the majority of students worldwide. It involves three components: sleep deprivation, consumption of processed foods, specifically high fructose corn syrup (HFCS), and consumption of ethanol. This research looks at how this epidemic has impacts that span generations through epigenetic influences, increasing likelihood of food addiction and obesity in future generations. *Caenorhabditis elegans* were used in this research as they are optimal for transgenerational studies. FLP-18 mutants were included in this study as they have excess intestinal fat which simulates how people genetically predisposed to obesity may be affected by this epidemic.

The following results will likely be observed in *C. elegans* exposed to the college epidemic: decreased activity shown by the Body Thrash assay, overexpression of the FLP-18 gene shown by qPCR, increased DNA methylation rates demonstrated by gel electrophoresis, increased preference for HFCS demonstrated by a preference assay, increased appetite as demonstrated by the pharyngeal pumping assay and increased fat accumulation demonstrated by Nile Red staining. While data is still being collected, such results will likely indicate that the college epidemic has epigenetic effects contributing to food addiction and obesity throughout generations.

47. Determining the Association Between Pets Sleeping in the Bed and Insomnia Symptoms Using Multivariable Linear Regression models

Ellaheh Gohari *(American Heritage School)*

Little is known about the association of pets and insomnia symptoms among US veterans. The aim of this study was to examine the association between pets sleeping in the bedroom and insomnia symptoms in US veterans. The sample consisted of US veterans at risk for sleep apnea (SA). Veterans completed home polysomnography and questionnaires which queried demographics, pet characteristics, insomnia (ISI), and mental health symptoms. Three linear regression models were constructed evaluating the associations between pet ownership and total ISI score, nocturnal symptoms, and daytime impairment symptoms. Models were adjusted for relevant covariates. 411 veterans (age 51±14, BMI 32±6 Kg/m^2, 87% male) were studied. Sixty-seven veterans reported sleeping with a pet in the bedroom. Of these, 19% sleep with a cat, 76% sleep with a dog, 6% sleep with both, and 31% sleep with multiple pets. The mean ISI was 18±7, and 81% of the sample had SA. In adjusted analyses relative to veterans without pets, co-sleeping with a pet in bed was negatively associated with total ISI and daytime impairments but was not associated with nocturnal insomnia symptoms. Furthermore, sleeping with a pet in the bedroom but outside the bed was not associated with insomnia symptoms in any model. Among veterans with a high prevalence of SA, co-sleeping with pets in bed was associated with less daytime impairment, but not greater nocturnal insomnia symptoms. Further studies are needed to clarify whether improvement in daytime impairment may be mediated through improvements in mental health among veterans co-sleeping with pets.

48. Bicarbonate Buffering As A Treatment For Atherosclerosis

Amarachukwu Okpala *(American Heritage School)*

Cardiovascular disease (CVD) has become one of the leading causes of mortality and morbidity globally. Atherosclerosis is a CVD characterized by the stiffening of the blood vessels, where the build up of fats, cholesterol, and other substances inside artery walls can block blood flow to important organs such as the heart and brain. The most effective treatment, statins, lowers platelet count, which increases the risk of diabetes and hemorrhagic stroke. Foam cells, macrophages that have engulfed the contents of plaque, contribute heavily to the formation of plaque, dying and depositing themself on the lining of the blood vessel. They also create a hypoxic environment, causing lactic acid buildup around a forming plaque. The adenosine triphosphate-binding cassette (ABC) transporter ABCA1 plays a key role in preventing foam cell formation, clearing cholesterol from foam cells and returning them to the liver for conversion into bile acids and excretion into bile. However, the ABCA1 gene is downregulated by the acidic environment of atherosclerotic lesions, compromising cholesterol clearance from atherosclerotic lesions. Bicarbonate is a basic compound that safely buffers lactic acid produced during physical exertion through the bicarbonate buffering system. Using murine macrophages as a model, it successfully showed the ability to bring the acidic pH caused by lactic acid to the normal physiological pH, and decreasing the formation of foam cells, increasing the viability of the cells compared to untreated cells. Therefore, utilizing bicarbonate buffering can be used as a safe, minimally invasive treatment for atherosclerosis.

49. The Effect of Sphingolipid Metabolites on Asthmatic Signaling in A549 Cells

Samuil Petrov *(American Heritage School)*

The asthma-implicated gene ORMDL3 has been found to inhibit de novo sphingolipid synthesis. This paper serves to examine the link between sphingolipids, and asthmatic signaling within airway epithelial (A549) cells. The effects of ORMDL3 on the sphingolipid synthesis pathway is mimicked by the protein myriocin, which was used in experimental groups to represent over-expressed ORMDL3. Interleukin-13 (IL-13) was used as the cytokine for generating the model asthmatic inflammatory response in the A549 cells. Various sphingolipids—sphingosine 1-phosphate (S1P), ceramide 1-phosphate (C1P), and C-16 ceramide—were introduced to A549 cells with or without myriocin, inflammation induced, and then the effects on asthmatic signaling recorded. Specifically, the effects on the 15-lipoxygenase-1 (15-LO-1) and TGF-α/EGFR pathways, which are implicated in mucus overproduction and cellular proliferation, respectively. The experiment concluded that the impairment of sphingolipid synthesis resulted in vastly decreased cell viability across all assays. Notably, the addition of C-16 ceramide to myriocin-treated cells returned 15-HETE concentrations back to standard levels. This suggests C-16 ceramide should be investigated as a possible remedy for asthma. Further, both C-16 Ceramide and S1P were able to reduce the activation of the 15-LO-1 pathway after stimulation with IL-13, as well as promoting normal cellular growth. These results suggest grounds for future research into utilizing C-16 Ceramide and/or S1P as treatments for patients with an ORMDL3 polymorphism, or even as general anti-inflammatory medicines.

50. Use of Essential Oil Cinnamomum Camphora and Grapefruit Seed Extract to Decrease Pathogenicity of Staphylococcus Aureus and Chromobacterium Violaceum in Chemotaxis Impaired C. Elegans

Armaan Fatteh-Patil *(American Heritage School)*

In patients with an impaired or diminished immune system, infection can be more severe. Chemotaxis of leukocytes is an important part of human immune responses against infection by certain microorganisms. Utilizing signaling of chemotaxis, immune cells move toward sites of infection to fight foreign bodies. Additionally, chemotaxis signaling can lead organisms to a nutrition source or even away from areas when a chemorepellent effect occurs. Patients can have impairment of chemotaxis of leukocytes as a result of underlying conditions such as Diabetes. This puts them at increased risk of suffering severe consequences of infection. In looking for a path to mitigate the severity of illness, the model C. elegans is used with the addition of cinnamomum camphora essential oil and grapefruit seed extract which has been shown to have antibacterial benefits in part by impeding biofilm formation. Sensory chemotaxis deficient C. elegans mutants are studied and exposed to Staphylococcus aureus and Chromobacterium violaceum. Cinnamomum camphora essential oil and grapefruit seed extract is added to the nematode growth medium and mutant and wildtype *C. elegans* are studied for comparison. Chemotaxis and drop test assays are utilized to measure the choice response of *C. elegans* to pathogenic *Staphylococcus Aureus* or *Chromobacterium violaceum* with and without addition of the Grapefruit seed extract and cinnamomum camphora essential oil. The *C. elegans* chemotaxis (RGS-3 mutant) demonstrated an increase in avoidance behavior to pathogenic Staphylococcus aureus and *Chromobacterium violaceum* organisms when cinnamomum camphora essential oil or grapefruit extract were added to the medium.

51. Identifying Inexpensive Bufo Toad Toxin Treatments for Canines

Anneliese Hsiao *(American Heritage School)*

A leading cause of sudden unexpected canine death in South Florida is toxin exposure from Rhinella marina, commonly known as the bufo toad or cane toad. Bufotoxin is known to work in a similar way as cardiac glycosides, such as digoxin and digitalis and directly inhibits the sodium potassium ATP pump located in the cell membrane. The only current effective treatment for bufotoxin poisoning is Digifab, an antibody developed for cardiac glycoside toxicity for humans. Unfortunately, it is extremely

expensive ($5400 per dose) and thus not cost effective. Due to this, many vets are not even familiar with the possibility of using Digifab to treat dogs. The purpose of this experiment was to find an inexpensive treatment from a selection of novel agents for bufotoxin toxicity in dogs. Insulin, norepinephrine, and magnesium have been shown to modulate and enhance the activity of the sodium-potassium pump. It was hypothesized these may be effective at counteracting the inhibition of the pump by bufotoxin. Cytotoxicity by bufotoxin was tested with MTT viability assay. Magnesium and norepinephrine did not protect from bufotoxin cytotoxicity. However, insulin was significantly effective at reversing bufotoxin cytotoxicity and improving cell survival at 6, 0.6, and 0.06 μM ($p=0.01$, $p=0.001$, $p<0.001$ respectively). Insulin is inexpensive ($25 per vial), can be purchased without a prescription, and is easily stored, making it an affordable and ideal antidote that a pet owner can keep at home and is commonly available also in veterinary offices.

52. Comparison of Machine Learning Algorithms for DC Motor PID Control with Genetic Algorithm

Ethan Deng *(American Heritage School)*

Proportional-Integral-Derivative (PID) is a closed loop control system based on a dynamic system feedback that is commonly employed in industrial control systems that require continuous modulated control. A PID control system continuously calculates the sum of error value *e(t)* of the system, which is the difference between the desired setpoint (SP) and a measured process variable (PV) and applies a correction to the system input based on the proportional, integral, and derivative controller. In principles of computer science, Machine Learning (ML) is defined as the ability of a program to learn and adapt from data to improve its performance on a certain task without explicitly being programmed to do so. Genetic Algorithm (GA), a subset of evolutionary algorithms, is a metaheuristic algorithm inspired by the process of natural selection and genetics, commonly used to solve search and optimization problems in machine learning. The research aims to compare the results of utilizing various machine learning algorithms with genetic algorithms to optimize PID control parameters to achieve more precise and efficient control of 12V DC motors with quadrature encoders. After a series of selections and crossovers, the genetic algorithm should be able to select the best performing combination of PID constants that would result in a minimal error value for the system. Optimizing PID parameters to enhance the efficacy of classical control theory would increase machining precision in industrial production and improve the robustness of integrated PID controllers in complex environments such as implantable artificial organs in the human body.

53. Mitigation of Decreased Protein Synthesis Under Elevated CO_2 in C3 Plants Using Transgenic and Exogenous Methods

Jacob Federici *(American Heritage School)*

The purpose of this experiment is to evaluate two transgenic and one exogenous approach to ameliorating decreased protein synthesis under elevated carbon dioxide in *Arabidopsis thaliana,* as well as evaluate the role of nitrogen assimilation, senescence, and photorespiration in the phenomena through metabolite analysis. Previous research has shown that competition between carbon assimilatory and nitrogen assimilatory processes for the reductant reduced ferredoxin has led to decreases in nitrogen assimilation under elevated carbon dioxide, a condition that upregulates carbon assimilatory processes. Knocking down ferredoxin:NADP-reductase (FNR) may decrease the competition for reductant, and yield loss by lack of NADPH may be compensated by greater amounts of available carbon and energy. Decreased photorespiration and peroxisomal senescence have also previously been observed as effects of elevated carbon dioxide. Agrobacterium-mediated transformation of *Arabidopsis thaliana* with the IPT8 gene, encoding the cytokinin producing enzyme isopentenyl transferase, may prevent senescence and maintain peroxisomal integrity. Exogenously supplementing subjects with the synthetic cytokinin, 6-benzylaminopurine (6-BAP) may yield similar effects. Under a constructed elevated CO2 (850ppm) environment, the FNR mutant had significantly decreased mass compared and significantly greater glutamate and protein than eCO2-wildtype but not aCO2-wildtype. Supplementation with 6-BAP caused growth inhibition at aCO2 but not at eCO2, and 6-BAP subjects contained significantly greater glutamate and protein levels than eCO2 wild type.

IPT8 similarly increased glutamate and protein levels but did not induce growth inhibition at either CO2 concentration, supporting its viability in increasing protein without sacrificing yield. A positive correlation between photorespiration and peroxisomal health was observed.

54. Terpene Compounds as a Treatment for Chemotherapy Induced Neurotoxicity

Likhitha Selvan *(American Heritage School)*

It was recently discovered that there is prevalence of chemotherapy-associated neurological effects in cancer patients. Specifically, cognitive impairment or “chemobrain” affects up to 75% of cancer patients during treatment and 35% of cancer patients post-treatment. With the rapid increase in the number of cancer survivors, chemobrain is becoming an urgent but unmet clinical need. Three compounds were shortlisted based on antioxidant and anticancer properties, and the ability to cross the blood barrier according to Lipinksi’s Rule of 5. The purpose of the study was to determine if the plant-based terpene compounds beta-Ionone, alpha-Pinene, and Terpinen-4-ol will be able to reduce the effects of cisplatin induced neurotoxicity. To study this, the cells were pretreated with the terpene compounds, then treated with the chemotherapeutic agent cisplatin. The expression of the proteins Caspase 3, Caspase 7, and PPAR, and cytotoxicity of the compounds were measured. The results signify that in cisplatin induced neurotoxicity, Terpinen-4-ol is able to reduce the expression of apoptotic proteins Caspase 7 and increase the expression of anti-apoptotic proteins PPAR at low concentrations, thereby reducing the cytotoxicity of cisplatin. Neurotoxicity caused by cisplatin treatment remains a serious dose limiting factor. However, this research provides a therapeutic approach to utilize Terpinen-4-ol as a pretreatment. This study brings attention to a different aspect of terpene compounds, whilst these compounds have the potential to be tested clinically as they have strong pharmacokinetic properties.

55. The behavioral and physiological impacts of chemical contaminants in hormetic concentrations on embryonic zebrafish

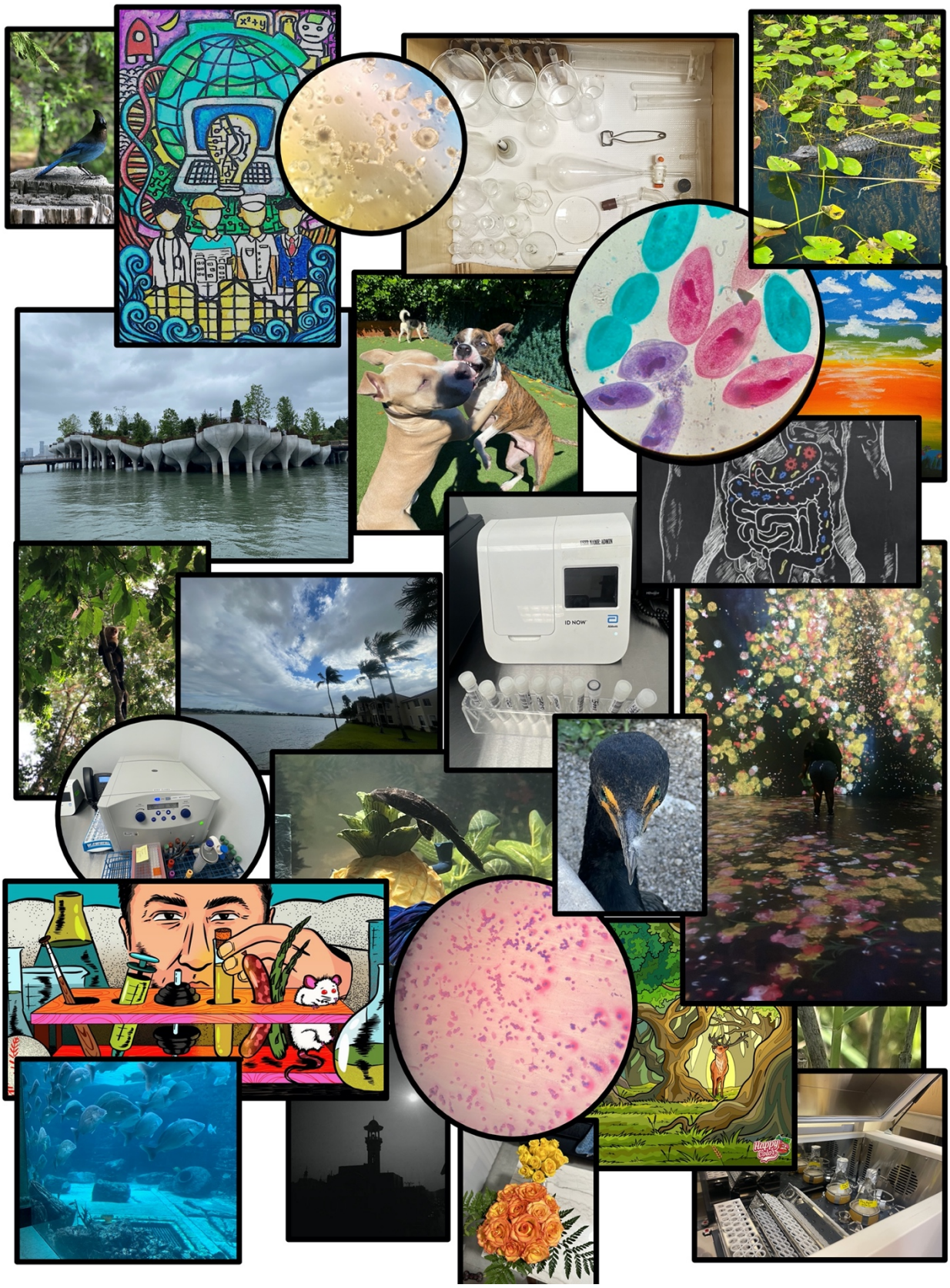
Akshay Kumar *(American Heritage School)*

Pharmaceutical chemicals are being produced, consumed, and excreted in human civilization at an increasing rate. These chemicals have the capacity to accumulate, especially in environments such as freshwater systems, but there have not been any major responses to this threat yet as the present concentrations of the chemicals is not viewed as dangerous. Previous research has shown that the developing concentrations of chemicals is an issue, supporting that these chemicals, though not present in large doses, have impacts on exposed organisms. However, prior research has not been conducted to examine the specific effects of chemicals at hormetic concentrations on freshwater organisms. “Hormetic concentration” defines the concentrations of chemicals at specific levels where the response to a low dose of chemical differs from the response to the high dose, and these were the ranges of concentration that were tested in this experiment. Zebrafish were acquired at zero days post fertilization, transferred to the medium containing the appropriate concentration of chemicals for the group that they would be a part of, and used as a model for aquatic organisms to show the resulting chemical, neural, and physical response to the chemical concentrations. The zebrafish were euthanized via bleaching and freezing prior to seven days post fertilization. The results of this experiment show that there is an ecological risk associated with the environmental accumulation of pharmaceutical chemical contaminants that is inherent to their use in human civilization, a result which makes it clear that this issue needs to be addressed.

56. The Effect of Varying Time Periods of the Intermittent Metabolic Switching (IMS) Diet on the Cognitive and Behavioral Abilities of mutant Drosophila melanogaster exhibiting Alzheimer's, leading to Neuroplasticity

Emma Colarte Delgado *(American Heritage School)*

The goal of this experiment was to determine the effect of Intermediate Metabolic Switching (IMS) on the short and long-term memory retention of mutant Drosophila exhibiting Alzheimer's disease. There have been past links between IMS and neuroplasticity. Neuroplasticity is the process of modifying neuronal functions and creating new neural networks. Plasticity can be measured in ketones, which are released during the plasticity process. IMS includes two components: fasting and a low-carbohydrate, high-fat diet. The Phenol-Sulfuric Acid Assay and the Hanus Iodine Solution Assay were both used to quantify the two diets of the flies, a 2:2 ratio of carbs to fats, and the other a 4:1 fat to carb ratio. It was hypothesized that if fruit flies are fed the IMS diet, leading to synaptic plasticity, then their overall memory and behavioral health will increase because of the amount of ketones released, increasing memory formation. Mutant Drosophila tested, which lacked the Amyloid-Precursor Protein-like gene (APPL), exhibited similarities to early-stage Alzheimer's patients. Assays used include the Aversive Phototaxic Suppression Assay to measure short term memory; the Aversive Pavlovian Olfactory Assay to measure long-term memory; the Drosophila Activity Monitor software, used to track Drosophila movement; the Drosophila Stress Odorent (dSO) Assay, used to measure mood changes in the flies, and the ß-Hydroxybutyrate Ketone Quantification assay, to measure ketones and ensure the IMS diet worked. Results from assays were all conclusive, establishing that the flies in the 4:1 diet were more sensitive but retained short and long term memory and the use of IMS as a preventative mechanism for Alzheimer's.



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