

Celebration of **SCHOLARSHIP**



THURSDAY, APRIL 13, 2023

Poster Presentation Program

IWU'S ANNUAL UNDERGRADUATE RESEARCH CONFERENCE

SPONSORED BY THE JOHN WESLEY HONORS COLLEGE

Throughout the day (8am to 4:30pm) on Thursday, student researchers will be available to present and take questions at their posters during the times indicated in the program and listed on the posters. Natural Sciences presenters will present, in addition, between 2:00 and 4:00pm.

BARNES STUDENT CENTER COMMONS

[Stage]

Music (3) Theology and Ministry (1)



[Baldwin Windows]

† Investigating the synergistic effects of HKLM, IFN γ , and CCL3 on macrophage activation using RAW 264.7

cell line

Mary Bonanno

As a part of the Summer Undergraduate Research Program at Albert Einstein College of Medicine, Mary researched the activation of macrophages in Dr. Gregoire Lauvau's lab. Upon recognition of a cognate antigen, CD8+ T cells release cytokines for the activation of the innate immune system before clonal expansion occurs providing a rapid immune response. Immunosuppressed individuals often lack the immune response needed to stimulate macrophages in this way. A potential therapeutic option is to create a bispecific fusion antibody that mimics the cytokine release from T cells to activate monocytes. It has been seen in vivo that memory T cells activate monocytes to initiate protection against tumors by the release of cytokines IFN γ and CCL3. Our goal is to create an in vitro assay to assess the functionality of a newly developed bispecific IFN γ and CCL3 fusion antibody that will be used to stimulate macrophages in vivo. The in vitro assay has 3 signals, a bacterial antigen (HKLM), CCL3, and IFN γ that stimulate production of transcription factors and activation markers which can be analyzed by flow cytometry. The minimum microbial signal for activation of macrophages in vitro has been determined and the monomeric IFN γ fusion antibody improves the release of activation markers from monocytes. The development of this antibody in vitro will contribute to the development of a macrophage activating immunomodular antibody therapy.

E.Coli in fast food chains

Courtney Studiale and Tara Renbarger

Intestinal Bacteria in Fast Food Chain Menu Items

I am conducting a research project with Dr. Tara Renbarger this semester. We want to conduct research that will catch the interest of many individuals. Both Dr. Renbarger and I have an interest in microbiology and how the process of living things inside our body affects our life in such a significant way. Today, fast food has become something that is convenient for everyone especially college students due to their prices and speed. I will be visiting various fast-food restaurants to obtain samples of food (most popular menu item), ice, and drink. We will be testing this food for intestinal bacteria such as E. coli. I will take a sample of each drink along with the ice. With this sample, I will add a portion of liquid directly to a petri dish to test the fountain contamination in its entirety. Next, we will blend a portion of the food in sterile broth and add the mixture to a plate. The petri dishes that are going to be used will detect coliforms, this will allow us to automatically determine what kind of intestinal bacteria was in the sample. I will be observing the composition of the bacteria to see the amount and if there are any other harmful components in our sample. The restaurants that we will be sampling from are McDonalds, Burger King, KFC, Culvers, Popeyes, Steak and Shake, and Wendy's. Our hypothesis is that Steak and Shake and Burger King will give us the most contaminated food. After we study the menu items and their contamination level, we will make an analysis on how this may affect the natural microbes that are in our intestines. It is possible that the contamination can lead to harmful bacteria in our gut that can result in obesity or other intestinal diseases.

† Endocytosis Inhibition as a Rescue Strategy for Zoledronate-Induced Cell Death

Alex Cartwright

Medication-related osteonecrosis of the jaw (MRONJ) arises most often in cancer or osteoporosis patients. The disease causes the jawbone and surrounding tissue to necrose, leaving painful intraoral fistulae and complications. Nitrogen-containing bisphosphonates (NBP's) are the most prominent risk factor for MRONJ. Zoledronate (ZOL) is one of the most potent NBP's available and was therefore chosen for this study. Blocking ZOL's entry specifically into cells of the oral cavity would make treatment easier for these same patients by removing the possibility of developing MRONJ from systemic NBP administration. This study investigates endocytosis as a possible cell uptake mechanism for ZOL by inhibiting different types of endocytosis and further determining if any of the inhibition rescues from ZOL-induced viability loss. This study used an endocytosis inhibitor panel that included Chlorpromazine, Methyl β -Cyclodextrin, Wortmannin, and Dynasore each of which inhibits a different subcategory

† Denotes a project also included on the oral presentation schedule

of endocytosis. Normal human oral keratinocyte (NHOK), confluent human gingival fibroblast (HGF), and Michigan Cancer Foundation 7 (MCF-7 human breast cancer) cell lines were tested for responses. The cells were treated with both ZOL and an endocytosis inhibitor to discover the endocytosis mechanism in use. Subsequent experiments with sub-confluent HGF's did reveal prevention of ZOL-induced viability loss in the presence of Dynasore (data in a separate presentation). The collective results indicate that inhibition of endocytosis (likely macropinocytosis) by Wortmannin or Dynasore in NHOK's and by Dynasore in HGF's is an effective way to lower ZOL-induced viability loss.

Promoting Pollinator Management Techniques to Develop Community Gardens and Plant

Clayton Smith

Pollinators, such as bees, butterflies, beetles, and many different kinds of moths, play a crucial role in the development of sustainable gardens in urban communities. They contribute to the reproductive process of plants, crop yield, genetic diversity, and overall ecosystem health. However, with the possible decline in the population of these essential insects, it is imperative to adopt sustainable practices that prioritize their presence in urban gardens. Throughout Grant County, IN, multiple garden sites were assessed for the presence of different types of pollinators. These insects were obtained through the process of setting pan traps and sweep netting at each garden location to determine the population of pollinators. The observed populations were selected from four plant pollinator gardens, including Boots Street Community Garden, 38th Street Alliance Garden, 46th Street Alliance Garden, and Curfman's Community Garden. After surveying the collected insects, inhabitants consisted of many pollinators, such as bees, wasps, and moths.

† The Effect of Hydrogen Bond Exchange on Polaritonic Spectra

Leah Stallkamp

The field of polariton chemistry studies the coupling of photons and molecules to produce hybrid light-matter states. Polaritonic-vibrational coupling research has primarily focused on using polaritons to modify chemical reactions. However, the effect of chemistry on polariton spectrum formation has largely been ignored. Here, we examine how the breaking and forming of hydrogen bonds within a solution affects the nature of the hybrid light-matter states. Using solutions of methyl acetate in methanol and D₂O, we couple the carbonyl stretch to a Fabry-Pérot cavity. By changing the path length, of the cavity, we can experimentally control the lifetime of the optical states. We observe three distinct polariton states when the cavity lifetime is 600 fs. But when the cavity lifetime is increased 1200 fs, only two polariton states are observed in the data. The data indicate that chemical interactions can drastically modify hybrid light-matter states.

† Polariton Modification of Chemical Kinetics

Natalie Lakanen

Polariton chemistry is a relatively new field that studies the effects of polaritons produced by coupling optical states to vibrational modes. Our research explored how polaritons modify chemical kinetics. We used a simple isomerization system of cis and trans-stilbene and aimed to compare the chemical kinetics inside and outside a Fabry-Pérot cavity.

† Identifying Intermediate Sterols in Azole-Induced Set4 Expression in *Candida glabrata*

Madeline Burghaze

Candida glabrata infections are a growing concern in clinical settings due to the pathogen's intrinsic resistance to azole drugs and ability to rapidly develop clinical drug resistance. Azole drugs target lanosterol 14-alpha demethylase (Erg11), a key enzyme in the ergosterol biosynthesis pathway. Inhibiting Erg11 leads to depletion of ergosterol and a buildup of intermediate toxic sterols. In *Saccharomyces cerevisiae*, expression of the protein Set4 is induced under azole treatment, but its overexpression leads to azole hypersusceptibility. In both *S. cerevisiae* and *C. glabrata*, Erg3 is an enzyme in the ergosterol biosynthesis pathway that corresponds with upregulation of Set4. In the presence of azoles or when Erg3 is absent, ergosterol is depleted and the cell resorts to side pathways to produce intermediate sterols. Because the expression of Set4 is increased when Erg3 is absent, we hypothesize

† Denotes a project also included on the oral presentation schedule

that these intermediate sterols accumulate under ergosterol depletion, then act as signaling molecules to induce the expression of Set4. To determine if intermediate sterols induce SET4 expression, we probed the ergosterol biosynthesis pathway by generating a series of CRISPR-mediated single and double deletions of involved genes. Using these deletion strains, we determined the downstream impact on Set4 expression at the transcript level, as well as phenotypic characterization of each strain.

Microgreen soil substrate alternative: determination of the viability of the use of spent coffee grounds as a soilless media amendment

Tyler Cairncross

Soilless growth substrates are becoming more expensive and less sustainable as the availability of naturally sourced peat moss decreases. Supplementation of materials such as coconut coir, pine bark, rice hulls, biochar, and compost are currently being evaluated to offset the decline of peat moss availability. Use of spent coffee grounds (SCG) could provide an affordable amendment to soilless growth substrates, particularly for microgreens. Microgreens are 30 day old seedlings of vegetables and herbs including lettuce, basil, radish and cilantro. Nine microgreen cultivars were grown in eight replicates using Promix soilless growth media with the amendment of spent coffee grounds ranging from 0-10% for either 15 or 25 days in a Biochambers FXC-9 growth chamber. Microgreens were grown in the dark for 4 or 8 days, and then given conditions of 16 hours of light and 8 hours of darkness at 20°C during day conditions and 18°C during night conditions. Plants were harvested, and their yield was determined in grams of fresh weight. pH and electrical conductivity (EC) were monitored as spent coffee grounds are known to lower soil pH. Average yields ranged from 1.2 g to 15.0 g among the cultivars. A negative linear relationship was exhibited between the yield and spent coffee ground concentration across all cultivars ($P \leq$). Additionally, a negative linear relationship was found between the soil pH and spent coffee ground concentration ($R^2 = 0.731$, $P \leq 0.05$) and a positive linear relationship was observed between soil electrical conductivity and spent coffee ground concentration ($R^2 = 0.615$, $P \leq 0.05$). While soil electrical conductivity increased suggesting adequate fertilizer concentration, decreasing pH negatively affected biomass yield. Therefore, it appears that the addition of spent coffee grounds at both 5% and 10% decreases biomass yield and may not be an ideal amendment to soilless growth substrates for microgreens.

Studying Big Cat Behavior

Jacquez Carter

P2Y Receptors: A Mechanism of Eliciting Extracellular pH Change in Axolotl Müller Cells

Kaleb Tinner

Glial cells have long been thought to serve a solely structural role in the central nervous system. Recently, studies have shown that these cells may have regulatory capabilities over neuronal signaling. Our research has demonstrated that in multiple vertebrate species, Müller cells (retinal glial cells) release hydrogen ions, causing local acidification, upon application of low concentrations of ATP (Tchernookova et al., 2018). Previous experiments have categorized the P2Y receptor as the starting point in this process (Tchernookova et al., 2021). The current study aims to test the P2Y receptor's enzyme activity and its downstream effects on intracellular calcium in axolotl Müller cells.

Slime Molds: Is It Primitive Intelligence?

Caleb Morrison

Slime molds are a group of single-celled organisms that are known for their unique ability to form complex and intelligent behaviors. Despite lacking a brain or nervous system, slime molds are capable of solving complex problems, navigating mazes, and making adaptive decisions based on their environment. This intelligence is believed to be the result of their ability to communicate and exchange information with other cells through chemical signals. Recent research has also shown that slime molds can exhibit memory-like behavior and learn from past experiences, further demonstrating their impressive cognitive abilities. The study of slime molds and their intelligence has the potential to offer upgrades to our own modern society as seen in AI and public transportation.

ATP Induced H⁺ Efflux Mechanism in Axolotl Müller Cells

Mason Vredevelt

[†] Denotes a project also included on the oral presentation schedule

Müller cells, the prominent glial cell in the most vertebrate's retina, are most well known for their structural and scaffolding function. Recent studies on the retina of Axolotl's have shown that these Müller cells have a neurophysiological role as well. The method of self-referencing or using a H⁺ selective microelectrode to take a differential voltage that correlated to a change in pH in a near and far location from the cell was used to identify this neurophysiological role. It was found that ATP induces a dose dependent efflux of H⁺ ions and an extracellular acidification. The mechanism by which the Müller cell releases the H⁺ ions is highlighted in this study. Key roles in the mechanism are played by calcium, the sodium hydrogen exchanger (NHE), and a monocarboxylate transporter (MCT). Inhibition or removal of these ions or proteins causes a decrease in H⁺ ions efflux. It has been found that this extracellular acidification is the means by which the Müller cells regulate neuronal synaptic transmission.

† Visualization and Quantitation of TRITC-Dextran Uptake in Human Gingival Fibroblasts

Colten Mowat

Zoledronate (ZOL) is a nitrogen-containing bisphosphonate (NBP), anti-bone resorptive agent used to treat patients with multiple myeloma, metastatic cancer to bone, osteoporosis, and Paget's disease of bone. ZOL is often prescribed to patients having bone lesions associated with hematological malignancies to prevent skeletal-related events (SREs). High doses of this medication delay onset of SREs and reduce pain in patients with cancers that have metastasized to bone. However, developing medication-related osteonecrosis of the jaw (MRONJ) is a serious side effect of taking NBPs. More than 90% of MRONJ cases occur in patients with cancer and bone metastases who receive high doses of NBPs or denosumab. Individuals affected with MRONJ are unable to heal from dental procedures, leading to painful oral lesions that involve exposed bone and unhealed soft tissue. Previous findings from our lab indicate that ZOL does not enter human gingival fibroblasts (HGFs) via soluble carrier sodium-dependent transporters as earlier predicted by some groups. However, 10 mM Dynasore, a dynamin inhibitor thought to reduce membrane ruffling required for fluid-phase endocytosis, was able to prevent viability loss in HGFs subsequently treated with 50 mM ZOL, suggesting that ZOL may enter HGFs via this mechanism. To investigate that question, a positive control was needed. It is known that tetramethylrhodamine isothiocyanate fluorescently-labeled dextran (TRITC-dextran) is taken into HGFs via fluid-phase endocytosis as measured by flow cytometry. The purpose of the study reported here was to visualize and quantitate TRITC-dextran uptake in HGFs via confocal fluorescent microscopy with the eventual goal of extending that visualization and quantitation to fluorescently-labeled ZOL uptake. Confocal fluorescence visualization and quantitation was best facilitated by analyzing sub-confluent and not confluent cultures at a concentration of 0.3 mg/ml TRITC-dextran. A method for quantitating fluorescent TRITC-dextran signal from individual cells was employed with the use of ImageJ software. The same protocol was used to calculate the corrected total cell fluorescence for TRITC-dextran in the absence and presence of prior 10 mM Dynasore treatment. Preliminary results indicated a modest decrease in TRITC-dextran uptake after Dynasore treatment. Additional captures and quantitations from a larger number of cells as well as independent quantitation verification through flow cytometry is warranted.

Conservation of Sea Turtles

Abigail Myers

Sea turtles are a vital part to their ecosystem. Due to human practices and multiple other circumstances, sea turtle populations have decreased over the years and are considered to be an endangered species on the IUCN Red List. There has been a vast amount of research done in efforts to conserve the sea turtle population. I will be explaining the importance of sea turtles to their environment, as well as, discussing the methods of conservation practices and reflecting on their effectiveness. I will also explain the importance of spreading awareness, ways to educate others, and steps one can take to make a difference in their population.

Development of Selective and Potent Bivalent Inhibitor of Tyrosine Phosphatase SHP2

Avery Fisher

Protein tyrosine phosphatases (PTPs) are responsible for regulating cellular signaling pathways within the human body. PTPs regulate these pathways by catalyzing the removal of a phosphate group from a phosphorylated tyrosine. When mutated or misregulated, PTPs have been linked to many diseases including LEOPARD Syndrome, Noonan Syndrome, Diabetes and many cancers. By making a specific inhibitor for SHP2, the PTP can be selectively prevented from aberrantly regulating cellular signaling pathways. Creating a specific inhibitor for SHP2 is challenging due to the highly conserved active site structures of the 107 phosphatases found in human cells. One

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approach is to generate a bivalent inhibitor composed of a generic PTP inhibitor for potency coupled to one of two distinct SHP2 SH2-domain-targeting peptides for selectivity. These pieces are assembled in situ with the self-labeling enzyme HaloTag. These bivalent inhibitor combinations will be tested in activity assays against SHP1, SHP2, E76K (a SHP2 single amino acid mutant with uninhibited activity) to determine their respective potencies.

Optimization of a CellProfiler™ Software Pipeline to Quantitate Fluorescently-Labeled Zoledronate Distribution in Human Gingival Fibroblasts

Conner Murphy

Medication-related osteonecrosis of the jaw (MRONJ) is a serious intraoral side effect of bisphosphonate, antiangiogenic, and denosumab treatments. Individuals affected with MRONJ are unable to heal from dental procedures, leading to painful oral lesions that involve exposed bone and unhealed soft tissue. Consequently, the development of a topical to prevent bisphosphonate-induced oral cell viability loss is a long-term goal. Previous findings from our lab demonstrated the ability of 10 microM Dynasore (Dyn), a dynamin inhibitor, to completely prevent viability loss in human gingival fibroblasts (HGFs) induced by 50 microM zoledronate (ZOL, a potent bisphosphonate). In addition, Dyn inhibited HGF endosomal acidification thought to be necessary for the maturation of ZOL-containing endosomes. Complete maturation of endosomes involves their movement to the perinuclear region prior to fusion with the lysosome for delivery of the contents to the cytosol. We hypothesized that perinuclear localization of ZOL-containing endosomes is needed to deliver ZOL to the cytosol where it can inhibit its target enzyme and cause viability loss. In order to understand whether Dyn's ability to prevent ZOL-induced viability loss involves interference with the complete maturation of ZOL-containing endosomes, the current study quantitated TRITC Dextran (an endosomal pathway marker control) as well as AF647-ZOL intracellular fluorescence distribution from confocal fluorescent images utilizing an optimized CellProfiler™ software pipeline. Prior to fixation and microscopic capture, HGFs were pre-treated with 30 microM Dyn or with vehicle for 15 minutes, followed by addition of 50 microM AF647-ZOL for each of 1- and 72-hour incubations. The endosomal pathway marker control confirmed a decrease in perinuclear localization after Dyn pre-incubation while the same pre-incubation minimally decreased perinuclear localization of AF647-ZOL after 1 hour of incubation and no significant change in perinuclear localization was observed after 72 hours of incubation. These results suggest that inhibition of perinuclear localization of ZOL-containing endosomes is not required for Dynasore's ability to prevent ZOL-induced viability loss in HGFs.

This work was funded through Indiana Wesleyan University's Hodson Research Institute.

Optimization of a CellProfiler™ Software Pipeline and a Positive Endosomal Pathway Control Marker to Quantitate Fluorescently-Labeled Zoledronate Distribution in Human Gingival Fibroblasts

Theodore Houseman

Medication-related osteonecrosis of the jaw (MRONJ) is a serious intraoral side effect of bisphosphonate, antiangiogenic, and denosumab treatments. Individuals affected with MRONJ are unable to heal from dental procedures, leading to painful oral lesions that involve exposed bone and unhealed soft tissue. Consequently, the development of a topical to prevent bisphosphonate-induced oral cell viability loss is a long-term goal. Previous findings from our lab demonstrated the ability of 10 microM Dynasore (Dyn), a dynamin inhibitor, to completely prevent viability loss in human gingival fibroblasts (HGFs) induced by 50 microM zoledronate (ZOL, a potent bisphosphonate). In addition, Dyn inhibited HGF endosomal acidification thought to be necessary for the maturation of ZOL-containing endosomes. Maturation of the endosomes involves their movement to the perinuclear region prior to fusion with the lysosome and delivery of the contents to the cytosol. We hypothesized that this pathway is needed to deliver ZOL to the cytosol where it can inhibit its target enzyme and cause viability loss. In order to understand whether Dyn's ability to prevent ZOL-induced viability loss involves interference with the endosomal maturation pathway, a method to visualize and quantitate endosomal trafficking was developed. TRITC Dextran (an endosomal pathway marker control) intracellular fluorescence distribution was quantitated from confocal fluorescent images utilizing an optimized CellProfiler™ software pipeline. Prior to fixation and microscopic capture, HGFs were pre-treated with 30 microM Dyn or with vehicle for 15 minutes, followed by addition of 0.3 mg/mL TRITC Dextran for each of 1- and 72-hour incubations. Dyn pre-incubation significantly decreased perinuclear localization of TRITC Dextran 5.9-fold ($p < 0.0001$) in cells captured after 1 hour of incubation, consistent with inhibition of the endosomal maturation pathway. By 72 hours of incubation, perinuclear localization of TRITC Dextran was decreased by a modest but significant 1.3-fold ($p < 0.0001$). These results indicate successful development of a means to visualize and quantitate a fluorescently-labeled compound being trafficked in the endosomal maturation pathway.

This work was funded through Indiana Wesleyan University's Hodson Research Institute.

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Implementing Integrated Pest Management Strategies in Diversified Urban Gardens

Grace Pleune

As a result of being in urban areas, there is naturally a lower amount of not only plants, but more specifically, native plants that aid pollinators. By increasing the amount of native pollinator plants, we are attempting to increase the number of pollinators that have since decreased in numbers due to habitat destruction. As a result of these pollinator plants there has also been an increase in pests as well. In this research presentation, the main topics discussed are the collection of pests, their analysis, and the impact of their presence. The pests analyzed in this research are White Fly (*Trialeurodes* sp.), Leafhopper (*Empoasca* sp.), Squash Bug (*Anasa tristis*), Squash Vine Borer (*Melittia* sp.), Striped Cucumber Beetle (*Acalymma vittatum*), Japanese Beetle (*Popillia japonica*), Flea Beetle (*Altica* sp.), Aphid (*Myzus persicae*), and Weevil (*Eurhinus magnificus*). In this research, we are using three different methods of collection for retrieving both beneficial and pests. These were from an assortment of 8 different urban gardens from the Marion, Indiana community with half having a pollinator garden installed. These findings have been collected and analyzed from the years 2021 to 2022. With these findings, we can analyze them and assess the pest populations in comparison with pollinators.

Cause and Effect of Red Tides

Amanda Clifford

The red tide is a natural phenomenon caused by various types of marine algae, mainly dinoflagellates. Typically, *Karenia brevis* is the algae that cause dinoflagellate red tides. When these algae flourish, they cause a large red/brown bloom on the surface of the ocean. Red tides happen all over the globe, but the blooms in the Gulf of Mexico and off the coast of Florida are the focus of most American scientists. Red tides cause a multitude of medical, ecological, and economic consequences, such as large fish kills, temporary disruption in the fishing industry, and respiratory distress in marine mammals, birds, and humans. Some researchers have enlisted the help of local fishermen in Florida to fill in gaps in the records and share firsthand accounts of the devastation.

Pollinators garden's effects on the growth of Tomato plants (*Solanum Lycopersicum*)

Arthur Hornback

Urbanization is a consequence of increasing population. With increased urbanization, pollinator habitats are destroyed. Urban gardens provide local produce often in areas with increased poverty rate. Pollinator gardens are thought to increase yield and overall health of local fruit/vegetable gardens. Although little research has been done to prove this. In this study we examined 8 local gardens with and without pollinator gardens using 'Yellow Pear' tomato (*Solanum Lycopersicon*). Plants had open and closed pollination and three replicates of each were used. Tomatoes were grown in the greenhouse at Indiana Wesleyan University until they were producing flowers. They were then transferred to their respective gardens for 48 hours. Fruit was grown to maturity and harvested once weekly for 6 weeks. Although tomato plants produced more fruit when they were grown in a garden that contained a pollinator garden section, there was no statistical difference. This serves as pilot study that will be expanded in the following years.

Characterization of new strains of halotolerant bacteria from the Dead Sea.

Catherine Steward

The Dead Sea is a land-locked, closed-basin, hypersaline lake in Israel and Jordan that contains salt concentrations five to nine times that found in oceans. Due to the extremely low water activity of the Dead Sea, the microbes inhabiting the water column are exposed to unusually high salinities and therefore must be either halophilic ("salt-loving") or halotolerant to exist in such conditions. We have isolated four halophilic, chemoheterotrophic bacteria strains from a surficial water sample from the Dead. One of these isolates, strain DST, produced tan-colored colonies and, based on 16S ribosomal RNA sequencing, appears to be a new strain of *Virgibacillus halodenitrificans*, an endospore-forming species isolated from a solar saltern in Korea. The other isolate, designated strain DSO, produced opaque colonies on agar plates, and a phylogenetic (16S rRNA) analysis of this strain placed it within the genus *Sediminibacillus*. Although belonging to different genera and, therefore, not especially closely

[†] Denotes a project also included on the oral presentation schedule

related to each other, strains DST and DSO were both moderately halophilic, with optimal growth occurring at 15% and 10% NaCl (w/v), respectively. Both strains could also use a wide variety of substrates as carbon and energy sources. Cells from strain DST can undergo endospore formation as a strategy to combat harsh environmental stressors, such as heat and dryness. The isolation and study of these organisms contribute to our understanding of the overall diversity and extent of halophiles in nature and may serve to enhance our understanding of adaptive mechanisms for existence in hypersaline environments.

Behavioral Techniques for Management of Dental Anxiety by Dental Practitioners in the Clinic

Danielle Dadisman

Dental anxiety is experiencing anxiety about visiting the dentist and about undergoing procedures to address tooth decay. It is not unique to the US and is felt by people all around the world. To address dental anxiety, dental practitioners have most often turned to anti-anxiety medication and sedation to help patients. Researchers have looked at behavioral techniques that a patient can be taught. Once the patient learns these techniques, they can implement them whenever needed. Researchers compared long-term results of using medication or behavioral techniques to address dental anxiety. In the short term, both proved effective; however, long-term results showed behavioral techniques to have reduced anxiety significantly. Behavioral techniques are time-consuming to teach patients, but it is worth it in the long run. One study showed computer-taught behavioral techniques also reduced anxiety; however, this requires more concerted efforts from the patient to address their own anxiety. Behavioral techniques to manage dental anxiety are more cost-effective and practical for the patient to be able to use at any time they need to cope with their anxiety. There are no side-effects from these techniques unlike anxiety medications. More awareness for these techniques such as dental practitioners teaching patients, recommending therapy, or recommending watching videos about these techniques would go a long way in helping patients manage their dental anxiety.

Deficiency of VPAC2R Impacts Lipid Metabolic Pathways and Body Weight in Older Mice

Eden Weghorst

Vasoactive Intestinal Peptide Receptor Types 1&2 (VPAC1R and VPAC2R) are two G protein-coupled receptors that share the same two ligands, vasoactive intestinal polypeptide (VIP) and pituitary adenylate cyclase activating peptide (PACAP). To study the function of VPAC2R, VPAC2R-deficient mice were created. Previous studies of these VPAC2R-deficient mice (mutant mice, or MUT) have revealed that these mice have significantly lower body weight after about 18 weeks of age, and a different circadian rhythm compared to the wild type (WT) mouse, which includes an advance in the time in which they feed. Additionally, respiratory quotient analysis of these MUT mice show that they preferentially burn fat.

To understand the impact that the VPAC2R deficiency imposes on mouse body weight in older mice, we used two study groups of mice that were 48 weeks of age. Each study group contained 5 male wild-type (WT) and 5 male MUT mice. We explored lipid metabolic pathways systemically and specifically in the liver and brown adipose tissue, and 24-hour fasting plasma samples were collected to determine glucose, insulin, and circulating free fatty acid (FFA) levels. At 48 weeks, mean pre-fasting and post-fasting body weights were significantly different. Significantly lower concentrations of FFAs were found in the MUT mice compared to the WT mice following the 24-hour fasts. The insulin concentration was higher in WT compared to the MUT mice following the 24-hour fasts. The weights of the WT genotyped mice were consistently higher than the weights of the MUT genotyped mice. An investigation of metabolic pathways in the liver and brown adipose tissue (BAT) of the mice was performed via measurement of the relative expression of the following proteins in MUT mice compared to WT mice: peroxisome proliferator-activated receptor alpha (PPAR α), Acetyl-CoA carboxylase (ACC), AMP-activated protein kinase (AMPk), and Protein kinase B (Akt1).

Optimization of HIV-1 Virus-like Particle Purification for Analysis of the Nef-Dependent Packaging of Hck into HIV Virions

Juliana Fenske

HIV is a retrovirus that has had detrimental effects on populations around the world. Due to the virus' persistence in reservoirs in the body that cannot be eradicated by the immune system, along with the virus' capability of

[†] Denotes a project also included on the oral presentation schedule

developing mutations for drug resistance over time, the discovery of additional anti-retroviral therapies is needed. HIV virions contain small, well-characterized, single-stranded RNA genomes. One of the genes encodes accessory protein Nef, which modulates viral infectivity by taking over various cellular mechanisms. A well-known function of Nef is its activation of cellular Src family tyrosine kinase Hck by binding with the proline repeat motif of Hck's SH3 domain, inducing its active (extended) conformation. This interaction has been shown to increase HIV infectivity, although the specific mechanism of how infectivity is increased is unclear. With the knowledge that cellular Hck is packaged into the HIV virion, this research aims to discover the mechanism by which the Hck-Nef interaction contributes to viral infectivity.

Here we have transfected HIV-1 genome (pNL43DEnv) into HEK293 cells to generate HIV virus-like particles (VLPs). We have optimized a protocol for high efficiency transfection, along with successful precipitation of the virus with PEG, as demonstrated by quantitative ELISA of the HIV viral protein, p24. We will complete this phase of the project by eluting VLP from the PEG and analyzing via SDS PAGE. Previous research successfully generated 293 cell lines (cells that do not express endogenous Hck) that stably express one of four mutations of Hck, each mutating a different aspect of the Hck-Nef interaction. Analysis of the contents of the VLP will determine the relevance of Hck in the VLP, and whether it's the protein-protein interaction between Hck and Nef, the kinase activity of Hck, or both that contribute to the packaging of Hck into VLPs.

Isolation and preliminary characterization of a new species of Vibrio bacteria from Soap Lake, Washington

Kelli Damman

Soap Lake is a meromictic, saline, and highly alkaline lake located in the Lower Grand Coulee in the central part of Washington. It is the last lake in a chain of 6 lakes, with no outlet, and has two distinct layers (mixolimnion is the top and monimolimnion is the bottom). The purpose of this study was to obtain more information on the microbial content in this unique lake. It was predicted that the organism isolated would be more cold-adapted and be halophilic. Water samples collected from various depths of Soap Lake resulted in a new species of Vibrio being isolated from 14m deep. Preliminary characterization of the isolate demonstrated it is cold-adapted, with its optimal growth temperature being around 10°C. Salinity testing characterized the isolate as a halophilic microbe, though it did have a little growth with no salt present. Sequence analysis of the 16S rRNA gene revealed that this new species of Vibrio has its closest relatives from other saltwater environments and known pathogenic Vibrio species. Phase-contrast microscopy demonstrated a long, polar flagella on the isolate indicating it is a very motile microbe.

Isolation and Characterization of New Pigmented Strains of Halophilic Bacteria from Dead Sea

Rebecca M. Brown

Halophiles, which are microorganisms able to tolerate moderate to extreme saline conditions, source unique biomolecules that show increasing potential in advancing medical and agricultural research. The aim of this research is to discover qualitative and quantitative characteristics of the new isolates from the Dead Sea while also working to identify them. More specifically, varying salinity and PH levels, as well as carbon sources, will be tested to determine the unique properties pertaining to the unknown halophiles. These trials are ultimately completed to provide further aid in the identification of the pigmented strains after DNA analysis. Through this research, phylogenetic trees can be synthesized from the results to gain additional information pertaining to the closest relatives recognized for each strain. The results display optimum salinity levels for both strains to be relatively high at 20-25% while carbon source data showed that yeast extract was the most favored among both as well. According to the data gathered for DSP, its preferred PH was found to be closer to 6, however, it still grew relatively well with PH 7 and 8 respectively. Lastly, the DNA results and phylogenetic tree suggest strain DSP as being 99.55% similar to a species called Halobacillus trueperi. We are still working to identify strain DSP as the results have come back inconclusive. The upcoming goal is to identify the makeup of this strain as well as possibilities of how both strains could be used in future research.

Role of Calmodulin Antagonists in Müller Cells

Alex Jesse

Numerous Calmodulin antagonists, chlorpromazine (CLP), trifluoperazine (TFP), and W7, all decrease the ATP-induced extracellular acidification of tiger salamander Müller cells.

Association of Acetylcholine Receptors with Lipid Rafts at the Embryonic Motor Endplate

Gage Haven

† Denotes a project also included on the oral presentation schedule

Agrin, a heparin sulfate proteoglycan that is secreted by the motor axon, binds to its receptor on the postsynaptic membrane and initializes signaling events that lead to the formation of the motor endplate, the hallmark of which is the aggregation of acetylcholine receptors (AChRs). Lipid rafts are small heterogeneous domains in the lipid bilayer containing cholesterol and glyco-sphingolipid that are important in organizing/recruiting membrane proteins and have been implicated in the aggregation of AChRs to the motor endplate. Lipid rafts are theorized to play an important role in the agrin signaling pathway. Through the fluorescent labeling of AChRs and lipid rafts in *Xenopus Laevis* embryos, we show that these structures are colocalized throughout the embryo. Further fluorescent resonance energy transfer (FRET) experiments provide evidence that AChRs and lipid rafts are uniformly within 10 nm of each other in frog embryo neuromuscular junctions, confirming the association of these structures. These results signal the importance of lipid rafts in acetylcholine receptor clustering and synapse formation.

The Antibacterial Properties of Black Elderberry Extract

Jillian Dean

Black Elderberry, or *Sambucus nigra*, has been used as a natural remedy for centuries due to its medicinal properties (Krawitz et al., 2011). Studies indicate that the subset of flavonoids called anthocyanins are largely responsible for some of its beneficial properties, such as its use as an antioxidant (Goud and Prasad, 2019). This study was conducted to assess the efficacy of elderberry's antibacterial properties. Nine different bacterial species were grown in vitro in the presence of elderberry extract to test the fruit's ability to reduce or inhibit the growth of bacteria. Both gram-positive and gram-negative bacteria species were used to discuss the potential modes in which elderberry inhibits growth. Over a three-day period, five of the nine species (*B. cereus*, *E. coli*, *P. aeruginosa*, *P. vulgaris*, and *S. epidermidis*) displayed varying degrees of reduction in growth. In vivo implications are also discussed.

Monocarboxylate Transport Mediates ATP-Induced Extracellular Acidification of Mammalian Astrocytes

Rachel Leininger

There has been recent heightened interest in understanding the role of glial cells in shaping synaptic transmission. Previous research regarding retinal Tiger Salamander Müller cells, a type of glia, revealed how ATP-dependent extracellular acidification can inhibit synaptic transmission through a cellular pathway involving intracellular calcium, purinergic receptors, and altered regulation of sodium-hydrogen exchange (NHE). This study demonstrates the common function that the NHE shares with ATP-mediated extracellular acidification in cultured rat cortical or hippocampal astrocytes. Isolated cells were examined through self-referencing, a method of measuring extracellular pH using an electrode containing a proton permeable ionophore. The study also reveals the role of a monocarboxylate transporter (MCT) in glial cell signaling pathways, suggesting that lactate transport contributes to the ATP-induced extracellular acidification. These findings reveal the importance of MCT along with NHE in mediating astrocyte cell signaling. The cross-species conservation of this mechanism observed in both tiger salamanders and rats suggests that this form of regulation using pH is fundamental to brain function. These methods of measuring extracellular pH through self-referencing can be used in determining the remaining portions of the cell signaling pathway.

Confocal Microscopy Visualization of Human Gingival Fibroblast Plasma Membrane

Daniel Wilmot

Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is a severe complication of taking antiresorptive bisphosphonate drugs. These drugs are common treatment for osteoporosis or some cancers and help to strengthen affected bones. Nitrogen-containing bisphosphonates (NBPs) are linked to struggles with BRONJ. The strongest of these NBPs is zoledronate (ZOL). The disease is characterized by areas of exposed, necrotic bone. Previous work in our lab revealed that pre-treatment of human gingival fibroblasts (HGFs) with 10 μ M Dynasore (DYN) prevented ZOL-induced death. DYN is known to inhibit dynamin within the cells, thereby preventing fluid-phase endocytosis by shutting down membrane ruffling. Our previous work also indicated that ZOL does not enter HGFs by the SLC family of sodium-dependent phosphate transporters. Thus, the current study sought to investigate whether ZOL enters HGFs via fluid-phase endocytosis. Our study utilizes red fluorescent Alexa Fluor 647-labeled ZOL (AF647-ZOL) to visualize the drug through confocal fluorescence microscopy. To visualize the hypothesized phenomena, a clear marker of the HGF plasma membrane was needed for orientation in conjunction with blue DAPI nuclear staining. We optimized a green fluorescent lipophilic marker, DiO, for HGF plasma membrane staining. Ten

[†] Denotes a project also included on the oral presentation schedule

minutes of 5 mM DiO staining at 37° C of subconfluent cultures was optimal. Optimized DiO conditions allowed clear visualization of red fluorescent TRITC-dextran (a positive control for fluid-phase endocytosis) uptake by HGFs over time through confocal fluorescent microscopy z-stack acquisition. The same conditions made it possible to visualize HGF uptake of AF647-ZOL. Fifteen minutes of HGF pre-treatment with 10 mM Dynasore did not appear to qualitatively prevent AF647-ZOL uptake. Additional experiments are needed to determine whether Dynasore prevents endosomal acidification and subsequent delivery of AF647-ZOL to the cytoplasm. DiO's role as a plasma membrane marker will be critical in future experiments to determine whether ZOL can be excluded from the cell with any treatment.

Exploring microorganisms as forensic indicators and physical evidence

Mackenzie Walker

Microorganisms have become increasingly important in forensic investigations. These microscopic scavengers create a time clock in which the time of death can be estimated, the cause of death can be determined, and sometimes these microbes point to suspects or potential bioterrorism situations. Because humans have a diverse microbiome, sometimes the ethnicity and country of origin can be determined, which might even lead to the identity of an individual. Although court cases cannot be heavily supported with microbiology, this science is a great tool to use for physical evidence.

Spatiotemporal F.R.E.T. Analysis of Neuromuscular Junction in Frog Embryos

David Rettstatt

The objective of this research project is to create a visual map of neuromuscular development in developing embryos. The neuromuscular junction is a well-researched structure as it is a large and accessible junction found within many animal models. The exact signaling cascade and protein recruitment needed for the development of a neuromuscular junction is still unknown. Using FRET and the temporal head-to-tail development of embryonic African clawed frogs we believe a visual map for development can be created. While we are not looking to identify the exact sequence of protein recruitment and activation we believe that the developmental imaging of NMJs in frog embryos would be a valuable tool for future research in the field. Specifically, we will target and stain lipid rafts and acetal choline receptors as they have been shown to colocalize during and after the formation process. In addition to the lipid raft analysis, we will look to develop a reproducible procedure for staining a number of structures in the embryonic model.

Health and Human Performance

Efficacy of Blood Flow Restriction on Pain Reduction for Knee Osteoarthritis

Garret TenBarge and Alex Serwatka

The CDC estimates that 1 in 4 (54.4 million) US adults have some form of arthritis, a figure that is projected to reach 78 million by the year 2040. While there are estimated to be more than 100 types of arthritis, osteoarthritis (OA) is the most common form, affecting 32.5 million US adults. The high prevalence of arthritis manifests in enormous societal and personal costs (OA Prevalence and Burden, n.d.). 43% of people with OA are 65 or older and 88% of people with OA are 45 or older with More than half of individuals with symptomatic knee OA are younger than 65 (OA Prevalence and Burden, n.d.). OA affects women at 62% of individuals with the condition, but in individuals younger than 45 OA is more common among men; above age 45, OA is more common in women (OA Prevalence and Burden, n.d.). People with OA experience greater pain, fatigue, levels of disability, and activity limitations than people of their comparable age (OA Prevalence and Burden, n.d.). Recent estimates suggest that one-fourth of adults with arthritis experience severe joint pain, characterized by a score of 7 or greater on the 0-10 pain scale (OA Prevalence and Burden, n.d.). 30% of adults with arthritis find stooping, bending, or kneeling very difficult (OA Prevalence and Burden, n.d.). 20% cannot or find it very difficult to walk 3 blocks or push/pull large objects (OA Prevalence and Burden, n.d.).” Critical appraisal of the best available evidence has suggested that Blood Flow Restriction is an effective therapeutic method for decreasing pain in individuals with osteoarthritis. However, the research is limited and will require reinforcement by additional research in the future to determine additional factors that might play a role in its efficacy.

[†] Denotes a project also included on the oral presentation schedule

† Dynamic Postural Stability in College Football Players with Chronic Ankle Instability

Jesse Clement, Spencer Hathaway, Cameron Lain, and Kyoungyoun Park-Braswell

Chronic ankle instability (CAI) is a result of recurrent ankle sprains. This condition is accompanied by a wide range of symptoms such as pain, weakness, and limited range of motion in the ankle joint. Lateral ankle sprains (LASs) are the most common injury incurred by collegiate football players, accounting for 31.4% of all lower body injuries. Consequently, evidence suggests that dynamic postural stability can be inversely affected by the presence of CAI. The purpose of this study was to determine if CAI negatively affects dynamic postural in college football players. Thirty college football players volunteered for this research (age=20.1±1.27 yr; body weight=105.06±20.7 kg; height=1.86±0.065 m). Fifteen participants with ankle instability who have a history of at least 2 ankle sprains or instances of giving away in the last 6 months are assigned to the CAI group. Fifteen participants with less than 2 ankle sprains or instances of giving away are assigned to the healthy control group. Time to stabilization tests (TTS) during single-leg jump landing was used to measure dynamic postural control. TTS is calculated using the peak ground reaction force (GRF) in the anterior/posterior and medial/lateral directions. An independent t-test was used to compare differences in TTS between CAI and the control group in anterior/posterior and medial/lateral directions separately. There was no statistical significance for TTS in medial/lateral direction ($t(28)p=1.50$, $p=.144$) and anterior/posterior direction ($t(28)=.58$, $p=.57$) between CAI and control group. Even though there was no statistical significance between groups, individuals with CAI took relatively longer to stabilize in the medial/lateral (2.02±.85 seconds vs. 1.59 ± .74 seconds). Possible limitations in this study include large variances in the BMI of participants. As well as not factoring in rehabilitation following an ankle sprain. Future research could be improved by implementing stricter recruitment for participants with similar BMIs and similar rehabilitation patterns following an ankle sprain.

† Effect of Different Durations of Whole-Body Vibration on Dynamic Postural Stability

Jacob Keith, Dalton Kinney, and Madeline Lawrence

Increased postural stability in athletics has been linked to a decrease in injury risk as well as an increased ability to complete desired movement patterns required by the sport. Whole-body vibration is a technique that has been tested throughout the world of sports and rehabilitation to try to increase postural stability as well as muscular strength, muscular power, vertical jump height, flexibility, and balance. However, it is not yet known what duration of whole-body vibration, if any at all, is most effective at increasing dynamic postural stability. PURPOSE: To determine if 3 minutes or 5 minutes of whole-body vibration is more effective than no vibration at all in increasing dynamic postural stability in collegiate athletes. METHODS: This study had one outlier, so 15 healthy collegiate athletes (21.07 ± 1.06 yrs; 78.43 ± 10.82 kg; 178.97 ± 5.51 cm) were used for analysis. Baseline postural stability tests were measured before whole-body vibration through the bilateral and unilateral drop jump tests. 3 minutes of whole-body vibration was completed and then the drop jump tests were repeated. At least 48 hours later, participants returned for 5 minutes of vibration followed by the drop jump tests. RESULTS: The vibration intervention did not elicit statistically significant changes in vertical ground reaction force (GRF) of double leg post vibration, $F(2, 28) = .344$, $p < .712$, with GRF 39.01 ± 16.07 N at 0 minutes of vibration, 36.69±17.79 N post 3 minutes of vibration, and 37.84±16.83 N at post 5 minutes of vibration. The intervention also did not yield any statistical significant changes for the stance leg ($p = .925$) or the dominant leg ($p = .786$) when comparing 0, 3, and 5 minutes of post vibration. CONCLUSION: There were slight decreases in GRF on double leg and when comparing dominant and stance leg, but this decrease was found statistically insignificant. However, dominant leg GRF was consistently decreased between 0, 3, and 5 minutes. Further research should be done to determine if vibration therapy has a positive impact on one's postural stability. In further research, more participants could help lead to a significant finding.

† The Effect 100mg of Caffeine Has on Simple Reaction Time

Isaiah Henry, Christa Vogel, Alexis Weldy, and Jessica Keller

Objective: The purpose of this study is to determine if consuming 100 mg of caffeine affects human reaction time in college-aged individuals.

† Denotes a project also included on the oral presentation schedule

Methods: 35 participants' reaction times were tested using the ruler drop test without consuming caffeine for at least 12 hours. The ruler drop test was performed using an apparatus to reduce potential anticipation. Then participants were given caffeinated chewing gum and chewed it for 10 minutes before retesting their reaction time.

Results: The results show a significant improvement in reaction time when comparing reaction time before and after caffeine ingestion. The results showed statistically significant improvements in reaction time from 2391 ms to 2253 ms on average when comparing before and after caffeine, respectively.

Conclusion: Ingesting 100 mg of caffeine did improve reaction time in college-aged individuals.

† The Validity of Bioelectrical Impedance for Testing Resting Metabolic Rate, Compared to Indirect Calorimetry using a Metabolic Cart

Melody Branan, Faith Jackson, and Ryan Whiteman

This research was collected with the intent of finding a faster and less expensive method for measuring clients resting metabolic rates (RMR) for applications in clinical settings. The purpose of this study is to discover if bioelectrical impedance analysis (BIA) can produce valid results in testing an individual's RMR compared to indirect calorimetry using a metabolic cart (MC). Thirty-one participants (n=31) above the age of 18 were recruited to complete both a 3-5 minute BIA scan and a 30-minute RMR test on the MC. Predicted RMR values were recorded first through a BIA. Measured RMR values were recorded using a ventilated canopy hood connected to a metabolic cart (MC). The two values were correlated using an SPSS Pearson's r correlation. Researchers found that there was a strong positive correlation between the two variables, $r(30)=[0.868]$, $p=[<0.001]$. Both the MC and the BIA scan appear to result in statistically significantly similar metabolic requirement values. The conclusion is that the BIA is a suitable and valid replacement for the MC when it comes to measurement of RMR values. Further research may need to be done to expand upon the substitutionary use of BIA. Clinicians of many kinds should consider incorporating the BIA for metabolic testing to increase knowledge of patients' nutritional demands, patient education in regard to their metabolic rate, tracking progress throughout programs, along with bridging the difficult conversation about prescriptive weight loss and gain.

† Kinesiology Tape's Perceived Effects on Muscular Strength within Individuals

Abbey Burton, Andy Cleverly, and Riley Spoltman

There are about 150 thousand medical professionals who utilize Kinesiology Tape in their practice to assist in pain modulation, proprioception, and post-injury treatment. Due to a lack of knowledge, clients seeking treatment for musculoskeletal issues may be subject to a placebo effect causing them to believe that the tape may increase their muscular strength.

PURPOSE: To determine whether kinesiology tape influences an individual's perceived strength.

METHODS: A group of 23 healthy individuals (18-24 years old) volunteered for this study. Perceived strength was measured using a VAS (Visual Analog Scale). Six trials of maximal grip strength were performed, three without kinesiology tape and three after kinesiology tape application. Grip strength was tested using a hand grip dynamometer.

RESULTS: It was found that an individuals' perceived grip strength increased after kinesiology tape was applied, despite being applied in a manner which inhibits grip strength. This result is due to the placebo effect associated with the kinesiology tape and how individuals anticipate it will affect muscular strength.

CONCLUSION: It can be concluded that kinesiology tape may cause a placebo effect to occur when used on individuals who lack knowledge regarding use and function of the tape. While it is important for clients to be aware of the purpose of treatment modalities being applied, the placebo effect could also be used to their advantage by creating an enhanced sense of performance possibly leading to faster recovery, increase in performance, or increase in strength.

† Effects of Celsius© on Anaerobic Performance

Jaclyn Grubbs, Kendra Coryell, and Hannah Whitehouse

The purpose of this study was to evaluate the effects of the Celsius© energy drink on short-term energy (anaerobic) performance using a 30 second bike sprint test known as Wingate. Each participant came in two times, drank either the placebo or Celsius©, and performed an "all out" bike sprint on the Wingate bike. After all the tests were

† Denotes a project also included on the oral presentation schedule

completed, average and peak performance were compared. Paired t-tests were conducted to compare the average and peak power of both the Celsius© and placebo showing no significant difference between the two. Heart rate and temperature pre and post consumption were compared using a Wilcoxon test also showing no significant increase. By doing this research, there was determined to be no effect of Celsius© on anaerobic performance compared to past research that showed a positive effect from Celsius© on aerobic performance.

† Physiological Differences on a Standard Treadmill versus a Lower Body Positive Pressure Treadmill

Taylor Waterway, Lucy Martin, and Ella Klhar

The purpose of this research is to examine the physiological and psychological differences while running on a treadmill at full body weight compared to running at reduced body weight through a Lower Body Positive Pressure Treadmill (LBPPT). Researchers studied: heart rate (HR), blood pressure (BP), enjoyability, and rate of perceived exertion (RPE). To conduct this research, 30 participants (16 F/14 M) volunteered to run on both treadmills at two different times. Participants began with paperwork and then their resting HR and BP was determined. Then the participant ran the test. When this test terminated, HR, BP and RPE were determined, and the participant answered enjoyability questions.

The findings reported there was statistical significance between RPE on the standard treadmill (ST) versus the LBPPT. LBPPT reported significantly less exertion (<.001). This information corresponds to the HR that was significantly higher on the ST versus the LBPPT (<.001). A question asking about enjoyability was also significantly different on the LBPPT, concluding LBPPT was more enjoyable for participants (<.001). Systolic and diastolic BP found mean arterial pressure (MAP) to compare between the treadmills. MAP did not show statistical significance (.088), although trending in the direction of the hypothesis.

Furthermore, all reported values indicated that participants enjoy running on the LBPPT more, which was supported by a higher HR and a higher RPE reported on the ST. Further research should be done to determine what is enjoyable about the LBPPT and more participants used to see if the MAP value will show significance.

Music

Music Therapy for Traumatized Refugees

Gabriela Gonzalez

Music Therapy, as defined by the AMTA (American Music Therapy Association), is the clinical & evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program. The United States has seen an increasing number of refugees migrating from countries including Ukraine, Venezuela, Syria, Afghanistan, and others. Refugees carry a psychosocial strain relating to traumatic experiences and stress from war, persecution, and post-migration experiences such as being away from family, poverty, lack of support, acculturation difficulties, and discrimination. Music Therapy has created a safe and supportive environment, allowing refugees to open up and be vulnerable. Music Therapists can meet the refugees through several interventions, including songwriting, group music-making, improvisation, and others. The presentation will provide research proving music's efficiency in reducing depression and anxiety, improving self-confidence, improving social connectedness, and increasing resilience and hope.

The Effects of Music Therapy on Childhood Trauma

Joelle Johnson

This presentation focuses on the research conducted on the practice of music therapy with children that have faced traumatic experiences. The American Music Therapy Association defines music therapy as "...the clinical & evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program" (2005). Some research included in the presentation relates to adults with unresolved childhood trauma, though the focus is on children

† Denotes a project also included on the oral presentation schedule

currently struggling with their trauma. Children often have a hard time expressing their emotions in a healthy manner, especially when they have experienced extremely traumatic events. The research provides evidence that children experiencing traumatic events learn positive coping skills in a more accessible way through music therapy. A thorough examination of the current research is used to discuss the use of music therapy with children who have experienced traumatic events including sexual abuse, war threats, and other forms of trauma.

Songwriting and Anxiety

Rebekah Pyle

Songwriting is a tool often used by music therapists to address various nonmusical goals. This study was done to look at the reasons why songwriting helps lessen the effects of anxiety in an individual. People have known for a long time that songwriting is therapeutic, but the goal was to make clear the underlying steps that result in stress-relieving effects. It was hypothesized that if a client participates in a songwriting music therapy intervention, the client will have improved distress tolerance which would, in turn, lower stress levels. Many scientific journals were studied through the Jackson Library's online database to gather information. Data shows that songwriting is a tool that can build distress tolerance by growing clients' coping skills, lowering depression levels, improving social connectedness, improving self-concept, decreasing symptoms of PTSD, and giving an outlet to address complex topics in a safe way. This is significant as it shows that songwriting is an effective intervention for clients with anxiety.

Theology and Ministry

[†] The Feel of the Dance: Form, Racial Redemption, and Lessons from Jazz

Madeline Mackinnon

What does it mean for four black men in the '60s to perform such a prestigious piece as Naima? What counts more: Improv or Order? Why does an attentive audience matter? John Coltrane's Naima revolutionized the world of Jazz and the world at large, unleashing people's imaginations for music, racial redemption, and life at large. Come join in the interactive learning session, where you'll get a chance to partake in activities and dialogue around significant, groundbreaking themes found in one single song: Naima.

[†] Denotes a project also included on the oral presentation schedule