Summer Undergraduate Research Expo

August 8, 2024 at 9:30-11:30am

McNamara Alumni Center Memorial Hall

Undergraduate Poster Presentations
Listed Alphabetically by Presenting Author

Presenters should be at their posters at the following time:
9:30 a.m. – 10:30 a.m. Odd Numbered Poster Presentations
10:30 a.m. – 11:30 a.m. Even Numbered Poster Presentations

1. **Afia Abdi**
Effect of a β-arrestin Biased Neurotensin Receptor 1 Modulator on Dopamine Receptor D2 β-arrestin Recruitment
Advisor: Lauren Slosky
Sponsoring Program: LSSURP
Home Institution: University of Minnesota, Twin Cities

Abstract: The development of effective pharmacotherapies for psychostimulant use disorders remains a critical unmet need due to their escalating public health impact. Neurotensin receptor 1 (NTSR1), a G protein-coupled receptor (GPCR), is integral in modulating dopaminergic signaling pathways in the brain, positioning it as a promising therapeutic target for these disorders. As a GPCR, NTSR1 mediates interactions with G-proteins and β-arrestins. Balanced peptide agonists targeting NTSR1 have demonstrated potential efficacy in preclinical addiction models. Still, their progression to clinical use is prevented by adverse on-target effects such as hypotension, hypothermia, and motor impairment. Therefore, we recently developed β-arrestin-biased NTSR1 ligands, exemplified by the compound SBI-553, which selectively attenuates psychostimulant-associated behaviors with methamphetamine and cocaine-induced motor activity. Despite these promising findings, the mechanism underlying its' action remains incompletely understood. This project aims to determine the effect of NTSR1 co-expression and activation on D2 receptor signaling to elucidate the mechanism by which SBI-553 eliminates on-target side effects. Using HEK293T cells, calcium phosphate transfections, and Bioluminescence Resonance Energy Transfer (BRET) assays, we hope to help identify the molecular mechanisms through which SBI-553 minimizes adverse effects. This research could pave the way for the development of more effective and safer pharmacotherapies for psychostimulant use disorders.

2. **Fardowsa Abdi**
Locating Self-Modification Sites in CDTa Domains.
Advisor: Michael Sheedlo
Sponsoring Program: LSSURP
Home Institution: University of Minnesota - Twin Cities

Abstract: Clostridioides difficile, is a gram-positive, anaerobic, and spore-forming bacterium. It is responsible for almost half a million infections within the US annually, and is known to be the primary cause of nosocomial and antibiotic associated diarrhea. Although only in 20% of strains, C. difficile transferase (CDT) is present in the majority of the clinical cases in the US. CDT is a binary, secreted A-B type toxin consisting of two proteins: CDTa, the enzymatic component directly involved in ADP-ribosylating globular actin, and CDTb, the pore forming, delivery component that translocates CDTa into the host cell. In addition to ADP-ribosylation of globular actin, CDTa also seems to ADP-ribosylate itself. To further understand the function of this modification, we first sought to determine whether the modification is occurring in the ADPRT or the pADPRT. Using an antibody for ADP-ribose, we found that the pADPRT domain was the subject of CDTa mediated ADP-ribosylation.

3. **Zamzam Abdullahi**

µCT Analysis of Bone Structure Using Mice Models: Ketone Metabolism and Ketogenic Diet Influences

Advisor: Hai-Bin Ruan

Sponsoring Program: LSSURP

Home Institution: University of Minnesota - Rochester

Abstract: Ketogenic diets have been clinically proven to aid with the management of a multitude of health conditions, including obesity and type 2 diabetes mellitus. Understanding the mechanism by which ketogenic diets affect skeletal health is crucial to individuals who rely on these diets for disease management. This study aims to explore ketones' physiological effect on bone structure by exploring various ketogenic diets and Acetoacetyl-CoA synthetase (AACS), an under-researched ketone metabolism pathway. Mice models consisting of 6 to 11 per group were subjected to one of three diets: (1) normal chow, (2) ketogenic, or (3) ketone ester over varying time periods. Samples on diets 1 and 2 had AACS genetic modifications (KO and Hetz). Femur samples were collected after 12-28 weeks on the diet and bone structure was analyzed by micro-CT. Results show no differences in bone structure in all sample groups. This concludes that the negative effects of KD on bone structure and bone health are not dependent on AACS-dependent ketone metabolism. This study provides insight into the physiological functions of ketones and their relationship to bone structure.

4. **Tomiwa Adedoyin**

LAT1 Inhibition Modulates Cellular Energy Phenotypes in Colorectal Cancer

Advisor: Subree Subramanian

Sponsoring Program: M-ASCEND

Home Institution: University Of Minnesota

Abstract: Colorectal cancer (CRC) is the third leading cause of cancer-related death, representing a significant unmet medical need. Notably, CRC incidence has been increasing year over year in younger patients. Preliminary evidence of CRC tumors and normal adjacent tissues has elucidated the enrichment of amino acids in tumor tissues. Additionally, gene expression profiles have suggested overexpression of the gene SLC7A5, encoding the large amino acid transporter 1 (LAT1). Understanding the metabolic consequences of LAT1 inhibition on CRC cell lines could inform novel combination therapy approaches which aim to metabolically reprogram the tumor microenvironment (TME) to promote response to immune targeting therapies. In this study, we sought to understand the metabolic consequence of LAT1 inhibition using a commercially available inhibitor JPH203. Our study showed that treatment with 5 uM JPH203 in vitro is sufficient to alter the oxidative consumption rate (OCR), extracellular acidification rate (ECAR), and proton efflux rate (PER) of DLD-1, HCT116, and SW480 CRC cell lines compared to DMSO vehicle control. Furthermore, our results suggest a potential difference in metabolic phenotype based on microsatellite instable (MSI) vs microsatellite stable (MSS) stratification. Future studies should validate differences in cellular energy phenotype alterations between MSI and MSS CRC following LAT1 inhibition.

5. **Sola Adeyiga**

Examining Individual Variability in Functional Brain Network Size

Advisor: Damien Fair

Sponsoring Program: LSSURP

Home Institution: University of Illinois Urbana-Champaign

Abstract: This study emphasizes the need to shift from group-level analysis to focusing on individual data and analysis in brain network research. Due to the inherent spatial and organizational variability within brain networks, each person has unique network features and topologies that should not be generalized into a single group. The current scarcity of studies on individualized structures leads to gaps in understanding and limitations in functional mapping. To address this, the study proposes collecting extensive data from numerous individuals to demonstrate the inadequacies of group-level analysis. Utilizing functional neuroimaging, which effectively characterizes individual brain function and organization, the research highlights the importance of recognizing brain organizational differences influenced by behavioral, biological, and environmental factors. This individualized approach holds potential for application in psychiatric practices, enabling personalized treatment. Compared to group-average networks, individual brain networks reveal more detailed features, often overlooked in group-level analysis, thereby ensuring higher quality insights from individualized data analysis.

6.   **Seyram Agudu**

Threat Memory Consolidation Therapy: A Three-Session Manual to Treat IntrusiveMemories in PTSD

Advisor: Sophia Albott

Sponsoring Program: Pathways

Home Institution: University of Minnesota Twin Cities

Abstract: Threat Memory Consolidation Therapy (TMCT) is a brief memory reconsolidation treatment designed to treat intrusive symptoms in people with post-traumatic stress disorder. Patients are instructed to visualize their traumatic event from a safe viewing environment, such as an imaginary cinema screen, with as much sensory detail as they can recall. TMCT is based on rewind therapy (Muss, 1991) and Reconsolidation of Traumatic Memories (RTM) therapy (Gray et al., 2019), adapting their core concepts in addition to aspects of other evidence-based PTSD treatments (Foa et al., 2001; Resick & Schnicke, 1993). Although limited research has been done on these interventions, the evidence available suggests that this mode of reconsolidation is effective in reducing the incidence of intrusive memories (Meneghini et al., 2023; Gray et al., 2021). The structure of TMCT outlines three 60-minute visualization sessions and a baseline session. The manual also contains example scripts between therapist and patient, worksheets, and psychoeducation handouts for patients. Throughout this research, we discuss the development of the TMCT manual, its anticipated strengths and limitations, and future use of the manual in studies and treatment to ensure standardized care.

7.   **Jonathan Aguirre**

Association of Marijuana Use with Symptoms of Depression and Anxiety in Adolescents and Young Adults

Advisor: Mustafa Al'Absi

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota- Twin Cities

Abstract: Introduction: Young adults and adolescents that experience symptoms of depression and anxiety often look for coping mechanisms to help them. One common coping strategy that has been observed is the use of tobacco and marijuana, either separately or in combination. This study investigates how tobacco and marijuana use among adolescents and young adults may relate to symptoms of depression and anxiety.

Methods: We have read publications that distinguish between traditional tobacco use and products modified with marijuana with the goal of understanding their impact on mental health.

Results: Individuals experiencing both depression and anxiety were more likely to use tobacco products that do not contain marijuana compared to those without these symptoms. Only those that experience major depressive symptoms were more likely to use e-cigarettes and tobacco products containing marijuana.

Conclusion: This literature review highlights the importance of addressing both marijuana and nicotine use in interventions targeting adolescents and young adults with anxiety and depression. Early intervention could potentially mitigate the adverse mental health effects associated with substance use in this population.

8.   **Ian Ahlberg**

The Immuno-Protective Effects of Metformin Against Doxorubicin-Induced Immunosenescence

Advisor: Beshay Zordoky

Sponsoring Program: SCoPE

Home Institution: University Of Minnesota - Twin Cities

Abstract: Doxorubicin is an anthracycline used primarily to treat soft tissue and bone sarcomas. Despite being used since the 1960s, doxorubicin still presents a long list of undesirable side effects such as immunosenscence. Immunosenescence is characterized by the aging of immune cells and results in an increase in susceptibility to infections and chronic inflammation. Recently, metformin has gained attention as a a possible ameliorator of immunosenescence due to its senomorphic properties. Such properties block the secretion of senescent-associated secretory phenotypes, preventing the spread of senescent cells. In this study, we worked to underline metformin's long-term influence on doxorubicin-exposed immune cell subpopulations. To accomplish this we injected mice with doxorubicin for three weeks and then waited five weeks, allowing for chronic symptoms to eventuate, before necropsy. Metformin was continuously administered via drinking water throughout the study. Upon analysis of the complete blood count, we found metformin truncated doxorubicin-induced neutrophil amplification and significantly increased lymphocyte count. More specifically through Flow Cytometry, we found that metformin reduced doxorubicin-associated increases in senescent T cells located in the blood. These results give us a cautious optimism that metformin reduces doxorubicin-induced immunosenescence while alleviating doxorubicin-induced immunosuppression.

9.   **Safa Ahmed**

The Pathway to Career Exploration

Advisor: Jeffrey Ratliff-Crain

Sponsoring Program: Independent Research

Home Institution: University of Minnesota Rochester

Abstract: Introduction: Mayo Clinic and the University of Minnesota-Rochester partnered to provide a groundbreaking college experience for future health care leaders. Called NXT GEN MED (NGM), this 2.5-year program is designed for students to rapidly complete degrees and enter the workforce sooner. With 67% of UMR students from underrepresented backgrounds, NGM graduates will play critical roles in diversifying leadership teams.

Objectives: As part of NGM, students earn a 45-week internship at Mayo Clinic. Preceptors work closely with students to design robust internship experiences and have latitude to implement varying internship structures, with such models' worthy of deeper study.

Materials & Methods: Surveys were sent to NGM students to analyze differences between rotational and anchored internships, with the goal of ascertaining which experience is ideal – and more effective for students' career planning – for this unique educational endeavor.

Discussion/Results: Survey results indicated that NGM students preferred rotational versus anchored internships. While only 78% of students actually had rotational internships, 100% of them favored rotational internships due to accentuated opportunities to develop broader and deeper understanding of professional healthcare leadership options, as well as strengthening skillsets and increasing personal adaptability.

Summary/Conclusion: Internships naturally take many forms, and we suggest a rotational arrangement is most ideal – especially for young collegians. Rotations within a department allow the undecided student to have exposure to diverse professional pathways while in safe learning and working environments, thereby effectively expanding their horizons.

10.   **Adnan Ai**

Determining the location of AMELX+ Osteoclast Precursors

Advisor: Kim Mansky

Sponsoring Program: LSSURP

Home Institution: University of Minnesota

Abstract: Osteoclasts are the cells that are responsible for resorbing bone. Osteoclast activity within the craniofacial complex orchestrates critical processes such as tooth eruption. Our lab has identified a population of monocytes (osteoclast precursors) through single-cell sequencing that also expresses a gene that has been shown to be important for tooth development, amelogenin (AMELX). However, the role of these AMELX+ monocytes in tooth eruption is unknown. My summer project was to determine the location of these AMELX+ monocytes/osteoclast precursors during mouse tooth development. Immunofluorescence staining of mice at day 3 after birth indicated positive staining for AMELX in the region of ameloblasts. However, even though I was able to identify osteoclasts near developing teeth by TRAP staining, I was not able to detect staining for AMELX in those regions. Real-time quantitative PCR demonstrated AMELX expression in mandible but not femur-derived osteoclasts. Additionally, I determined enhanced expression of Wnt 4a and Wnt 10, which are involved in tooth development, from mandible-derived osteoclasts. Overall, this data suggests that mandible-derived osteoclasts do express genes involved in tooth development, and future directions will include performing immunofluorescence of cultured osteoclasts to determine the expression of AMELX.

11.   **Marwo Alimire**

Clearing The Air: Exploring Somali Parent's Knowledge on Shisha Secondhand Smoke and Children's Health

Advisor: April Wilhelm

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota-Twin Cities

Abstract: Background:

Shisha/hookah, a water-filtered smoking method, is common in Somali communities and often occurs at home, exposing children to secondhand smoke (SHS). SHS causes adverse health effects, including cancer and pulmonary diseases. Global research has highlighted knowledge gaps concerning SHS health effects of shisha. This study will describe Somali parents' understanding of the health impacts of shisha SHS on their children.

Methods: A literature review was completed examining perceptions of shisha SHS health risks in various populations; focus groups (30-35 Somali parents) and 10 key informants in Somali communities were interviewed.

Results: The literature review indicates multiple misconceptions of shisha use and SHS dangers, with many believing it to be safer than other tobacco products. Lack of awareness about the downstream effects of shisha SHS poses a significant risk of exposure and an increasing risk of smoking-related diseases. Research on SHS in Somali households and children is scarce. Results from the focus groups and key informant interviews are forthcoming.

Discussion: Findings will guide the development of a culturally tailored shisha-use intervention for parents, e.g., religious sermons, community health worker visits. This approach aims to address the unique challenges of shisha SHS exposure in Somali communities to improve children's health outcomes.

12.   **Leah Allen**

Labile Carbon Estimation in Small-Scale Field and High Tunnel Vegetable Production in Minnesota

Advisor: Gabriela Hidrobo

Sponsoring Program: SOAR-REEU

Home Institution: Smith College

Abstract: Small-scale vegetable production often uses compost to provide nutrients for crops. However, overapplication can exceed crop needs, creating nutrient imbalances and build-up. This issue is exacerbated in high tunnels—commonly used to extend growing seasons—due to high temperatures and lack of rain. In the last decade, nearly 500 small-scale growers have accessed incentives to install high tunnels in Minnesota. As farmers continue to utilize compost and high tunnels, understanding the effects of these practices on soil carbon pools and soil nutrient dynamics is crucial.

This study assessed soil carbon pools in 100 vegetable farms across Minnesota using Permanganate Oxidizable Carbon (POXC) analysis to measure labile carbon. POXC is a fraction of the soil organic matter pool, correlating positively with organic matter, and possibly with Phosphorus (P) and Potassium (K). POXC has been shown to be more sensitive to changes in management practices than total organic carbon.

We expected high POXC levels due to overcomposting, especially in organic farms, with higher levels in high tunnels due to their unique conditions. Our results confirmed high POXC levels, particularly in high tunnels and organic farms. These results suggest farmers can reduce compost use, alleviating environmental challenges and reducing costs.

13. **Ariam Aman**

Flushing Out Barriers: A Mobile Clinic Approach to increase CRC Screening

Advisor: Jonathan Kirsch

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota

Abstract: Background:

Screening is essential to preventing colorectal cancer (CRC) as early detection is associated with decreased mortality. Inequitable access to CRC screening contributes to lower screening rates in racial and ethnic minorities. This study looks to understand knowledge, attitudes, barriers, and facilitators to CRC screening in underserved communities by administering a survey.

Methods: A literature review was completed to aid in creating the Colorectal Cancer Knowledge Acquisition Survey, conducted at a community health event hosted by the UMN Mobile Health Initiative in collaboration with Power of the People Leadership Institute.

Results: 30 participants completed the survey; most (92.6%, N=27) recognized CRC screening was important to them and felt comfortable using both stool tests (59.2%, N=27) and colonoscopies (65.2%, N=23). Over half (55.2%, N=29) discussed CRC screening with a primary care provider, and many (69%, N=29) previously had CRC screening.

Discussion: Participants who reported CRC screening as important and discussed screening with a primary care provider tended to be more comfortable screening for CRC. Familiarity with CRC and related factors were also greater when participants indicated the aforementioned options. Survey feedback indicated clarity and few suggested changes.

14. **Aleeza Amin**

The Role of Intersectional Identities in Medical Student Experiences

Advisor: Patricia Frazier

Sponsoring Program: Pathways

Home Institution: University of Minnesota Twin Cities

Abstract: There are limited studies using an intersectional approach in analyzing medical student experiences. This study aimed to understand how gender, racial, and sexual identities, as well as the pandemic and year in school, are associated with having negative experiences in medical school. This study assessed data collected by the Association of American Medical Colleges (AAMC) from 2019-2022. Responses from the Year Two Questionnaire (Y2Q) and Graduate Questionnaire (GQ) were analyzed. The effect size was greater than small between the relationship of intersectional identity and rates of burnout, career regret, discrimination, satisfaction with medical education, positive perceptions of faculty professionalism, and positive student-faculty interaction. The relationship between mistreatment and discrimination and the year in school of the respondent had greater than small effects. Graduating students reported more of these experiences compared to students in their second year. Study year and the interaction between intersectional identity and year in school had less than small effects with the outcome variables. Students with minority identities and graduating students were more likely to experience adversity compared to students who had no minority identities and students in their second year. Future interventions should focus on fostering an inclusive environment for students of all identities.

15. **Millicent Anderon and Nimo Mahamud**

The Effect of Different Types of Tobacco/Nicotine on Oral DNA

Advisor: Cathleen Drilling

Sponsoring Program: M-ASCEND

Home Institution: Roosevelt High School

Abstract: We investigated how different types of Tobacco/Nicotine cause oral DNA damage. To investigate this we sampled 72 participants on the University of Minnesota campus. Participants took a survey about their lifestyle and demographic and then provided a 5mL saliva sample. Their saliva samples were then analyzed for 8OHdG using an ELISA. Data is currently being analyzed and will be presented on the poster

16.   **Carah Anteck**

Evaluating the Effectiveness of Biocontrol Methods in Managing Sclerotinia sclerotiorum Stem Rot (SSR) in Canola

Advisor: Megan McCaghey

Sponsoring Program: SOAR-REEU

Home Institution: Berea College

Abstract: White mold (Sclerotinia sclerotiorium) is a devastating plant pathogen causing substantial yield losses across hundreds of plant species. Despite initial success of fungicides, S. sclerotiorium has been shown to develop resistance when the chemicals are applied in small doses for prolonged periods of time. This study investigates the efficacy of biocontrol agents in managing S. sclerotiorum Stem Rot (SSR) in canola, an under-researched crop in this context. Various biocontrol agents including Coniothyrium Minitans (Contans), Bacillus amyloliquefaciens (Double Nickle LC), Bacillus subtilis (Serenade OPTI), and Endura (Boscalid) were applied at different bloom stages in randomized plots of a canola SSR-infected field. Treatments involved both individual and combined applications of these agents. Additionally, the field contained buried bags of sclerotia, the resting structures of the mold. Evaluation protocols included disease ratings, calculating disease severity index (DSI), yield assessment at harvest, and analysis of mycelial growth in cultures alongside microbial work and DNA extractions for the sclerotia. Plots containing Bacillus subtilis proved to be the most promising in managing disease based off the DSI calculations. Interestingly, the DSI in the Contans plots was higher than the untreated plot. Sclerotia viability assays from the Contans and untreated plots were also consistent with these results.

17.   **Helen Atkins**

Reversing MHC-I Loss in CIC::DUX4 Sarcoma

Advisor: Darko Bosnakovski

Sponsoring Program: Pediatrics CCRF Internship

Home Institution: University of Minnesota - Twin Cities

Abstract: CIC::DUX4 is a rare form of undifferentiated round cell sarcoma primarily affecting young adults and typically found in the soft tissues of the trunk and extremities. Recent advances in immunotherapy have significantly improved tumor treatment. However, cancer cells often possess genetic mutations that allow them to evade immune recognition, diminishing the efficacy of these therapies. CIC::DUX4 sarcomas are characterized by decreased expression of the Major Histocompatibility Complex Class I (MHC-I), a consequence of the direct interaction between the CIC::DUX4 oncoprotein and STAT1. MHC-I is crucial for immune recognition and response coordination by cytotoxic T cells, and its absence allows the tumor to evade the immune system. New treatments aim to induce the expression of MHC-I and inactivate the transcription of DUX4 in these sarcomas, thereby enhancing immune recognition and response. This presentation details our methodology and findings on targeting CIC::DUX4 sarcomas through treatments designed to inactivate the CIC::DUX4 transcription factor and induce MHC-I expression.

18.   **Salome Augusto**

The MASK Project: Developing Custom Non-Invasive Ventilation Masks for Pediatric Patients

Advisor: Linsey Griffin

Sponsoring Program: Pathways

Home Institution: University of Minnesota

Abstract: Providers are increasingly employing the help of non-invasive ventilation devices (NIVs) to support patients with chronic respiratory issues in both inpatient and outpatient settings. Within inpatient healthcare systems, NIVs can often be critical for progressing patients through to the completion of their treatment. Despite the crucial support that effective NIV devices provide, pediatric designs notably lag behind their adult counterparts in comfort, efficacy, and accessibility. These issues highlight a need for further exploration of pediatric NIV mask design. This study aims to explore whether or not a customizable approach may bring advantages, bridging the gaps that traditional, pre-sized mask design leaves behind. In preparation for this project, 3D scans were taken of the heads of a group of pediatric participants. This anthropometric data was then utilized to develop an efficient process for the production of a custom mask interface and the development of an accompanying adaptable harness. The mask interface was prototyped in Rhinoceros 3D modeling software, while the harness was developed through physical sketching and prototyping methods. Focusing mainly on the harness, we discuss the implications of findings from the prototyping stage as well as future plans for testing the efficacy of each component.

19.   **Kathleen Bacigalupi and Joanne Le**

Investigating the Impact of Religiosity and Structural Support on Pubertal Development in LGBTQ+ Adolescents

Advisor: Victoria Papke

Sponsoring Program: Equitable Data Science

Home Institution: Smith College and the University of Rochester

Abstract: Members of the LGBTQ+ (Lesbian, Gay, Bisexual, Transgender, Queer, and more) community face discrimination in a hetero/cisnormative world, experiencing what is called minority stress. For adolescents, minority stress may be associated with accelerated pubertal development, which is linked to negative health consequences. Research has yet to explore whether specific environmental factors, such as religiosity and state-level structural support, are associated with minority stress and accelerated puberty in LGBTQ+ youth.

Ordinal logistic regression was used to investigate the relationship between religiosity in LGBTQ+ youth and families, structural support, and pubertal development. Data were from the Adolescent Brain Cognitive Development (ABCD) Study® and Movement Advancement Project. Participants were 9-10 years old at baseline and followed yearly for five years (N = 1199).

The results suggest that living in states with lower levels of structural support and reporting higher levels of religiosity were significantly associated with higher pubertal stages at baseline through Time 3. However, after accounting for demographic factors, structural support and religiosity were no longer significant predictors of puberty. While this suggests religiosity and structural stigma may not be robustly related to accelerated pubertal development, it encourages further exploration of relationships between environmental factors, stress, and pubertal development in LGBTQ+ adolescents.

20.   **Kalina Berg**

Courageous Conversations? Exploring White Mothers' Conversations on Race to Cultivate Antiracist Parenting

Advisor: Gail Ferguson

Sponsoring Program: Pathways

Home Institution: University of Minnesota- Twin Cities

Abstract: Research on racial socialization within White families is limited, but a recent study in Minnesota demonstrated that mothers with more advanced White racial identity development (WRID) talked more explicitly about race and racism with their children (Ferguson et al., 2022). This study uses observational data to directly investigate how White mothers are talking to their 5-8 year old children about race and racism in unstructured and structured discussions of a storybook about White privilege. The sample included 38 non-Hispanic White mother-child dyads from The CARPE DIEM Study's baseline dataset (PI: Gail Ferguson; Fall 2023). Discussions underwent content analysis using deductive codes of racial socialization and real-world connections. Using SPSS, behavioral frequencies were correlated with child's age and mother's WRID (Helms & Carter, 1990). Mothers with higher levels of WRID make significantly more explicit statements about race and racism and draw more race-related connections between the book and real life in unstructured conversations. Additionally, all mothers are more likely to make real-world connections once prompted to do so (structured conversation). This suggests that mothers are capable of having antiracist conversations with their children, but only mothers with higher WRID levels do this spontaneously.

21.   **Allie Beyer**

Expression, Purification, and Secondary Structure Determination of Proteins Made from Reduced Amino Acid Alphabets

Advisor: Burckhard Seelig

Sponsoring Program: Pathways

Home Institution: University of Minnesota Duluth

Abstract: Investigating the timeline of genetic code evolution uncovers the mechanisms by which life originated on Earth. This project aims to structurally characterize primordial-like ATP binding proteins constructed from random reduced amino acid libraries. We synthesized proteins 80 residues long, comprised of the first five and nine earliest likely amino acids to exist on Earth. We then purified proteins on immobilized metal and amylose affinity columns, and purity was quantified using LDS-PAGE analysis. We optimized purification conditions to remove a contaminant heat-shock protein, HSP70, produced during E. coli expression. We applied denatured lysate and ATP-Mg solution in the first purification step to disrupt interactions between HSP70 and ATP-binding proteins. We then determined the secondary structure of concentrated, purified proteins using CD spectroscopy to yield the percent composition of alpha-helices and beta-sheets. We then compared the CD-determined results to those of the AlphaFold 3 protein structure prediction software to assess its confidence and accuracy in structure prediction. Following metal and amylose affinity chromatography steps, we expected purity to reach 90-95%. Additionally, we expected proteins from the nine reduced amino acid library to have greater secondary structure content due to increased intermolecular interactions provided by greater residue diversity.

22. **Zachary Bovelsky**

Accuracy of RAYFace 3D Facial Imaging for Orthodontic Records

Advisor: Amy Tasca

Sponsoring Program: LSSURP

Home Institution: Wake Forest University

Abstract: 3D scanning has revolutionized dentistry, providing clinicians with new technology and information to aid treatment planning for patients. Historically, these innovations have primarily focused on the acquisition of bone and teeth, but recent advancements have targeted soft tissue capture and analysis. The RAYFace is a state-of-the-art 3D facial scanner that can create a detailed facial image in just half a second using six cameras. The objective of this study was to evaluate the accuracy of the RAYFace 3D facial scanner. Nineteen anthropometric landmarks were identified on male and female mannequins. Eighteen manual caliper measurements were taken at seven different angulations and compared to digital measurements acquired from RAYFace scans using Meshmixer software. Overall, the RAYFace 3D scanner demonstrated high accuracy across most measurements, with deviations generally below clinical significance (2mm). However, notable exceptions were observed in the measurement of skull base width and nasal tip protrusion for male and female mannequins, respectively. The precision of soft tissue measurements indicates that the RAYFace scanner can be integrated into clinical practice with confidence. With A.I. powered software, RAYFace scans can be integrated with intraoral scans and CBCTs to create the complete 3D digital patient of the future.

23. **Abigail Boyle**

Organoid Models to Investigate Driver Gene Mutations in Colorectal Cancer

Advisor: Subree Subramanian

Sponsoring Program: LSSURP

Home Institution: Valparaiso University

Abstract: Colorectal Cancer (CRC) contributes to approximately 10% of cancers worldwide and is the second leading cause of cancer-related deaths. Inactivation of the gene SMAD4, a regulator of the TGF-ß pathway, has been implicated in metastatic disease; about 60% of CRC patients experience loss of SMAD4 function. Studies suggest there may be a connection between SMAD4 mutation status and immunosuppressive microenvironments. We hypothesized that organoids harboring co-mutations in APC(-/-), KRASG12D, P53(-/-), SMAD(-/-) (AKPS) would proliferate faster, exhibit increased drug resistance, and altered immune infiltrates compared to organoids bearing APC(-/-), KRASG12D, P53(-/-) (AKP). In this study, we conducted a BrdU Assay and drug sensitivity assay with 5-fluorouracil (5-FU) on AKP and AKPS organoids to measure growth differences and drug sensitivity. We quantified the immune infiltrate presence of both phenotypes with C57BL/6 Mice tissue via immunofluorescence. Our studies show that AKP organoids have a higher cell proliferation rate, an increased CD8 T-Cell and decreased M2 macrophage presence, and similar drug resistance to AKPS. This could be because organoids cannot replicate the microenvironment present in an actual organ. Therefore, SMAD4 mutations may involve alteration of the microenvironment and its immune infiltrates, resulting in different metastatic outcomes in vivo rather than influence on cell proliferation.

24. **Kira Braun**

Resolvin D1 Decreases Heat Hyperalgesia in Tumor-Bearing Mice through Inhibition of HIF-1a

Advisor: Donald Simone

Sponsoring Program: LSSURP

Home Institution: Amherst College

Abstract: RvD1 (Resolvin D1), a ω-3 polyunsaturated fatty acid, has previously been found to activate pro-resolving pathways, reducing inflammation. Through this activation, resolvin can alleviate hyperalgesia in a cancer mouse model. From the pro-resolving properties of RvD1, its use may be linked to the decrease of Hypoxia-Inducible Factor 1 alpha (HIF-1a) concentration within tumor cells. HIF-1a is a highly concentrated transcription factor within hypoxic environments that helps with cellular regulation. HIF-1a is a prominent gene within tumor cells due to their hypoxic environments, assisting tumor survival, and has been suggested to contribute to pain signaling. By using HIF-1a targeted siRNA injections on a cancer mouse model, we are studying the analgesic effects of HIF-1a inhibition to understand the antinociceptive properties of RvD1 further. This cancer mouse model measures hyperalgesia using a heat latency behavioral test. The results demonstrate decreased heat-induced hyperalgesia, supporting the hypothesis that HIF-1a concentrations are decreased using RvD1.

25.   **Mufaro Chiduza**
Investigating Striatal and Prefrontal Cortex Dopamine Dynamics During a Working Memory Task
Advisor: Arif Hamid
Sponsoring Program: LSSURP
Home Institution: University of Maryland, Baltimore County

Abstract: Schizophrenia is a debilitating psychiatric disorder where patients show a deficit in their working memory capabilities. Those with schizophrenia are shown to have abnormally high levels of the neurotransmitter dopamine in the striatum, however, it is unclear how this contributes to symptoms such as impaired working memory. Here, we investigate how dopamine supports working memory by recording it across multiple brain regions as mice perform a working memory task. Specifically, we use fluorescent indicators to image dopamine cell activity in the midbrain and dopamine release across the following brain regions: dorsolateral striatum (DLS), dorsomedial striatum (DMS), prefrontal cortex (PFC), and nucleus accumbens (NAcc). We hypothesize that increases in dopamine, specifically in the PFC and DMS, support working memory during task performance. Currently, our mice are learning the working memory task and we see large dopamine spikes in the DLS at reward outcome. As mice learn the full task, we will investigate how pharmacological manipulations of dopamine impact working memory. This work aims to further contribute to our understanding of how dopamine supports working memory, as it serves importance in understanding symptoms seen in patients with psychiatric disorders.

26.   **Ev Cho**
Exploratory Linguistic Analysis of Participant Interview Transcriptions from an Arts-based Adolescent Depression Intervention: Utilizing LIWC to Evaluate Data from the Creativity Camp
Advisor: Bonnie Klimes-Dougan
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities

Abstract: Depression is a growing global health concern that often arises in adolescence. Many adolescents do not respond to empirically established interventions, necessitating the development of novel, effective treatments. Although in the initial phases of investigation, evidence suggests that Participatory Arts Interventions (PAIs) like the Creativity Camp, a two week long day-camp designed to increase self-exploration through creative engagement, may enhance well-being while diminishing depression in adolescent participants. Additionally, research supports the use of linguistic analysis for qualitative data as a potential method of gauging treatment progress. The aim of this study was to determine whether key aspects of depression and wellbeing can be examined through linguistic patterns in transcripts of participant interviews from the final day of Creativity Camp. Camp participants included adolescents (ages 12-18), primarily assigned female at birth with a depressive or anxiety disorder. Linguistic Inquiry and Word Count (LIWC) was used to analyze 54 interviews with adolescent participants who completed the Creativity Camp intervention. Analyses focus on measures of time orientation, all-or-none thinking, emotional tone, and the composite measure of linguistic distancing from LIWC as they relate to depression and well-being scores. Future directions using LIWC and qualitative data from participants in intervention research are also discussed.

27.   **Grace Conroy**
Exosome Delivery of mRNA for Gene Editing Hematopoietic Stem Cells
Advisor: Gregory Vercellotti
Sponsoring Program: LSSURP
Home Institution: College of the Holy Cross

Abstract: Sickle-cell disease (SCD) is an anemia in which episodes of hemolysis and painful vaso-occlusion occur as a result of deoxygenation and sickling of red blood cells. The disease arises when a point mutation occurs in the HBB gene, which produces beta-globin, a key subunit of the hemoglobin tetramer. The base pair substitution causes a mutation from glutamate to valine, resulting in beta-globin polymerization and overproduction of HbS, which polymerizes in the deoxygenated state. The gene-editing technology CRISPR-Cas9 and base editors are promising tools for gene therapy, aiming to reverse the base pair substitution and ultimately, the adverse effects of SCD. Exosomes are a promising delivery vehicle for gene therapy, as they offer a non-toxic, efficient targeting of and translocation into stem cells. A U937 macrophage cell line was transfected with mRNA or plasmids coding for mCherry or luciferase, respectively. Subsequently exosomes were collected and isolated from the transfected U937 cells. These exosomes were ~50-200 nm in diameter and expressed fluorescent mCherry or luciferase. We then incubated these exosomes with human CD34 cells and examined uptake of exosomal mCherry or luciferase by the cells.

28.   **Savanna Conzemius**

Parenting with Adverse Childhood Experiences

Advisor: Armeda Wojciak

Sponsoring Program: McNair

Home Institution: University of Minnesota - Twin Cities

Abstract: Adverse childhood experiences (ACEs) such as abuse, neglect, and household dysfunction are common, with 63.9% of people reporting at least one ACE. Parents with their own maltreatment are at greater risk for mistreating their children, negative parental self-image, increased parenting challenges, and aggressive behavior toward their children. This mixed methods study examines the influence parents' traumatic childhood experiences have on their parenting behaviors and family functioning. Qualitative data was collected through semi-structured interviews with trained professionals. Five quantitative measures collected data about the participants' PTSD symptomology (Primary Care-PTSD), parenting behaviors/practices (Parenting Assessment of Protective Factors), childhood experiences (Benevolent Childhood Experiences and Adverse Childhood Experiences), as well as family functioning (Family Adaptability and Cohesion Scale IV). Results provide a greater nuanced understanding of the influence trauma has on parenting to develop a better parenting intervention—final results and publication pending Spring 2025.

29.   **Liv Courneya Kishish**

The Role of XPA Genes in Removing DPCs

Advisor: Colin Campbell

Sponsoring Program: LSSURP

Home Institution: University of Minnesota, College of Liberal Arts

Abstract: DNA Protein Crosslinks (DPCs) are a major problem when it comes to DNA repair because it does the exact opposite; destroy the important genetic code of ourselves, DNA. If cells are deficient in the XPA gene, do they have a defect in removing the DPCs from 5'Azadeoxycytidine? There hasn't been much research done in the past or even present, but what has been proven, in cells that do have an aza-deoxycytidine methylation on cytosine is that they induce massive increases in producing DPCs. Amongst various methods used, two major methodologies were used in my research: agarose gel electrophoresis and quantitative polymerase chain reaction (qPCR). Encountering obstacles with our KCl Ark Assay Precipitation; to separate proteins from the DNA and even RNA; simply overcoming when it came to editing a few steps and fixing the issue. It didn't stop us from examining the cells we were treating to see if there was a change or difference between the sizes of the DPCs by Density and whether they could repair the DNA in the end. The most important thing is this will help gain insight that can be used to improve the safety and efficacy of cancer chemotherapy.

30.   **Sarah Cravens**

Validating Single Cell-Derived STAT5 Knockout Clones in Prostate Cancer Cell Lines

Advisor: Scott Dehm

Sponsoring Program: LSSURP

Home Institution: Loyola University Chicago

Abstract: Prostate cancer (PC) is the second leading cause of cancer deaths for men in the United States, and 1 of 8 men will be diagnosed with prostate cancer at some point in their lives. Growth and survival of metastatic PC is dependent on androgen receptors (AR), therefore common early-stage treatment is androgen deprivation therapy (ADT). This treatment suppresses the growth of PC by interrupting the binding of androgens to AR. However, PC often advances to lethal castration-resistant prostate cancer (CRPC) during ADT. The constantly active AR (and its variant forms) in the absence of circulating androgens in CRPC indicates the need for other therapeutic targets to prevent the progression of PC. Recently, there has been evidence that STAT5 may be a driver of AR. To investigate the roles of STAT5 in CRPC, we apply gene editing technology to create STAT5 knockout (KO) PC cell line models. We strive to understand how a STAT5 deletion can affect the CRPC growth rate by comparing the WT CRPC cell lines to the STAT5 KO lines. We will analyze our results in order to validate potential therapeutic opportunities to leverage STAT5 as a target to block AR expression in CRPC.

31.   **Amber Croonquist**
Development of Immunotherapies for Opioid Use Disorder
Advisor: Alonso Guedes
Sponsoring Program: LSSURP
Home Institution: Denison University

32.   **Jane Crosby**
Ferritin Degradation and Axon Development in a Model of Iron Deficiency
Advisor: Michael Georgieff
Sponsoring Program: LSSURP
Home Institution: University of California, Davis

Abstract: Iron deficiency is one of the most common nutrient deficiencies in the world and is exacerbated during pregnancy with demands nearly doubling at the beginning of the second trimester. Globally, one in two pregnant women experience iron deficiency and are unable to provide the fetus with sufficient iron reserves to support neuronal metabolism and morphogenesis. The purpose of this study is to examine how neurons degrade ferritin, the iron storage protein, in response to iron deficient conditions. Using immunocytochemistry in E13.5 primary neurons, we quantify the intensity of ferritin and NCOA4, a ferritinophagy mediator, at 18, 24, 48, and 72 hours in culture. Our initial findings show that older neurons in the control group have higher ferritin levels than younger cells, but similar NCOA4 levels and that some, but not many, of the chelated cells have high levels of NCOA4 and low ferritin. Overall, there is a high level of heterogeneity within timepoints and treatment groups. Further work will analyze morphological changes across time and treatments to examine changes in protein localization and neuronal polarization.

33.   **Leo DannerSmith**
The Practicalities of Pilgrimage
Advisor: Rebecca Krug
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota twin cities

Abstract: Pilgrimage was a common practice of the 14th century and appears in many historical documents of the time. But there is much that can't be learned about these journeys from source work alone. The goal of this research project was to learn more about the practicalities of 14th century travel through the practice of experimental archaeology. I completed a simulated pilgrimage here in Minnesota with a group of volunteers using 14th century camping equipment and shoes and will present my methods and findings at this summer's undergraduate research expo.

34.   **Zetovi Dillard**
Navigating Blackness Within the Goth Subculture: Two Stories
Advisor: Yolanda Williams
Sponsoring Program: Pathways
Home Institution: University of Minnesota

Abstract: This project examines experiences of Afrogoths, or Black goths, within the goth subculture. Ideas of how Afrogoths experience the subculture were explored by reviewing literature on the history of the goth subculture, socialization within the subculture, and how Black people experience white majority spaces. Combined with two interviews of Afrogoths, this information showcases a fresh perspective about race in music.

35.   **Sharon Dosunmu**

Evaluation of a Potential Public Health Policy for Reducing Cigarette Smoking Among Older Adults

Advisor: Dana Carroll

Sponsoring Program: LSSURP

Home Institution: Purdue University

Abstract: Older adults (commonly defined as 55+ years) tend to be overlooked in public health efforts geared towards smoking cessation, despite quitting smoking at any age has benefits.The U.S. FDA is considering a nicotine reduction standard for cigarettes as a way to help people quit smoking. A secondary statistical analysis was conducted on data from a recent randomized controlled trial. The trial aimed to evaluate the effects of simulating a real-world marketplace by randomizing participants into two groups: normal nicotine content (NNC) and very low nicotine content (VLNC) cigarettes. The analysis revealed significant reductions in cigarettes per day for both age groups using VLNC cigarettes. Older adults demonstrated trends towards increased smoking cessation and reduced use of non-combustible nicotine products. In contrast, younger adults experienced more pronounced improvements in respiratory health and smoking reduction. This study highlights VLNC cigarettes as a pathway to smoking cessation for older smokers, who may be less inclined to switch to non-combustible alternatives. The findings underscore the need for age-specific smoking cessation strategies and further research into the differing responses by age group. This analysis supports ongoing FDA considerations regarding nicotine standards in cigarettes, aiming to enhance smoking cessation, particularly for older adults.

36.   **Hadley Dowell**

Evaluating Guideline-directed Medical Therapy for Chronic Kidney Disease with Metabolic Risk Factors and Cardiovascular Disease: The Pharmacist's Role in Adherence

Advisor: Wendy St. Peter

Sponsoring Program: SCoPE

Home Institution: Goucher College

Abstract: Cardiovascular-kidney-metabolic (CKM) syndrome is the interaction of metabolic risk factors such as diabetes and hypertension with chronic kidney disease (CKD) and cardiovascular disease (CVD), increasing risks for heart failure and end-stage kidney disease. Guidelines recommend a multidisciplinary team (MDT) approach to CKM management, promoting early detection and adherence to guideline-directed medical therapy (GDMT). This literature review evaluates GDMT pillars for treating CKD with metabolic RFs and CVD, identifies barriers to adherence, and assesses the potential ways a pharmacist can mitigate these barriers to enhance patient outcomes and GDMT adherence. A manual literature search using various databases and professional websites identified guidelines, published articles, and resources informing CKM management and the role of MDT pharmacists. We find GDMT often underutilized due to barriers such as clinical inertia and limited CKM education among patients and providers. Pharmacists within a MDT could improve GDMT adherence through comprehensive medication management (CMM), potentially slowing CKD progression associated with metabolic RFs and reducing CVD risk. Supported by the Advancing Kidney Health through Optimal Medication Management initiative, the identification of barriers and facilitators to GDMT adherence informs the implementation of pharmacist-led CKM-CMM care in diverse MDTs and the development of a CKM-CMM Change Package.

37.   **Fay Edao**

MMM I'm Loving It: Study on Diet and DNA Damage

Advisor: Cathleen Drilling

Sponsoring Program: M-ASCEND

Home Institution: Roosevelt high school

Abstract: We investigated the relationship between diet and DNA damage in the mouth, with the expectation that ultra processed food would have more damage than other foods. To do this, we sampled 72 participants on thee University of Minnesota campus. They completed a survey about their demographics and lifestyle factors as well as provided a 5 mL saliva sample. The saliva was then analyzed for 8OHdG, a common DNA adduct, using an ELISA. Data analysis is currently underway and will be presented on the poster.

38. **Jamie Enright**

Impact of Dysregulated Translation on the Proteomic Determinants of PARP Inhibitor Sensitivity on High-Grade Serous Ovarian Cancer.

Advisor: Stefani Thomas

Sponsoring Program: LSSURP

Home Institution: Hamline University

Abstract: High-grade serous ovarian cancer (HGSOC) is the most common and most lethal form of ovarian cancer. HGSOC often have BRCA-1/2 mutations which cause homologous recombination deficiency leading to DNA breaks. Poly (ADP-ribose) polymerase inhibitors (PARPi) inhibit the ability to repair double stranded DNA breaks in cells that are deficient in BRCA1/2 through synthetic lethality. Over 40% of patients with BRCA mutation HGSOC do not respond to PARPi treatment. We aimed to determine if the dysregulation of the HGSOC translatome underlies the alterations in the proteomic landscape that impact PARPi treatment sensitivity. To do this we investigated the proteomic and translational changes associated with a steady-state and non-steady state proteome characterized by drug-induced DNA damage, using western blotting and mass spectrometry-based proteomics in a HGSOC cell line panel with different BRCA mutational backgrounds. The goal of this study is to identify proteomic profiles that are sensitive to combination treatment. Through this preliminary study we demonstrate distinct, proteome-wide changes associated with Torin, Rucaparib and combination treatment. To further this study we would conduct quantitative mass spectrometry analysis on Caov3, PEO1 and Cov362 cell lines after PARPi treatment.

39. **Fredric Esters**

An Assessment of the Availability of Online Grocery shopping in Two Micropolitan Communities

Advisor: Lisa Harnack

Sponsoring Program: McNair

Home Institution: University of minnesota

Abstract: Online grocery shopping has the potential to improve food accessibility and increase the opportunities for consumers to make nutritious food choices within their household budget and dietary needs. This study investigates the online grocery shopping capabilities of two micropolitan communities in Minnesota. Worthington, MN and Hutchinson, MN, are the micropolitan communities under investigation. The procedure for collecting data is currently under development. A Qualtrics survey was made to ease data entry. The food items were chosen by Dr. Lisa Harnack based on her expert opinion and using the USDA Thrifty Food Plan as a guide. For the study, an Android Galaxy S23 128GB phone will be used to evaluate nutrition and food budget-related features in the online grocery shopping app. There are 31 stores that we are examining in these micropolitan areas. The stores were selected using the USDA SNAP-approved store locator.

40. **Suli Fakunle**

Determining the Function of RNase H1 in Resolving R-loops in Human Cells

Advisor: Hai Dang Nguyen

Sponsoring Program: LSSURP

Home Institution: University of Minnesota

Abstract: R-loops are created during transcription where it consists of an RNA:DNA hybrid and a displaced single stranded DNA. Dysregulated levels of R-loops in human cells can cause genomic instability, one of the hallmarks that promote carcinogenesis. Human cells evolved different pathways to either prevent or resolve R-loops to prevent genomic instability. My research focuses on characterizing RNase H1, an enzyme that specifically resolves R-loops. To assess RNase H1 function in cells, we generated a series of cell lines inducibly expressing either wildtype or mutant version of RNase H1. My research focuses on confirming the expression of Flag-tagged RNase H1 by western blot. My preliminary results indicate that exogenous Flag-tagged RNase H1 was expressed only in the presence of doxycycline. Future experiments will use these cell lines to probe the ability of RNase H1 function in R-loop resolution.

41.   **Dorcas Falokun**

Characterizing the Bleomycin–Monocrotaline Rat Model of Pulmonary Hypertension Due to Lung Disease

Advisor: Sasha Prisco

Sponsoring Program: LSSURP

Home Institution: The Pennsylvania State University

Abstract: Introduction: Pulmonary hypertension (PH) due to lung disease is the second most common form of PH. The median survival after diagnosis is 2.5-5 years. The bleomycin-monocrotaline rat model of PH due to lung disease has not yet been fully characterized. Achieving greater understanding of this model will aid in developing better treatments to improve patient outcomes.

Methods: Male Sprague-Dawley rats were randomly assigned to 3 experimental groups: control, bleomycin, and bleomycin+monocrotaline (MCT). Bleomycin 2.5 mg/kg was instilled intratracheally on days 0, 3, and 6. On day 14, bleomycin+MCT rats received a one time subcutaneous injection of MCT 60 mg/kg. The bleomycin group was sacrificed on day 14 and bleomycin+MCT on day 38. Echocardiography and invasive hemodynamics defined PH severity and right ventricular (RV) function. Lung and RV histology assessed the degree of pulmonary vascular remodeling, lung fibrosis, and RV hypertrophy.

Results: Compared to the bleomycin group, the bleomycin-MCT model had worse RV function, increased PH, greater RV hypertrophy, lung fibrosis, and pulmonary remodeling.

Conclusion: While bleomycin alone induced lung damage and caused a mild elevation in pulmonary artery pressures, the combined bleomycin-MCT model had worse PH, fibrotic lung disease, and RV function.

42.   **Rahma Farah**

Development of Immunotherapies for Opioid Use Disorder

Advisor: Alonso Guedes

Sponsoring Program: MnDRIVE

Home Institution: University of Minnesota- Twin Cities

43.   **Matthew Farnsworth and Guadalupe Dimayuga**

Characterizing the Structure of Early-Life Adversity and Associations with Risk-Susceptibility in Adolescent Behaviors

Advisor: Mark Fiecas and Mustafa al'Absi

Sponsoring Program: Equitable Data Science

Home Institution: Belmont University

Abstract: Early-life adversity (ELA) has tremendous impacts on adolescent behavioral development; however, studies on youth adversity are challenged with characterizing the complexity of ELA co-occurrence and broad heterogeneity. We seek to understand the latent structure of adversity measures by following a subsample of youth in baseline (ages 9-10) and at two-year follow up (ages 11-12) from the Adolescent Brain Cognitive Development (ABCD) study (N = 8091), a multi-level study of youth neurodevelopment across the U.S. Exploratory Factor Analysis on 76 distinct measures of ELA from baseline data identified a 10-factor model of experiential domains such as parent psychopathology, family dysfunction, parent substance use / physical violence, and socioeconomic disadvantage. We then uniquely associated these factors with youth impulsivity and motivational systems, captured via the 20-item Urgency, Perseverance, Premeditation, and Sensation-seeking (UPPS) survey, and the 25-item Behavioral Inhibition / Behavioral Activation Systems (BISBAS) survey, respectively. Previous findings have cognitively linked BISBAS and UPPS subscale scores with risk-averse behavioral development, particularly in the domain of substance use and addiction. Our results indicate strong associations between ELA factor scores and both BISBAS subscale and UPPS scores, which suggest the identified domains of ELA have consistent implications for risk-taking behavior in youth across time.

44. **Patrick Flores**

Investigating Cellular Architecture and Heterogeneity of Fetal Notochord in Mice

Advisor: Andrew Venteicher

Sponsoring Program: LSSURP

Home Institution: University of Denver

Abstract: Chordoma is a rare sarcoma theorized to have notochordal origins. Better molecular characterization of these tumors will enable the creation of targeted therapies. Recent single-cell RNA sequencing data collected by the Venteicher Lab indicate that there may be at least two distinct subpopulations of notochord cells that differ in gene expression. We are utilizing two genes, Noto and Zfp385b, as markers of these subpopulations because the single-cell transcriptomic data show that cells exhibit differential expression in these genes. To better understand the cell-of-origin for chordoma, we are using RNA fluorescence in situ hybridization to stain cells with Noto and Zfp385b expression in sections of E9.75 and E10.5 mouse embryos and subsequently using confocal microscopy to pinpoint the locations of these notochord populations. Image analysis provided evidence for the existence of two subpopulations within the notochord. One of these subpopulations highly expresses both Noto and Zfp385b and appears to be located around the midpoint of the tail. Most of the notochord seems to be composed of a subpopulation of cells that only express Zfp385b. Additionally, a cell population ventral to the notochord is Noto and Zfp385b expressive at the tail with decreasing Zfp385b expression rostrally.

45. **William Frank**

Piezo1 Activation Promotes Macrophage TNF Production

Advisor: Bryce Binstadt

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico at Ponce

Abstract: Patients with rheumatologic diseases are at increased risk of cardiovascular complications, including inflammation cardiac valves. The valves of the high pressure left-side of the heart (e.g. mitral valve) are more often affected than the valves on the low pressure right side of the heart. Piezo1, a mechanosensitive ion channel protein, plays a crucial role in cellular responses to mechanical stimuli. We hypothesized that activation of Piezo1 exacerbates inflammation within the mitral valve. To explore this, we utilized Yoda1, a Piezo1 agonist, to investigate the response of macrophages to Piezo1 stimulation in vitro. J774 murine macrophages were seeded in a 12-well plate at a density of 320,000 cells per well. After 24 hours of incubation, the cells were stimulated with varying concentrations of Yoda1 for an additional 24 hours, and the supernatants were collected for measurement of TNF via ELISA. We found that TNF production was directly proportional to the concentration of Yoda1. Our finding that Piezo1 activation promotes macrophage TNF production enhances our understanding of how pressure sensing might promote preferential mitral valve inflammation.

46. **Christine Friendshuh**

Why Does Neighborhood Matter? A Study of Neighborhood Opportunity Effects on Corticolimbic Circuitry

Advisor: Ka Ip

Sponsoring Program: McNair

Home Institution: University of Minnesota-Twin Cities

Abstract: Neighborhoods with lower opportunity levels are associated with negative outcomes. The stress acceleration hypothesis posits that early life stress leads to protracted brain maturation as a short-term adaptation to adverse environment. However, it is unclear whether this effect can be generalized onto a) children living in low opportunity neighborhoods, and b) corticolimbic circuitry during resting-state fMRI. Objective: We hypothesize that lower COI (child opportunity index) would be associated with earlier maturation of the corticolimbic circuitry, as indexed by a more negative amygdala-CON (cingulo-opercular network), and hippocampus-CON resting-state functional connectivity. Method: We will use data from the Adolescent Brain Cognitive Development study. Multilevel modeling will be conducted using Mplus. Results: Amygdala-CON is significantly related to COI, with a positive beta. Hippocampus-CON is significantly related to COI with a positive beta. Conclusion: Our findings shed light on possible new areas of intervention and mechanisms behind why neighborhood matters.

47. **Cameron Ghalichi**

Does Mulch Type Influence Crop Type and Insect Pest Damage in Brassica Vegetables?

Advisor: Christina Perez

Sponsoring Program: SOAR-REEU

Home Institution: Winona State University

Abstract: Brassicaceae crops such as kale, broccoli, cabbage, and cauliflower are popular vegetables for the fresh market but experience damage from various insect pests, especially in organic production systems. Common pests include flea beetles, imported cabbageworm, diamondback moth, and cabbage looper. This study compared different mulch types, including reflective and black film, to bare soil to assess impacts on pest pressure. The experiment used a randomized complete block design with four brassica varieties: 'Red Russian' and 'White Russian' kale, 'Novantina' broccoli raab, and 'Gypsy' broccoli. Each week, caterpillars were counted on five random sample plants from each treatment and variety, and marketable fresh weight was collected. A Wilcoxon test determined if pest presence and marketable fresh weight differed among mulches. Results showed that the mean number of caterpillars for Novantina, Gypsy, and White Russian kale did not significantly differ among mulch types (p=.1136, p=.883, p=.2011, respectively). However, for Red Russian kale, the difference was significant (p=.0026). The mean weight of marketable harvest differed significantly among treatments for White Russian and Red Russian Kale (p=.01064, p=.00324).

48. **Zada Gordon**

The role of Heat Shock Transcription Factor 1 (HSF1) in Synaptic Gene Regulation across Lifespan

Advisor: Rocio Gomez-Pastor

Sponsoring Program: LSSURP

Home Institution: Howard University

Abstract: Heat Shock Transcription Factor 1 (HSF1) is a stress protective transcription factor canonically known for its role in the regulation of protein quality control systems. Recent studies have highlighted non-canonical roles of HSF1, one being HSF1 ability to participate in the regulation of synaptic genes within different contexts and various regions of the brain. We have previously shown that HSF1 plays a role in the regulation of synaptic genes within different contexts and various regions of the brain. We have previously shown that HSF1 plays a role in the regulation of synapse stability by directly controlling the expression of the postsynaptic scaffolding protein PSD-95, which is necessary for maintaining excitatory synapse stability and neurotransmission. Previous data collected from the mouse striatum, a brain region associated with motor control and some forms of cognition, demonstrated an age-dependent decrease in the concentration of HSF1 that parallels a decrease in overall PSD-95 levels, as well as a specific loss of excitatory synaptic connections originating from the thalamus (thalamostraital/T-S) synapses. It remains unclear why specifically T-S synapses are more sensitive to HSF1 depletion, as PSD95 is expressed at T-S synapses, and other excitatory synapses within the striatum. Preliminary ChIP- Seq and RNA-Sep evidence from our lab in wild type mouse striatum suggests that HSF1 additionally controls the expression of other key synaptic genes specifically within the postsynaptic compartment that are essential in the formation and maintenance of synapses. Here, we sought to validate targets that displayed HSF1 binding activity in our ChIP-Seq and both HSF1 dependent and age-dependent decline in total transcript levels within the striatum utilizing RT-qPCR.

49. **Shanay Goyal**

Reactivation of CD8+ T Lymphocytes Indicative of Increased Tumor Cell Killing

Advisor: Brandon Burbach

Sponsoring Program: LSSURP

Home Institution: St. Bonaventure University

Abstract: Adoptive cell therapy (ACT) to treat cancer involves activating and expanding tumor-specific T cells in vitro before infusion into patients. Although the addition of the cytokine interleukin 12 (IL-12) during initial activation of CD8 T cells promotes increased expansion in vivo and drives memory CD8 T cells tissue residency, IL-12 is not typically included during ACT T cell activation in the clinic. Furthermore, using interleukin-2 (IL-2) for expansion prior to ACT is suboptimal for in vivo expansion and tissue residency formation. We hypothesize that after IL-2 mediated post-activation expansion, a secondary 3-signal "reactivation" with IL-12 will restore T cell functionality. To test T cell function after reactivation conditions, we tested the ability of activated ovalbumin-specific CD8+ T cells to kill target tumor cells in vitro. We found that killing was antigen-specific, required upregulation of MHC-I/SIINFEKL complexes at the tumor cell surface, and increased with increasing T cell number. Re-activation in the presence of IL-12 enhanced tumor cell killing by previously activated, IL-2 expanded T cells, regardless of whether IL-12 was present during initial in vitro activation. Our results suggest that reactivation of T cells with IL-12 following expansion may enhance the generation of tumor-specific T cells in ACT.

50. **Vandita Gupta**

Parental Perceptions of Infants' Prosocial Behavior: Analyzing Infants' Age, Sex and Visual Attention to Antisocial Characters

Advisor: Charisse Pickron

Sponsoring Program: Pathways

Home Institution: University of Minnesota, Twin Cities

Abstract: Infants show awareness of prosocial and antisocial behaviors from as early as 5 months old, and parents play a key role in shaping these behaviors. This study first examined the relation between parents' views of their infants' prosocial actions and the infants' visual attention towards antisocial actions. Second, the variability in reported prosocial behavior was examined based on infant age and sex. Infants aged 11-24 months (n = 47) completed a prosocial behavior eye-tracking task and their caregivers completed the Early Prosocial Behavior Questionnaire. Analyses first revealed a weak correlation between prosocial scores and attention to antisocial actions (r = 0.197). Second, a regression analysis showed that age significantly predicted prosocial behaviors ($\beta = 0.491$, $p < 0.01$), while sex was not significant. Specifically, as infants aged there was a significant increase in parent's reports of prosocial behavior. These findings suggest that parental perceptions are more influenced by age than by sex. Further research is needed to explore other factors shaping parental socialization strategies.

51. **Ava Gustafson**

Interrogating the Role of RSPO2 in Wnt Pathway mPCs

Advisor: Justin Hwang

Sponsoring Program: Independent Research

Home Institution: University of Minnesota - Twin Cities

Abstract: Prostate cancer (PC) is one of the leading causes of cancerous death in men. PC primarily affects the prostate gland and can evolve from adenocarcinomas to more lethal metastatic prostate cancer (mPC). The Wnt signal transduction pathway is thought to regulate tumor initiation of PC as well as subsequent metastasis. Wnt pathway regulators involve the R-spondin protein family, including RSPO2. RSPO2 alterations usually result in amplification, which we have determined drives poor clinical outcomes. Structural rearrangements, another form of alteration, was first reported in two metastatic castration-resistant prostate cancer cases, in which fusion events were found between RSPO2, transcription factor GRHL2, and SNX31.1 This event was reported to enhance the expression of RSPO2. Since then, there has been no comprehensive analysis of the role of RSPO2 in mPC. Our research indicates RSPO2 overexpression results in morphological changes and tumorigenic features as well as promotes drug resistance. Further directions include RNA Sequencing to compare gene expression profiles between primary and metastatic samples and a 3D spheroid assay to visualize and analyze cellular structures. In conjunction, we aim to elucidate the function of RSPO2 in the Wnt pathway and the progression of PC, as well as identify potential therapeutic targets.

52. **Kylie Hansen**

Improved Alfalfa Stem Digestibility Alters Root Chemistry and Architecture

Advisor: Jake Jungers

Sponsoring Program: SOAR-REEU

Home Institution: Utah State University

Abstract: Alfalfa has been bred to have reduced lignin in stems to improve cattle digestibility and increase milk production, but it remains unclear how forage lignin content impacts root architecture and chemistry. Variation in these root traits among lines differing in stem lignin content could have implications for global carbon and nitrogen cycling. We evaluated tap and fine roots of three alfalfa lines varying in stem lignin content for biomass, surface area, length, lignin content, and the carbon-to-nitrogen ratio (C:N). Roots were excavated at the early flower stage in St. Paul and Rosemount, MN, from three-year-old alfalfa stands. The increased lignin line had the highest mean C:N, suggesting reduced root decomposition compared to the other lines. The reduced lignin line had the largest fine root biomass, so although it had a lower C:N than the others, it had the largest carbon and nitrogen inputs to the soil. We predict that stem lignin content is positively associated with root lignin content. These data show that variation in stem lignin influences root architecture and chemistry, and that reduced lignin lines can contribute labile C and N to the soil via high root biomass with stoichiometry conducive to nutrient cycling.

53. **Chante Hardaway**

The Abundance of Microplastics in the South St. Paul Parks System

Advisor: Nic Jelinksi

Sponsoring Program: SOAR-REEU

Home Institution: Michigan State University

Abstract: Many studies have demonstrated the negative health effects associated with the abundance of microplastics in water systems. However, few have considered the abundance of microplastics in inland soil, which is important knowledge for soil toxicity, nutrient mobility, and moisture diffusion in soil. Similarly, there isn't a thorough and repeatable method for quantifying microplastics in soil. This study was conducted to test methods of quantifying the amount of microplastics in soil samples collected from the city of South St. Paul (MN) Parks System. Soil samples were collected from each horizon. For this, 10 related methods were evaluated, with variables including reagents, filter type, method of extraction, use of hydrogen peroxide, and drying time changed with each iteration. The most effective method for quantifying microplastic content was separating samples in double deionized water and placed directly onto a slide for ease with using confocal microscopy. This method was then used to quantify microplastics in 47 samples, expected results are higher concentration of microplastics in higher soil horizons. Given the results of this study, a future study measuring the types and sources of microplastics in these soil samples should be conducted in order to further understand the impacts of this contamination.

54. **Joseph Hartung**

Changes to Amino Acid Residues in Capsid Domain of Gag Protein Effects HIV 2 Particle Production

Advisor: Louis Mansky

Sponsoring Program: LSSURP

Home Institution: St. Cloud State University

Abstract: Today much of HIV research is focused on viral particle production, as the assembly of particles is the method by which the virus is transmitted from cell to cell. A major contributor to the assembly of HIV particles is the gag protein complex. Gag proteins bind together to make a protein lattice which then allows the virus to bud off from the host cell. The capsid domain (CA) of gag is responsible for the gag-to-gag protein binding that creates a needed lattice that drives budding. The goal of this study was to test mutants with one of four amino acid changes within the CA to investigate the impact on particle production. To test this, HEK 293T cells were transfected with either WT or mutant HIV-2. Cells were collected, lysed, and used to prepare samples for immunoblot analysis. Cell culture supernatants were collected and used for immunoblot analysis of WT or mutant virus particle production. Statistical analysis of differences in band intensities was done by using a Bio-Rad imager and image lab software. Viral mutants L150A, D151A, and I152A were found to be comparable to that of Wild Type virus, whereas amino acid change K153A significantly decreased particle production.

55. **Mumtaz Hassan**

Developing Interventions to Promote Cancer Prevention and Screening Among the Somali Community in Minnesota Using Electronic Health Record Data

Advisor: Rebekah Pratt

Sponsoring Program: McNair

Home Institution: University of Minnesota

Abstract: Somali American patients have low rates of cancer screening, for all cancers, compared to other ethnic groups and face many barriers to preventive care. Screenings are crucial to help catch cancers at an earlier stage, potentially lowering morbidity rates. There is a gap in the research about which cancers have the highest frequency among Somali patients in Minnesota. Addressing this gap could help with prioritizing which cancers are most important to address in the community. In this research project, Community Voices of Health is working with members of the Somali community and stakeholders using a multi-pronged approach to help identify interventions and strategies that can help increase cancer screening and prevention. Using BPIC to access health record data, we will assess the frequencies of common cancers among Somali patients within the MHealth system. This information will help guide which interventions are needed to increase cancer screenings in the community. Frequencies of common cancers will be determined for Somali American patients, and compared across other ethnic groups in the MHealth Fairview system.

56. **Kheyra Hassan**

Military Burn Pit Toxins: Effects on Blood-Brain Barrier Integrity, Neuroinflammation, and Cognitive Health.

Advisor: Kheyra Hassan

Sponsoring Program: MnDRIVE

Home Institution: University of Minnesota

Abstract: The use of burn pits for waste disposal has been a common practice in military operations. Burn pits are open-air combustion sites used to dispose of various types of waste, including plastics, metals, chemicals, and medical waste. Military personnel are exposed to the toxic pollutants in the air which has a range of adverse health effects. One of the effects of burn pit toxin exposure is chronic inflammation and the increasing permeability of the blood-brain-barrier can lead to the accumulation of neurotoxic agents in the brain. Disruption of the BBB can lead to neuroinflammation and cognitive impairments, Alzheimer's disease, and Parkinson's disease, and excessive aging.

Additionally, exposure to high levels of pollutants in the air can lead to increased risk of depression, anxiety, and stress. Chronic stress can further compromise the BBB and cognitive functions. This project aims to explore the interaction between burn pit toxin exposure and its impact on cognitive health and neuroinflammation.The findings will be significant for public health, particularly for veterans, by informing policies and therapeutic strategies to mitigate these health risks.

57. **Anna Hillstrom**

Retinotopic Adaptation to Visual Noise In Visual Snow Syndrome

Advisor: Michael-Paul Schallmo

Sponsoring Program: UROP/URS

Home Institution: University of Minnesota

Abstract: In visual Snow Syndrome (VSS), individuals perceive tiny, constantly flickering specks across their entire visual field. Studying VSS is important, as it often has a significant impact on people's lives, and where it originates in the brain is currently unknown.

We hypothesize that VSS originates after the retina in the visual pathways because patients do not display retinal abnormalities. We will test this using a behavioral task involving adaptation. Visual adaptation using dynamic noise temporarily eliminates visual snow. Because adaptation effects are retinotopically specific, snow is only affected in the part of the visual field that was adapted.

Participants with VSS will view dynamic noise stimuli with sinusoidal contrast envelopes (i.e., vertical and horizontal gratings) of different wavelengths on either side of the screen. Afterwards, participants will press a button once their snow matches on both sides, indicating adaptation has worn off. The amount of time it takes for snow to return to normal will be analyzed to evaluate the size of VSS generating neurons' receptive fields. With this, we can make inferences about the brain region(s) from which visual snow originates, which could support future research on causes and treatments of the disorder.

58. **Alex Ho**

Patterns in Family Play

Advisor: David DeLiema

Sponsoring Program: McNair

Home Institution: University of Minnesota-Twin Cities

Abstract: In open-ended play-based settings, children propose, adopt, and negotiate different roles and rules as their play progresses, experiencing the process of leading activities by creating the structures of their play. We extended this prior work by studying naturalistic, outdoor family play through detailed analyses of video. Families with children 2-4, who participated in Free Forest School gatherings, recorded and shared videos of their play. We utilized interaction analysis to create a coding framework for capturing their play and moment-to-moment negotiations over roles and rules. We then created transcripts of focal moments that capture participants' body language and verbal expressions. Preliminary findings suggest that children are the prime leaders when playing. Children constantly come up with new ideas, create variations on activities, establish play patterns, and negotiate changing roles and rules. This study emphasizes the significance of unstructured play in developing leadership, interpersonal, and creative skills for educators, researchers, and parents.

59.   **Haniya Hopson**
Language Development Trajectories in Children with Agenesis of the Corpus Callosum
Advisor: Jed Elison
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: This study characterizes longitudinal language development in children with agenesis of the corpus callosum (ACC), a congenital brain malformation. Participants were divided into four groups: Isolated ACC, Corpus Callosal Hypoplasia (CCH), Uncertain Dysgenesis, and ACC with other abnormalities (Plus). Data from typically developing children served as controls. Language

development was assessed at 6, 12, 18, 24, and 36 months using the Vineland Adaptive Behavior Scales (VABS), MacArthur-Bates Communicative Developmental Inventories (MCDI), and Child Behavior Checklist (CBCL). The data were analyzed with mixed-effects linear regression models, Pearson correlations, and a logistic regression model for parental worry. Results showed

that children with ACC have delayed language development with the Plus group showing greater delays. The regression models showed that the VABS highly predicted other scores, and the MCDI and CBCL were highly correlated. Language delay significantly increased parental worry, and parental worry significantly increased the probability of language delay.

60.   **Lili Imbler**
A Standardized Methodology to Screen for Blackspot Bruise Susceptibility in Potatoes (Solanum tuberosum L.)
Advisor: Laura Shannon
Sponsoring Program: SOAR-REEU
Home Institution: University of California, Davis
Abstract: Blackspot bruise is an internal defect in potatoes that causes major economic losses as many varieties remain susceptible. There are no standardized methodologies to screen for blackspot bruise vulnerability. This study was conducted to develop a standard protocol to screen for bruise resistance and enable the efficient selections of potatoes to breed more resistant varieties. The effect of different storage times, storage temperatures, and tumbling times were evaluated to determine the procedure that induced bruise development. Susceptibility was measured by bruise incidence, color, and severity. A lower pulp temperature at the time of impact, moderate tumbling duration, and warm post-impact storage conditions led to the most significant bruising. Severity was found to be a more reliable metric than incidence to assess bruise susceptibility. An index was calculated to accurately assess blackspot bruise resistance.

61.   **Maliah Jaiteh**
Decoding the Neural Basis of Tics: The Critical Role of EEG-Tic Alignment
Advisor: Christine Conelea
Sponsoring Program: NSSA Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: Tics, characterized by involuntary movements or vocalizations, pose significant challenges for affected individuals. While Comprehensive Behavioral Intervention for Tics (CBIT) is a cornerstone treatment, its efficacy remains variable. To advance our understanding of tic pathophysiology and optimize CBIT, this study investigates the neural correlates of tics. Central to this research is the precise alignment of EEG data with detailed tic coding. Previous limitations in technical capabilities have hindered progress in this area. By addressing these challenges, we hypothesize that accurate alignment of EEG data with tic videos will enable us to identify neural biomarkers predictive of treatment response, refine CBIT strategies, and inform the development of novel therapeutic approaches.

62.   **David John**
Investigating DUX4 Expression in Differentiated iPS Cells from FSHD Patients
Advisor: Michael Kyba
Sponsoring Program: Independent Research
Home Institution: University of Southern California
Abstract: Facioscapulohumeral muscular dystrophy (FSHD) is a common inherited myopathy characterized by progressive muscle weakening and is linked to the unusual expression of the DUX4 gene due to deletions in the D4Z4 repeat array on chromosome 4q. This study aims to differentiate induced pluripotent stem cells from FSHD patients and healthy controls into early neuromotor cells, to evaluate DUX4 expression, and to explore potential motor neuron involvement. Using a motor neuron differentiation protocol, iPS cells were differentiated over a six-day period up to the neuroepithelial progenitor phase, with RNA extraction and antibody staining performed daily. The results indicate an unexpected peak in DUX4 expression during the pre-neuroepithelial phase of motor neuron differentiation around days 3 and 4, contrary to the hypothesis that DUX4 would be expressed predominantly during the late, mature motor neuron phase of cell differentiation. Additional long-term differentiation experiments over 25 days revealed insights into mature motor neuron characteristics and the effects of various differentiation components. These findings provide a deeper understanding of DUX4's role in FSHD pathology and its potential impact on motor neuron development, with implications for therapeutic intervention in adults. Further research will explore the mechanisms underlying DUX4 expression and its effects on motor neuron differentiation.

63.   **Josie Johnson**
Telomere Biology Disorders: Their Impact and Presentation Depending on Patient Demographics.
Advisor: Christen Ebens
Sponsoring Program: Pediatrics CCRF internship
Home Institution: University of Minnesota, Twin Cities (?)
Abstract: Telomeres, as an important component of proper DNA replication and protection, have been studied for decades for their role in health and wellbeing. In particular, the role of telomeres has been extensively researched for individuals with telomere biology disorders (TBDs), many of which inherit pathogenic variants in their genome that impact the production of key enzymes and proteins involved with the synthesis telomerase. To investigate the relationship between condition presentation and family history, I conducted an investigative review among patients presenting to the MHealth Fairview system for TBDs and other related conditions. This included collecting information from 117 people about age of presentation and severity, as well as family records of previously known disorders if available. My results indicate that the highest rate of identification of a TBD for patients in the MHealth Fairview system is among those who were referred by a family member or who have an extensive family history of TBD related disorders. Additionally, younger patients generally had more severe conditions than their older relatives. The results of this study are beneficial to the improvement of better screening as well as reviewing genetic anticipation among predisposed populations.

64.   **Holley Johnson**
Oxidative Stress Biomarkers of Post Traumatic-Epilepsy
Advisor: Lisa Coles
Sponsoring Program: SCoPE
Home Institution: Fayetteville State University
Abstract: Post-traumatic brain injury increases the risk of patients developing post-traumatic epilepsy (PTE). Post-traumatic epilepsy is characterized by recurrent, unprovoked seizures that occur as a result of a traumatic brain injury. Understanding the pathogenesis of PTE is essential to knowing the underlying causes that initiate the onset of epilepsy. Identifying biomarkers for oxidative stress can help tell us the possibility of TBI patients who will likely go on to develop PTE in the future. Observing the levels of oxidative stress in post-TBI patients can help determine whether high levels of oxidative stress cause the development of PTE. Early detection of these biomarkers can help us determine if pharmacotherapy drugs such as Levetiracetam can modulate changes in oxidative stress biomarkers, potentially reducing the development of PTE. Utilizing biomarkers as an approach to PTE could lead to preventative therapies and improved chances for post-TBI patients at risk of developing PTE.

65.   **Nyalaam Jok**

Promoting Equity by Addressing Health and Social Service Barriers

Advisor: Jeff Waid

Sponsoring Program: McNair

Home Institution: University of Minnesota - Twin Cities

Abstract: Health and social service barriers negatively affect child and family development. Understanding how family characteristics and service barriers affect service access may promote child and family wellbeing. This study utilized secondary data from a family navigator intervention study to explore factors associated with family service access. Twenty-nine caregivers participated. Measures included a family service plan, service barriers checklist, navigator check in notes, and lab meeting notes. Thematic analysis was used to explore the qualitative data, and descriptive statistics was used to explore the quantitative data. Findings were mixed to uncover factors associated with service access. On average families experience 10.4 (4.1) barriers to care. Every participant that completed the study identified the lack of awareness about available service options was a barrier to care, and the majority of these families reported needing services for mental health care. Based on the check-in notes and the lab meeting notes family dynamics also played a role in barriers. Families systems that didn't function smoothly had a delay to accessing services.

66.   **Scarlet Jumper**

What is the Effect of Air pollution on DNA Damage in the Mouth?

Advisor: Cathleen Drilling

Sponsoring Program: M-ASCEND

Home Institution: Harding high school

Abstract: We investigated the relationship between Air pollution and DNA damage in the mouth, with the expectation that those with higher exposure to Air pollution would have more DNA damage than those with less exposure. To do this, we sampled 72 participants on the University of Minnesota campus. They completed a survey about their demographics and lifestyle factors as well as provided a 5mL saliva sample. The saliva was then analyzed for 80Hdg, a common DNA adduct, using an ELISA. Data analysis is currently underway and will be presented on the poster.

67.   **Elin Kairies**

Analyzing RSPO2 as a Potential Therapeutic Target in Metastatic Prostate Cancer

Advisor: Justin Hwang

Sponsoring Program: Independent Research

Home Institution: Cornell College

Abstract: Prostate cancer patients have poor clinical outcomes. Outcomes become worse for patients with metastatic prostate cancers (mPCs). mPCs come in three subtypes; androgen receptor (AR) positive, neuroendocrine (NEPC) and double negative (DNPC) The Wnt pathway is responsible for controlling cellular processes and is a known player in prostate cancers. This process is regulated by antagonistic RSPO2 binding. In the Wnt pathway, CTNNB1 acts in the nucleus to advance proliferation. CTNNB1 has high protein-protein interactions, which makes it difficult to target. RSPO2 is upstream of CTNNB1, potentially making it a more accessible target. An in silico study across multiple mPC cohorts, mainly AR+, found that RSPO2 was altered mostly by amplification in patients and led to worse clinical outcomes. Due to the holistic function of RSPO2 being not entirely known, we plan to test the function of RSPO2 as a Wnt based mPC driver in three mPC subtype cell lines (AR+, AR-, ARv7). RSPO2 will be overexpressed in these mPC cell lines and run on a western blot to look at downstream effects of Wnt overexpression. While we are confirming RSPO2's role in Wnt, it appears RSPO could be a potential target for therapeutic treatment.

68.   **Adity Kamath**
S100B Relationships with Psychosis Spectrum Disorders
Advisor: Jeffrey Bishop
Sponsoring Program: SCoPE
Home Institution: Dickinson College

Abstract: Introduction:
S100B is a calcium-binding protein predominantly secreted in the central nervous system. Elevated S100B levels and gene polymorphisms are associated with psychosis spectrum disorders: Schizophrenia, Schizoaffective Disorder, and Bipolar Disorder with psychosis. S100B could be a biomarker for disease progression and a therapeutic target, given its role in neuroinflammation and neural function regulation.

Methods: Participants from the Bipolar-Schizophrenia Network on Intermediate Phenotypes study were divided into two groups: serum analyses (153 cases and 70 controls) and genetic analyses (702 cases and 347 controls). S100B serum levels were assessed using ELISA. We selected SNPs with known associations with S100B (rs9722, rs881827, rs2300404, rs2239574, rs2839357), genotyped them in participants, and examined their relationships with cognition (BACS), race, symptom severity (PANSS), and S100B levels

Results: We found that lower BACS scores were associated with minor alleles in rs9722. No significant associations were found for other SNPs. S100B serum levels quantified in a subset of patients (n = 18) and controls (n = 6), showed no significant differences between groups or other variables.

Conclusions: Our findings suggest rs9722 may affect S100B expression or function, influencing cognitive performance in psychosis patients. Further research is needed to clarify the relationship between S100B levels and psychosis spectrum disorders.

69.   **Faith Karanja**
Assessing Therapy Resistance in ER+ Breast Cancer Cell Models
Advisor: Julie Ostrander
Sponsoring Program: LSSURP
Home Institution: University of Maryland, Baltimore County

Abstract: Around 70% of breast cancer cases are estrogen-receptor positive (ER+). Endocrine therapies (e.g tamoxifen/Tam) plus CDK4/6 inhibitors (e.g. palbociclib/Palbo) are commonly prescribed to patients with advanced ER+ breast cancer. However, tumors can acquire resistance to these treatments. We aimed to assess therapy resistance, and cross-resistance, in tamoxifen-resistant and palbociclib resistant ER+ cell lines. We conducted MTT assays by plating cells, treating them with varying concentrations of Tam, then using a plate reader to yield IC50s for each cell line. We also hypothesized that Tam could be having an agonistic effect on our Tam-resistant cells, so we performed an Alamar Blue Assay to visualize proliferation over time for each cell line when plated with or without Tam and/or Palbo. The MTT assays yielded the highest IC50 values for PalboR and TamR/PalboR, showing the greatest reduction in sensitivity to Tam. The growth plate revealed that there were no significant differences in the pattern of cell growth between the four cell lines. These results indicate that palbociclib-resistant cell lines may display some cross resistance, but further testing is needed to explain the higher sensitivity of TamR cells to Tam.

70.   **Corinne Kelling**
Precipitated Withdrawal of WIN55212-2 Impacts c-FOS Expression Across the Female Rat Brain
Advisor: Sade Spencer
Sponsoring Program: LSSURP
Home Institution: University of Wisconsin-Madison

Abstract: Cannabis withdrawal syndrome (CWD) is a common characteristic of cannabis use disorder, therefore understanding withdrawal may aid in faster identification of and intervention for individuals who need help. In this study, we examined the somatic and neuronal response to rimonabant precipitated withdrawal from WIN55212-2 (WIN), a potent synthetic cannabinoid receptor agonist, compared to a vehicle (VEH) control in adult female, Long Evans rats (n = 4, 2 per treatment group). Experimental rats received WIN infusions of increasing concentrations over a 5-day period while control rats received VEH injections. Four hours after the final infusion, rats were injected with rimonabant, a cannabinoid receptor antagonist/inverse agonist, and global withdrawal scores were employed to quantify behavioral withdrawal responses over 30 minutes of observation. Rat brains were harvested and sliced using a microtome prior to indirect immunohistochemical imaging. Using c-FOS as a marker of neuronal activity, and DAPI to tag all cells, we imaged withdrawal-associated brain regions on a Keyence microscope and counted signals using Quanti-cFOS. We expect to see increased c-FOS expression in withdrawal associated regions in WIN rats, as compared to VEH. We aim to identify brain activation during cannabinoid withdrawal and link it to the somatic responses.

71. **Hannah Khan**

Global Proteomic Analysis of Ovarian Clear Cell Carcinoma Cells Lacking ARID1A Reveals Upregulated Mitochondrial Electron Transport Chain Components

Advisor: Martina Bazzaro

Sponsoring Program: LSSURP

Home Institution: University of Minnesota Twin Cities

Abstract: Ovarian clear cell carcinoma (OCCC) is the most lethal gynecological cancer. It is characterized by inactivating mutations of ARID1A, a gene component of the SWI/SNF chromatin-remodeling complex. This inactivating mutation occurs in up to 70% of patients, and these patients have considerably poorer outcomes compared to those without such mutations. We and others have contributed to the knowledge that ARID1A-deficient cells have a higher dependence upon mitochondrial respiration, suggesting that targeting mitochondrial respiration is a promising approach to eliminating ARID1A-deficient cancer cells. However, the absence of data regarding the distinctive expression patterns of individual components within the mitochondrial Electron Transport Chain (mETC) in the context of ARID1A function hinders the development of mitochondrial inhibitors with high specificity. To provide a justification for developing such inhibitors, in this study, we generated and characterized OCCC-derived ARID1A wild type and knock-out cell lines. Our biochemical and proteomic data provides evidence of the increased relative abundance of mETC proteins as well as increased reliance on mitochondrial metabolism in the ARID1A knock-out OCCC cells. Taken together, our data provides a rationale for identifying therapeutic vulnerabilities within the mETC in the context of treating ARID1A-deficient OCCC.

72. **Christine Kitoy**

Investigating Lung Cancer Screening Access in MN - An Imaging Center Study

Advisor: Abbie Begnaud

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota - Twin Cities

Abstract: Lung cancer kills more than breast, prostate and bladder cancer combined. Lung cancer screening (LCS) decreases the mortality rate by 20%, has been recommended for over 10 years, and yet less than 20% of eligible populations get screened. One barrier that is causing low screening rates is access, especially in rural populations. A recent geospatial study found that 86% of eligible rural populations do not have an American College of Radiology (ACR)-designated imaging center capable of doing LCS within 10 miles of them. Minnesota (MN) has 51 ACR-designated LCS imaging centers, yet there are over 100 imaging centers in MN who do clinical Computed Tomography (CT) imaging, which is the test done for LCS. Therefore, there may be imaging centers that are accessible, but underutilized and not recognized. Thus, the objective of this study is to review and characterize the imaging centers that are not ACR-designated LCS locations in Minnesota, with the intent to further understand the resources available for LCS. Methods of inquiry include reviewing existing public information and contacting the non-ACR-designated imaging centers that have LCS, and discover if their LCS program aligns with existing LCS program recommendations.

73. **Gretta Koppers**

Agmatine Reduces Fentanyl Reinstatement in Mice

Advisor: Carolyn Fairbanks

Sponsoring Program: UMN Summer Pain Consortium

Home Institution: Macalester College

Abstract: The increased detection of lethal drug mixtures including xylazine and fentanyl has raised significant public health concerns. Agmatine, an NMDA receptor antagonist, has been previously demonstrated to reduce opioid seeking behaviors in mice. To investigate agmatine's ability to prevent the seeking of xylazine fentanyl combinations, we utilized a model of operant conditioning. ICR-CD1 mice were trained to activate a lever for fentanyl reward over a control lever. Eight mice were pretreated with agmatine and xylazine and the other eight received a xylazine alone pretreatment. After a period of extinction, the data recorded during fentanyl restatement shows a decrease in lever presses for the agmatine and xylazine pretreatment group. The results of the experiment support that agmatine reduces fentanyl seeking in the presence of xylazine in mice.

74. **Lay Lay**
Investigating Lead Levels in St. Paul Parks: Analyzing the Rhizosphere of Common Plants
Advisor: Cara Santelli
Sponsoring Program: MnDRIVE
Home Institution: University of Minnesota Twin Cities
Abstract: Over the years, the city of Saint Paul the capital city of Minnesota has become home to many immigrants and refugees. They mostly reside in the metropolitan area of Saint Paul near the area where traffic is high. Historically, Minnesota has been the home of the Mining and railroad business where a lot of times, heavy metals such as lead are produced and left in the soil and waters of where people live. Prolonged exposure to lead; a heavy metal can cause neurological damage in both adults and children. For this research, we are looking specifically for lead levels in the parks of Saint Paul and asking if the lead levels in these parks are elevated. Specifically, we are looking at Como Lake, Trout Brook, and Swede Hollow. These parks are located closer to high-traffic, and low-income neighborhoods. From these parks, we are collecting soil samples from plants; as plants can take up lead from the soil to determine lead levels. Depending on the results of the samples collected, educational awareness efforts about lead levels and their potential impact on the population that resides in these areas will be made, to advocate for environmental justice for the population affected.

75. **Abigail Leagjeld and Lindsey Collins**
Expression of Genes Relevant to HIV Pre-Exposure Prophylaxis in the Female Genital Tract
Advisor: Melanie Nicol
Sponsoring Program: SCoPE
Home Institution: Michigan Technological University
Abstract: Approximately 2 million new HIV infections occur in women world-wide each year. Pre-exposure prophylaxis, utilizing common antiretrovirals tenofovir and emtricitabine, is a method used to prevent HIV infection in areas such as the female genital tract. Drug transporters (ABCC4, ABCB1, ABCG2, SLC22A3) influence intracellular and extracellular tenofovir and emtricitabine drug concentrations variably depending on tissue type. Enzymes NME1 and AK2 influence phosphorylation of tenofovir, and enzyme CYP3A5 may alter drug concentrations. Presence of immune cell marker CD4 and cytokine IL-6 may indicate an inflammatory tissue state which may indicate a higher risk of HIV acquisition. Therefore, the primary objective was to determine the gene expression profile of the aforementioned drug transporters, enzymes, and inflammatory markers within female genital tissue to guide future pre-exposure prophylaxis research. To determine the gene expression profiles across tissues, ribonucleic acid was extracted from human cervical and vaginal tissue, subsequently converted to complementary deoxyribonucleic acid, and ultimately reverse-transcription quantitative polymerase chain reactions of the complementary deoxyribonucleic acid were performed with comparison to the GAPDH housekeeping gene. These findings could inform future drug development and dosing guidelines for a variety of female genital tract pre-exposure prophylaxis.

76. **Victoria Lee**
Cortical and Motor Adaptation During Standing Balance Reactions in Older Adults With and Without Stroke
Advisor: Jacqueline Palmer
Sponsoring Program: MnDRIVE
Home Institution: University of Minnesota - Twin Cities
Abstract: The development of cortical and motor controls in adult brains with and without stroke for balance has been researched before, but there still lacks many details that can contribute to the overall understanding of adults with stroke. For older adults, after stroke, lesions that affect the cortical and subcortical pathways may compromise their ability to engage cortical motors and recover rapidly from destabilization of balance. It suggests that there may be an increase in their reliance on cortically-mediated strategies in order to balance. However, the relationship between an individual's biomechanical adaptation and preferred stepping leg in different direction conditions needs to be examined further. Here we show that non-paretic legs in stroke individuals have a smaller SM and CoP compared to their paretic legs in the directions of NPPL and PPL. For participants with stroke, when the force plate movement moved in the direction of their paretic leg, their non-paretic leg was loaded and therefore able to help them balance whether it was by taking a step or leaning on it for support. It explains why the SM and CoP slopes were smaller because of the recovery participants were able to learn throughout the different trials. This was thought to be the case as it makes sense that the non-paretic leg would be the preferred stepping leg as it is unaffected and easier to control. To compare the results, control participants were also included and it was found that half preferred stepping with their left while the other half preferred stepping with their right signifying no overall preference. This analysis could help enhance the knowledge of adults with stroke and investigate further studies regarding other motor impairments or effects of paretic legs.

77.   **Margo Lewis and Hannah Graff**

The Impact of Early Life Adversity on Mental Health Outcomes

Advisor: Mark Fiecas and Mustafa al'Absi

Sponsoring Program: Equitable Data Science

Home Institution: Carleton College

Abstract: Early Life Adversity (ELA) negatively impacts mental health, although the relationship between specific ELA categories and mental health outcomes is not well understood. Using a longitudinal analysis of the Adolescent Brain Cognitive Development (ABCD) study, we analyzed the relationship between ELA and mental health outcomes. The ABCD study is an ongoing comprehensive evaluation that follows over 11,000 adolescents across the United States, gathering data on brain development and health. Beginning with the data from baseline and year two of the study, we looked at seven key categories, adapted from previous definitions of ELA: Physical and sexual violence, parental instability (encapsulating parental substance use, mental health, and other unstable behaviors), neighborhood threat, prenatal substance exposure, discrimination, scarcity, household dysfunction, and potentially traumatic events. Additionally, we examined four mental health outcomes: internalizing behaviors, externalizing behaviors, anxiety, and depression. Using linear mixed models, our research found strong associations between ELA and these mental health outcomes. Furthermore, there was an overall shift in the effects of ELA on mental health as adolescents grew up. It is important to monitor adolescents' mental health in future years to further understand the impact of ELA.

78.   **Shoshana Liu**

Assessing Effects of Chemotherapy Treatment on the Shedding of Cell-Free DNA from Ovarian Cancer Cells

Advisor: Emil Lou

Sponsoring Program: LSSURP

Home Institution: University of Minnesota, Twin-Cities

Abstract: Cell-free (cf) DNA are fragmented molecules that can be found circulating in the plasma after being shed by necrotic or apoptotic cells. The release of degraded DNA is associated with pathophysiological conditions, making it intriguing in clinical diagnostic and biomarker-based research. These molecules are elevated in cancer patients and have the ability to conserve genetic information that discloses the tissue of origin. This makes liquid biopsies a potential non-invasive tool for cancer screening and monitoring. To investigate the conditions that induce DNA shedding, we treated ovarian carcinoma cells (ES-2) with chemotherapeutic drugs including cisplatin, doxorubicin, and paclitaxel. We predicted that cfDNA could be accurately quantified using an in vitro assay and that ES-2 cells subjected to cellular stress induced by chemotherapy would shed more cfDNA and result in greater apoptosis compared to untreated cells. DNA samples were purified using a PCR clean-up kit and submitted to the University of Minnesota Genomics Center for quantitation, purity analysis, and fragment size profiling. Apoptotic cells were determined using a TUNEL Assay. By comparing the in vitro characteristics of cfDNA between the treatments, we found that chemotherapeutic drugs acted on ES-2 uniquely by causing apoptosis at different rates but did not affect cfDNA qualities.

79.   **Lucas Lopez**

What is the Effect of Oral Hygiene on DNA Damage in the Mouth?

Advisor: Cathleen Drilling

Sponsoring Program: M-ASCEND

Home Institution: Hiawatha Collegiate High School

Abstract: We investigated the relationship between oral hygiene and DNA damage in the mouth, with the expectation that not brushing your teeth would have more damage than actually brushing your teeth. To do this we sampled 72 participants on the University of Minnesota campus. They completed a survey about their demographics and lifestyle factors as well as provided 5ml saliva sample. The saliva was then analyzed for 8OHdG, a common DNA adduct, using an ELISA. Data analysis is currently underway and will be presented on the poster.

80. **Jeffrey Lopez-Martinez**

Baseline TET Expression in H522 Lung Adenocarcinoma Cells

Advisor: Natalia Tretyakova

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota

Abstract: Epigenetics focuses on heritable changes in gene function that don't involve alterations to the DNA sequence. Epigenetic modifications, such as histone modification and DNA methylation, can alter gene activity and lead to tumors behaving abnormally. Abnormalities in these epigenetics marks have been noted to exist in a subset of adenocarcinoma, a type of lung cancer. They may play a role in the progression of cancer. The TET enzymes, perform the stepwise oxidation of 5-methylcytosine to produce 5-hydroxymethylcytosine as an intermediate step in the process of DNA demethylation. Anomalous 5hmC levels are identified in many cancers and is believed to be linked with tumorigenesis and the cancer formation stage. In lung adenocarcinoma, the 5hmC levels are largely downregulated, and the inactivation of TET enzymes leads to hypermethylation of the tumor suppressor gene, leading to increased oncogenesis. Restoring TET activity could potentially lead to the inhibition of tumor growth. This research aims to define the expression status for TET in untreated H522 lung adenocarcinoma cells. This was carried out through cell culture, RNA extraction, cDNA synthesis, and qPCR using TET and housekeeping gene GAPDH. The functionality of the primers for TET and GAPDH has been confirmed—more information on the poster.

81. **Leslie Luces Saavedra**

Incorporating Culturally Responsive Pedagogy and Indigenous Ways of Knowing into Minnesota K-12 Education Through Science Educator Professional Development

Advisor: Katie Johnston-Goodstar

Sponsoring Program: McNair

Home Institution: University of Minnesota-Twin Cities

Abstract: In 2019, Minnesota adopted science education standards that would require science educators (grades 1-12) to teach Indigenous knowledge. In Minnesota, almost 80% of teachers are White and teacher preparation programs at colleges and universities are taught by majority White faculty with little exposure to other ways of knowing. The purpose of our year-long Teacher Professional Learning Communities (PLC) for Indigenous Science project is to support science educators in learning about Indigenous knowledge and to increase their efficacy to implement these concepts and pedagogies into their curriculum in a culturally responsive way. Over the course of a year, teachers attended 2-4 in-person experiential and 4 virtual sessions. We employed reflexive interviews to understand participant experiences with the program and to collect data. Preliminary findings on teacher experience and efficacy are presented in addition to an exploration of implications for higher education, teaching training, Native and non-Native student achievement, and school connectedness.

82. **Mary Lynn**

Cleavage of the CD200 protein via Matrix Metalloproteinases May Release the Natural Ligand for the CD200 Activation Receptor

Advisor: Michael Olin

Sponsoring Program: LSSURP

Home Institution: Louisiana Tech University

Abstract: The CD200 protein is highly expressed in tumor cells and neurons. CD200 regulates the immune system through paired receptors, an inhibitory receptor (CD200R1) and multiple activation receptors (CD200AR). When bound to natural ligand CD200 protein binds to the CD200R1, it promotes tumor growth by suppressing the immune system. However, to date the natural ligands for the CD200ARs remain unknown. However, it has been reported that when the CD200 is released from tumors, via proteases, the ability of CD200 to bind to and phosphorylate CD200R1 is affected. We posit that the natural ligand(s) for the CD200AR are the fragments or altered CD200 protein following proteolytic cleavage. Our previous studies have suggested that a natural ligand for CD200AR could be uncovered by cleaving the CD200 molecule via matrix metalloproteinases. This cleavage is thought to expose and/or release peptides that would act as a ligand to bind to CD200AR. This study intended to detect the natural ligand for CD200AR by exposing CD200 to a matrix metalloproteinase. CD200 was incubated with ADAM-15 and Raw cells were exposed to this supernatant. The proliferation of the cells before exposure was analyzed. A BCA Assay, Western Blot, and ImageJ analyses were performed. The results are preliminary but confirm that the study is being performed properly so far.

83.   **Trevor Marquez**

Predicting Drugs that Extend Lifespan in C. Elegans Using Machine Learning Models

Advisor: Chad Myers

Sponsoring Program: McNair

Home Institution: University of Minnesota - Twin Cities

Abstract: Aging has long been an extensively researched topic, but many of the mechanisms and processes involved remain poorly understood. In our work, we plan to utilize drugs and their effects on C. elegans to study the aging process. Nematode life extenders (NLEs) are the focus of this study, but many of them are likely undiscovered. Due to the wide scope of compounds that exist, it would be inefficient and prohibitively expensive to screen all compounds in vivo. Machine learning models are a useful way to help narrow down the chemical search space. A variety of machine learning models were evaluated to determine the efficacy of NLE discovery using machine learning. The goal of this study is to create a method to more efficiently identify new NLEs.

84.   **Kali McDonough**

Determining the Role of RNase H1 Phosphorylation in R-loop Resolution

Advisor: Hai Dang Nguyen

Sponsoring Program: LSSURP

Home Institution: University of Michigan

Abstract: Genomic instability, a hallmark of cancer, arises through DNA replication and transcription. Transcriptional stalling can lead to the formation of R loops, stable RNA:DNA hybrids with a displaced single stranded DNA. Extensive R-loop accumulation has been shown to lead to genomic instability through the promotion of collisions between DNA replication and transcription machinery. Reducing DNA damage and genomic instability requires concise methods of R-loop regulation, such as the hydrolysis of RNA:DNA hybrids by RNase H1 guided by Replication Protein A (RPA) interactions (1). Despite the importance of RNase H1 in R-loop resolution, the regulation of the RNase H1:RPA interaction is unclear. This project aims to dissect how RNase H1:RPA interaction is regulated. Phospho-proteomic analysis revealed that RNase H1 is phosphorylated at Ser76, adjacent to the RPA interaction site; we suggest that Ser76 phosphorylation could promote RNase H1:RPA interaction at R loops. First, we generated a phospho-specific antibody and validated Ser76 phosphorylation detection in human cells. We then generated wildtype and phospho-mutant versions of RNase H1 to examine how it affects RPA interaction and ultimately R-loop levels in human cells by western blot and immunofluorescence. In the future, using our phospho-antibody, we will identify the kinase(s) involved in RNase H1 phosphorylation.

85.   **John McFadden**

Mitochondrial Abnormalities in Duchenne Muscular Dystrophy Cardiomyopathy

Advisor: Forum Kamdar

Sponsoring Program: LSSURP

Home Institution: Coe College

Abstract: Duchenne Muscular Dystrophy (DMD) is a fatal, x-linked recessive disease in which the DMD gene is mutated, resulting in a total loss of the structural protein, dystrophin. The leading cause of death in patients with DMD is cardiomyopathy. Without dystrophin, forces generated during sarcomeric contractions can cause "microtears" to form in the sarcolemma, allowing for the diffusion of ions into the muscle fiber and leading to elevated ion concentrations. Chronically elevated diastolic calcium concentrations within muscle fibers leads to dysfunctional mitochondrial calcium handling. In DMD (mdx) mouse models, it has been established that cardiac mitochondrial content and mitochondrial calcium uniporter (MCU) function are abnormal; however, further investigation into human induced pluripotent stem cell-derived cardiomyocyte (hiPSC-CM) models is yet to be conducted. In this study, we determined that the DMD phenotype is likely not causing an increase in the total mitochondrial content of cardiac cells via fluorescent imaging. Furthermore, we conducted calcium imaging on WT and DMD hiPSC-CMs with and without inhibition of the MCU via Ru360. We determined that, in DMD, the MCU plays a less significant role in transporting calcium.

86.   **Arpum Mehmi**
How to Get Access to College Access: Exploring Family Engagement in Twin Cities College Access Programs
Advisor: Sara Axtell
Sponsoring Program: Pathways
Home Institution: University of Minnesota - Twin Cities

Abstract: Students who identify as BIPOC, low-income, or first-generation college students often receive mentorship and support from college access programs in order to overcome barriers to higher education. However, many college access programs use student-centered engagement approaches that do not include families into the conversation around college access. This is detrimental because the process of entering, attending, and graduating from a higher education institution impacts various factors that affect a family's socioeconomic standing, postsecondary enrollment knowledge, and relationships with their students. Family engagement aims to circumvent these detriments by including families into college access programming through the use of information-sharing, collaboration, and active participation. This poster presents an overview of a thematic analysis analyzing family engagement information included in various college access program websites around Minnesota's Twin Cities. By examining family engagement content in college access program websites, this analysis aims to identify barriers to family engagement and offer recommendations for integrating family engagement strategies into college access programs. Results indicate that very little family engagement techniques are currently being advertised on public-facing college access program websites, and recommendations for improvement include actively providing and tailoring website pages for family members to understand possible opportunities for family engagement.

87.   **Grayshalie Melendez**
Combating New Insect Pest, Swede Midge, in Minnesota Using Mitigation and Monitoring
Advisor: Cindy Tong
Sponsoring Program: SOAR-REEU
Home Institution: University of Puerto Rico - Utuado

Abstract: Gardeners in St. Paul are having difficulty obtaining harvestable Brassica (e.g., broccoli, cauliflower, and collards) crops due to a new insect pest called the swede midge.We need to better understand how to manage this pest in organic systems. Swede midge adults can lay 50 eggs on a plant, which become larvae that could impede head formation in broccoli and cauliflower, and distort leaves. Pupae can overwinter for 3 years under soil. The goals of my project were to examine midge emergence patterns among years, compare infestations on farms versus community gardens, and learn the effectiveness of a system to mitigate midge infestation. Midges were trapped on sticky cards at farms and gardens, and counted using a dissecting microscope. The numbers of unaffected plants in mitigation systems were compared to control plants grown outside the systems. No midges were found on farms, whereas midge numbers were higher in gardens than in previous years aside from one garden, where brassicas had been banned for 3 years. The average 73% of brassicas inside mitigation kits were in good condition, compared to 54% of controls outside the kits.

88.   **Hannah Meyers**
Developing Inhibitors of CDK5 using Phage-Displayed Peptide aptamers
Advisor: Laurie Parker
Sponsoring Program: McNair
Home Institution: University of Minnesota

Abstract: Cyclin Dependent Kinase 5 (CDK5) is a proline-directed serine/threonine kinase activated by non-cyclin binding partners p35 and p25. The physiological activation and localization of CDK5 is guided by p35, a membrane-anchored protein. Activation by p35 is required for neuronal development and differentiation. The interaction of p25, a cleavage product of p35, results in the pathological hyperactivation of CDK5 implicated in Alzheimer's disease. To date, no major topological differences in the binding interactions of CDK5/p35/p25 have been reported; thus, hindering inhibitor development that is specific to CDK5/p25. We explore the potential of Pyrococcus furiosus thioredoxin (PfTrx) as a peptide aptamer scaffold to evolve p25-specific binders via phage display. The PfTrx construct tolerates peptide insertions within its active site, generating a disulfide-bridged constrained loop. The mutagenized libraries will undergo plate-based selections to screen for p25-specific binders. The phage-derived p25-specific binders will be assayed for inhibition of aberrant CDK5/p25 following selections.

89.   **Lul Mohamed**

How Does Alcohol Affect DNA Damage in the Mouth?

Advisor: Cathleen Drilling

Sponsoring Program: M-ASCEND

Home Institution: Roosevelt HIgh School

Abstract: We investigated the relationship between alcohol and DNA damage in the mouth, with the expectation that the more alcohol consumption, the more DNA damage in the mouth. To do this, we sampled 72 participants on the University of Minnesota campus. They completed a survey about their demographics and lifestyle factors as well as provided a 5mL saliva sample. The saliva was then analyzed for 80HdG, a common DNA adduct, using an ELISA. Data analysis is currently underway and will be presented on the poster.

90.   **Bianca Morcho**

Mitotherapy as a Prospective Treatment Option for Several Neurodegenerative Diseases

Advisor: Walter Low

Sponsoring Program: LSSURP

Home Institution: Grinnell College

Abstract: Alzheimer's Disease (AD) is a progressive and incurable neurodegenerative disease that predominantly affects the elderly population worldwide. Characterized by symptoms such as cognitive decline, memory loss, personality changes, increased aggression, and paranoia, AD is one of the top ten leading causes of death in the United States. While there are attempts to slow down the disease, there is currently no way to prevent it. Previous studies have shown that mitochondrial dysfunction is directly linked to the onset of AD and other neurodegenerative diseases.

Cells with high energy requirements, such as those in the brain, depend highly on mitochondria to maintain functionality. Primarily using oxidative phosphorylation as an energy source, mitochondrial dysfunction can cause neuronal cell death.

This study looks at the amount of mitochondria and microglia observed in neurologically healthy mice to get a baseline for future imaging of AD mice. Mice brains and embryos were sliced coronally and mounted onto slides before being stained with DAPI and imaged for mitochondria and microglia. The resulting images were consistent with what we expected to see in healthy mice.

91.   **Jing Jing Munson**

Behavioral Consequences of HSF1-mediated Thalamo-striatal Synapse Loss

Advisor: Rocio Gomez-Pastor

Sponsoring Program: Independent Research

Home Institution: Carleton College

Abstract: Heat Shock Transcription Factor 1 (HSF1) is a stress protective transcription factor canonically known for its role in cellular stress responses and the regulation of protein quality control systems. However, any role HSF1 may play under non-stressful, physiological conditions within the central nervous system has been understudied. Importantly, HSF1 levels decline during aging and this decline is exacerbated in various neurodegenerative diseases. Recent evidence has demonstrated that HSF1 participates in the regulation of synaptic genes within different contexts and brain regions, highlighting non-canonical roles for HSF1 beyond the regulation of protein quality control systems. We have previously demonstrated that depletion of HSF1 within the striatum, a brain region that controls movement and some forms of cognition, results in a loss of excitatory synaptic connections originating from the thalamus (T-S synapses) and impairment in tasks measuring cognitive flexibility. Here, we examined the effects of striatal HSF1 deletion on both gross motor and spatial memory to determine if HSF1-mediated loss of striatal synaptic connections results in additional behavioral deficits.

92. **Elias Muy-Landi**

Gait Analysis in Patients with Parkinson's Disease During ON and OFF Medication Phases

Advisor: Robert McGovern

Sponsoring Program: MnDRIVE

Home Institution: Augsburg University

Abstract: Parkinson's Disease (PD) is characterized by a deficiency of dopamine production in the brain, leading to symptoms such as resting tremor, bradykinesia, rigidity, and postural instability (balance). This project aims to study gait and balance in PD patients during "on" and "off" phases of dopaminergic medication to determine if medication improves postural instability. Understanding the impact of medication on gait and balance is crucial, as these symptoms significantly affect patients' quality of life. To study gait and balance, we attach a system of fifteen inertial measurement units (IMUs) to various parts of their body. Specialized motion capture software (Visual 3D, HAS-Motion) is used to analyze the accelerometer and gyroscopic data from the IMUs to produce data on how the various body segments move. R/RStudio is used to perform comprehensive statistical analysis. Through this research, we aim to enhance our understanding of Parkinson's Disease and inform treatment strategies. If medication is found to be insufficient in improving stability, surgical options might be considered. This project has the potential to contribute valuable insights into the management of PD, ultimately aiming to improve patient outcomes and quality of life.

93. **Laura Neal**

Analgesic Effects of SI-RNA Inhibition of HIF-1a in Murine Model of Bone Cancer

Advisor: Iryna Khasabova

Sponsoring Program: UMN Pain Consortium

Home Institution: Macalester College

Abstract: More than 60% of patients with primary or metastatic bone cancer experience severe pain. This pain is often exacerbated by cancer treatments such as chemotherapy. Cancer-related pain is hard to treat as it is inflammatory, tumorigenic, and neuropathic. Resolvin (RvD1), a pro-resolving antinociceptive product of ω−3 polyunsaturated fatty acids, may alleviate tumor-induced hyperalgesia by resolving inflammation. We have previously shown the antinociceptive properties of Resolvin in tumor-bearing mice, but the exact mechanism through which Resolvin alleviates pain is not yet fully understood. One possible mechanism is that it decreases the levels of HIF-1a in the spinal cord. Our preliminary data shows that tumor-bearing mice treated with resolvin have lower levels of HIF-1a in their spinal cord than untreated tumor-bearing mice. Tumor-bearing mice also have higher levels of HIF-1a than naive mice, as HIF-1a is associated with tumor survival, enabling cells' survival in hypoxic environments. To explore this possible mechanism of Resolvin, we injected tumor-bearing mice with SI-RNA to block HIF-1a. We hypothesize that HIF-1a is directly involved in the pain pathways of tumor-related mechanical hyperalgesia and that this pathway can be intercepted through treatment with Resolvin.

94. **Maybelle Newcombe**

Best Practices for Returning Results to Biomedical Research Participants

Advisor: Jenny Poynter

Sponsoring Program: CCRF

Home Institution: University of Minnesota - Twin Cities

Abstract: Background: Voluntary participants are essential to biomedical research, in which many studies cannot be conducted without them. Many researchers and participants believe that a summary of the results should be returned to the participant following the study's completion. This review investigates the philosophy and best practices for returning results.

Methodology: Available literature about returning results to participants was reviewed. Ten articles published between 2005 and 2023 were reviewed. Following the review, return of results materials were produced for two studies involving pediatric germ cell tumors.

Results: Investigators and study participants both feel that participants deserve to receive results from research studies as their contributions make the work possible. Participants emphasized that return of results make them feel valued and help build trust within the research process. When returning results, the report should focus on findings that are meaningful to participants, in a simple and intuitive format, and distribution of the report should be tailored to the specific participant audience.

Conclusion: Results should be returned to study participants in an accessible and easy to understand way to build trust between participants and investigators, as well as the research process in general. Results may provide guidance to participants on future health decisions.

95. **Nicole Ngeno**
Picky Eating in Preschoolers: Prevalence and Association with Caregiver Feeding Styles
Advisor: Katie Loth
Sponsoring Program: M-ASCEND
Home Institution: University of Minnesota Twin Cities
Abstract: Picky eating is a common concern among parents of young children. Research indicates that parental feeding approaches can significantly influence the development of picky eating habits. The current study aimed to understand the prevalence of picky eating among preschoolers and the relationship between caregiver feeding style and child pickiness. Parents (n=218; 53.2% BIPOC) responded to survey questions on feeding style and their preschooler's eating behaviors. Statistical analyses were performed to examine associations between child pickiness, demographic characteristics, and caregiver feeding style. A quarter (25.2%, n=55) of preschoolers were categorized as "high pickiness" (mean score >3.5, scale 1-5). No significant differences in mean picky eating scores were found by child/parent race, child sex, or age. A quadratic relationship was observed between picky eating and income and educational attainment; picky eating scores were lower among children whose parents had lowest and highest levels of income (p=0.014) and educational attainment (p=0.039). Mean picky eating scores were lowest among children whose parents had an indulgent feeding style and highest among children whose parents had an uninvolved feeding style (p=0.053). Findings suggest that picky eating is quite common among preschool-aged children, with differences in mean pickiness observed by parent's income, education, and feeding style.

96. **Weslee Nguyen and Samantha Darby**
Impacts of Prenatal Tobacco Exposure on the Developing Brain: Socioeconomic, Environmental, and Genetic Influences
Advisor: Eric Rawls
Sponsoring Program: Equitable Data Science
Home Institution: University of Arizona
Abstract: Prenatal Tobacco Exposure (PTE) is associated with a greater likelihood of developing internalizing and externalizing behaviors overtime. Preliminary studies suggest PTE may influence behavior by changing connectivity between subcortical Incentive Salience (IS) and neocortical Executive Function networks. However, such studies have not distinguished whether PTE, correlated social determinants of health (SDH), or genetic influences primarily impact these connectivity changes. Using a sample of 9-12 year olds (N = 1518, 11% PTE) from the ABCD study, we explored the role of environmental factors and genetics in PTE-associated brain connectivity changes via Factor and Mediation Analyses. We observed that PTE is associated with increased bottom-up brain connectivity, regardless of covariates (polygenic risk scores, gender, age, parent marital status, parent education, household income, and sibling status). This association was not mediated by exposome factors. Moreover, PTE independently associates with exposome factors relating to Substance Accessibility, Family Substance Rules, and Isolated Screentime. Thus, PTE is associated with increased bottom-up IS connectivity that cannot be accounted for by SDH. Increased bottom-up IS connectivity is implicated in increased addictive relapse and susceptibility to addiction-related cues. Future studies taking advantage of the longitudinal aspect of the ABCD study should investigate whether PTE predicts higher tobacco use overtime.

97. **Charlie Nguyen**
Therapeutic Engineering of NK Cells Using Non-Viral Precision Knock-in
Advisor: Jeffrey Miller
Sponsoring Program: LSSURP
Home Institution: University of Minnesota
Abstract: Natural Killer (NK) cells are innate immune lymphocytes that are currently being studied for their potential as a cancer immunotherapy. Prior attempts to genetically modify these cells using retroviral methods have been challenging due to extremely low efficiency and uncontrolled random integration in NK cells. CRISPR-mediated gene knock-in has been demonstrated to be a feasible method to circumvent some of these challenges in T cells. However, these nonviral knock-in methods have not been able to generate meaningful efficiency and cell recovery when applied to NK cells due to the toxicity of exogenous DNA. We sought to optimize different parameters of genome engineering based on cellular physiology. Using our optimized system, we successfully expressed a chimeric antigen receptor (CAR) and sIL15 construct under the control of an endogenous immune checkpoint promoter in NK cells. This work demonstrates an effective method that holds potential in the design of off-the-shelf NK cell therapeutics.

98.   **Yareliz Nieves**

Examining CREB5 Regulation of Tumorigenicity and Cell Surface Proteins in Basal-like Breast Cancers

Advisor: Justin Hwang

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico - Mayaguez

Abstract: Basal-like breast cancers (BLBC), most of which are triple-negative breast cancers (TNBC), exhibit aggressive behavior and poorer prognosis, with a 5-year survival rate of 77%, compared to 91% for all breast cancers. A major challenge in treating BLBC is the lack of targeted therapies. CREB5, a transcription factor linked to increased tumorigenicity in various cancers, has an unexplored role in BLBC. This study investigates CREB5's role in regulating tumorigenicity and cell surface proteins in BLBC to identify new therapeutic targets. CREB5 and a control gene (Luciferase) were overexpressed in TNBC and BLBC cell lines, MDA-MB-231 and HCC1806. CREB5 overexpression led to higher proliferation and tumor-like spheroid formation rates in these cell models. RNA sequencing of 2D and 3D cultures revealed transcriptomic changes associated with CREB5 expression, varying gene overexpression by 6% in 2D cultures and 10% in 3D cultures compared to controls. Using surfaceome assays, we determined CREB5 regulates cell surface proteins linked to stemness and metastasis, such as IL13RA2, potentially enhancing tumorigenicity and metastatic potential in BLBC. Overall, we determined CREB5 plays a regulatory role in phenotypic, transcriptomic, and proteomic changes in BLBC. Understanding CREB5's influence in BLBC can identify targets for new therapies, potentially improving patient prognosis.

99.   **River Norris**

Real-time Soil Health Sensing: Soil Permittivity and Soil Organic Matter Correlation in Annual Tilled Crops Versus Perennial Turf

Advisor: Bryan Runck

Sponsoring Program: SOAR-REEU

Home Institution: Volunteer State Community College

Abstract: Soil health is fundamentally influenced by soil organic matter (SOM). It is traditionally measured through lab analysis of soil samples, which can be time intensive and costly. Previous work has shown that SOM is a suitable proxy for soil health and can be measured in real-time by permittivity sensors. This experiment is to determine the correlation between soil permittivity and SOM in annual tilled soy/corn fields and perennial zero-tilled turfgrass fields to aid in soil health evaluation. Composite soil samples were taken at five randomized locations within each field and then sent to the UMN Soil Testing Laboratory for SOM analysis. To measure permittivity, an Acclima TDR 315H soil sensor was inserted into three sub locations within a square meter of the randomized locations. Correlation analysis showed that SOM was positively correlated ($r = 0.88$) with permittivity in all three fields. An ANOVA showed that SOM and permittivity similarly differentiated between different crop types and tillage ($p<0.001$). The relationship between SOM and permittivity is significant; therefore, these results suggest that soil health can be estimated by soil permittivity sensing in medium textured soils. Further work should evaluate the on-farm usefulness of this approach for soil health management.

100.   **Aralyn Nunez**

Erosion Mats: An Alternative Method for In-Field Erosion Monitoring in Research and Agronomic Operations

Advisor: Anna Cates

Sponsoring Program: SOAR-REEU

Home Institution: University of Florida

Abstract: Soil erosion is a leading concern for farmers and policymakers as extreme weather events remove more topsoil yearly. Measuring erosion is often an expensive task done with edge-of-field (EOF) monitoring technology, so this project aims to investigate an accurate, more accessible alternative method of measuring soil erosion using fabric erosion mats. Erosion mats are 6x6 inch squares of porous mesh fabric staked to the soil surface that can catch sediment moved by water in fields. One group of mats was deployed at the Farm at the Arboretum in different cropping systems. Based on ANOVA tests, the mats were able to detect that perennial Kernza had less erosion than most other cropping systems while soybeans without cover crops usually had the most erosion. The second group of mats was deployed at two Discovery Farms sites (Marathon, WI and Redwood, MN). The soil sediment and nitrate from mats were compared to EOF total suspended solids (TSS) and nitrogen. There are correlations between in-field measurements and EOF data, but this method should be investigated further as a tool to measure progress in farm management and soil conservation.

101. **Shannon O'Hara Wiora**

Individual Differences in Cognitive Impairment Following NMDAr Ablation in Mice

Advisor: Nicola Grissom

Sponsoring Program: LSSURP

Home Institution: College of William and Mary

Abstract: According to the National Alliance on Mental Illness (NAMI), there are about 1.5 million U.S. adults with schizophrenia. Current antipsychotic medications primarily address positive and negative symptoms, but cognitive symptoms, such as impaired learning and working memory deficits, are left largely untreated, and as a result are highly predictive of quality of life. The mechanisms behind these cognitive symptoms remain unclear, complicating treatment efforts. Recent research has shown fewer NMDA receptors in the prefrontal cortex (PFC) of individuals with schizophrenia. NMDA receptors, a subtype of glutamate receptors in the brain, are crucial for synaptic plasticity, memory, and learning, suggesting a potential link between cognitive symptoms of schizophrenia and NMDA receptors in the prefrontal cortex. Using transgenic mouse models can help us unpack the relationship between NMDA receptors in the PFC and schizophrenia, in particular how specific genes might be contributing to these cognitive symptoms. This is essential for developing targeted therapies for cognitive deficits in schizophrenia. Our research utilizes a CRISPR-Cas9 mouse model and region PFC specific viral ablation of NMDA receptors to investigate whether a decrease in NMDA receptors in the PFC is sufficient to produce schizophrenia-like behaviors in a multi-armed bandit task. Early results show significant behavioral differences between control mice and those with viral ablation of PFC NMDAr, but with considerable inter-individual variability. Post-behavior brain slicing and staining revealed like-wise variability in viral expression between animals, suggesting that variability in behavior may be linked to degree of ablation in our animals. Future studies will test equal sex variation and larger sample sizes.

102. **Ashley Okafor**

Community Validation of Key Elements for Creating Culturally Relevant Cancer Education Materials

Advisor: David Haynes

Sponsoring Program: M-ASCEND

Home Institution: Northwestern University

Abstract: Background Cancer education materials have been used to address the racial disparities in cancer mortality. Haynes et al. created a guide, called PEARL, that suggests 5 key elements for creating culturally specific cancer education materials. UMN researchers created breast cancer education materials following the PEARL. Our work examines if breast cancer advocacy organizations found the materials acceptable.

Methods We conducted four focus group interviews with four breast cancer advocacy groups. Members reviewed a slidedeck and corresponding voiceover recording. Each interview was 60 minutes, recorded over Zoom, and transcribed for thematic analysis.

Results One theme that was not initially in the PEARL was accessibility. Accessibility could be improved by removing the following barriers: language, technology, and sensory. Suggestions included that we make the content easy to translate, provide additional education materials that aren't online, and have the voiceover synchronized with the slides to help those with sight challenges.

Conclusions Three other themes that were identified confirmed the key elements from the PEARL. Going forward, we think the PEARL should be tested with other communities to see if it can be used in more spaces.

103. **Favour Olatunde**

Biofilm Formation of Enterococcus Faecalis in Conditions Relevant to the Oral Cavity.

Advisor: Julia Willett

Sponsoring Program: LSSURP

Home Institution: Augustana College

Abstract: Enterococcus faecalis, can be found at low levels in the oral cavity, and accounts for 3.7-25% of periodontal infections. E. faecalis forms surface-adhering biofilms with a protective extracellular matrix for prolonged survival. The growth and biofilm formation of E.Faecalis in relevant oral conditions and its way of interacting with other bacteria in the oral microbiome are not well known.

Previous studies indicate that E.Faecalis forms an increased biofilm in sucrose and glucose compared to BHI leading us to further investigate how this bacteria behaves in other relevant oral conditions like SHI. We seek to understand how E. faecalis forms biofilms under different growth conditions. Understanding the growth and behavior of E. faecalis pathogenicity provides potential targets for therapeutic intervention for improving the management of oral infections.

104.	**Saleim Omer**
Biological Control Methods of Plant Pathogens
Advisor: Devanshi Khohkani
Sponsoring Program: MnDRIVE
Home Institution: University of Minnesota - Twin Cities
Abstract: An ever-increasing population demands an equal increase in food supply. Farmers are working to prevent the loss of crops by commonly using pesticides. The danger of pesticides is well known; from potential runoff into ecosystems to adverse health effects. However, bacteria in the rhizosphere have been shown to limit the effects of plant pathogens. This study examined a combination of various subcommunities of bacteria and their effect on sorghum growth. Data analysis is still pending.

105.	**Marlon Oviedo Alfonso**
Synthesizing Small Molecule Bifunctional Ten-Eleven Translocation Inhibitors
Advisor: Natalia Tretyakova
Sponsoring Program: Pathways
Home Institution: University of Minnesota
Abstract: 5-methylcytosine is an important epigenetic modification introduced by DNA Methyl Transferases and then removed by Ten Eleven Translocation (TET) dioxygenases. TETs 1-3 are an alpha-ketoglutarate (a-KG) and Fe (II) dependent family of enzymes that catalyze the oxidation of 5-methylcytosine (mC) into 5-hydroxymethylcytosine (hmC), 5-formylcytosine (fC), and 5-carboxycytosine (caC). This catalytic oxidation leads to the removal of the silencing methyl mark and the reactivation of gene expression. Aberrant methylation patterns are common across cancers such as lung, liver, and brain. Current inhibitors for TET either mimic a-KG or cytosine with medium inhibitory effect and have dose-limiting toxicity. Described here is the synthesis of bifunctional inhibitors containing aKG and mC mimics with low uM activity against in vitro TET1 and 2 and minimal cytotoxic effects in H441 cells.

106.	**Shemai'ya Peak**
Heat Inactivation of Chronic Wasting Disease Prions in Soil
Advisor: Stuart Lichtenberg
Sponsoring Program: LSSURP
Home Institution: University of Alabama
Abstract: Chronic Wasting Disease (CWD) is a fatal neurodegenerative disorder that affects cervids, such as deer and elk, and is caused by prions that are highly resistant to degradation and persist in the environment. Misfolded prions pose severe risks to wildlife populations and ecosystems by remaining infective in soil and other substrates for extended periods. Prions are highly transmissible, spreading through soil, direct animal contact, and a variety of additional mediums. This study investigates the effectiveness of heat treatment as a method for decontaminating CWD-contaminated soil. The project involves repeated 30-minute burns on contaminated soil samples to evaluate whether heat effectively reduces prion seeding activity. Key variables include burn temperature, duration, and frequency. Prion activity is assessed using RT-QuIC technology, a highly sensitive assay for detecting prion presence. Results suggest that multiple burn cycles can reduce prion seeding, with the 2x burn showing the most significant reduction. However, notable prion activity persists at deeper soil layers. Future research will focus on extending burn durations, modifying heating methods, and testing various soil types, including naturally contaminated samples. Controlled wildfires may be employed to refine practical CWD management strategies and improve efficacy of prion inactivation.

107. **Catrina Pereda**

The Role of mATXN1 Expression in Microglia in SCA1 Pathogenesis

Advisor: Marija Cvetanovic

Sponsoring Program: LSSURP

Home Institution: Indiana University-Indianapolis

Abstract: Spinocerebellar Ataxia Type 1 (SCA1) is an autosomal dominant genetic disease caused by a polyglutamine repeat expansion (PolyQ) in the ATAXIN1 (ATXN1) protein. It's characterized by motor deficits and cerebellar neurodegeneration, especially the loss of Purkinje cells. Microglia play an important role in brain function. In neurodegenerative diseases, microglia undergo activation that can ameliorate or exacerbate neuronal dysfunction and loss. Previous studies demonstrated that microglia are activated early in SCA1, but to what extent signaling from dysfunctional neurons or from mutant ATXN1 expressed in microglia impacts microglial activation and role in SCA1 pathogenesis remains unknown. To address this question, we used a novel conditional mouse model of SCA1 to delete mutant ATXN1 from microglia (SCA1mKO mice). I examined how deleting mutant ATXN1 from microglia impacts pathogenesis of Purkinje cells. In particular, I analyzed the expression of Purkinje cells genes previously found to be altered in SCA1 using quantitative polymerase chain reactions (qPCRs).

108. **Valerie Rakotomalala**

Implementation Science within Cancer Screening Interventions: Development of a Data Extraction Form

Advisor: Serena Xiong

Sponsoring Program: M-ASCEND

Home Institution: Yale University

Abstract: Background: Underutilization of cancer screenings disproportionately impacts marginalized populations due to factors such as low literacy and racism, leading to increased cancer mortality rates. Implementation science (IS) examines how evidence-based interventions are translated into practice. Through frameworks, models, and theories (FMTs), IS guides and evaluates the quality of healthcare services.

Objective: To develop an extraction form for a scoping review of how evidence-based cancer screenings have been planned, designed, and implemented using IS FMTs to address cancer health disparities.

Methods: Search strategies were conducted in five bibliographic databases: Ovid MEDLINE, PubMed, Scopus, Web of Science, and EMBASE. Covidence was used to manage and analyze studies. Two reviewers independently screened studies for inclusion criteria. Data elements extracted include study setting, implementation processes, and cancer health disparities contexts.

Results: The final extraction tool emphasized the collection of information related to the IS process, such as the level of FMT integration and facilitators to application. The Expanded FRAME was used to identify intervention adaptations.

Conclusions: The extraction form was beneficial for thoroughly understanding the application of an FMT. However, some data elements, such as the rationale for health disparities, were difficult to understand or locate due to the lack of standard reporting requirements.

109. **Isabella Ramirez**

Effects of Chronic Voluntary Alcohol Consumption on Nerve Injury-Induced Neuronal Activation in Limbic Structures

Advisor: Lucy Vulchanova

Sponsoring Program: LSSURP

Home Institution: Scripps College

Abstract: Chronic pain (CP) is a complex process of physiological dysregulation of pain signaling and is frequently comorbid with other conditions. Alcohol use disorder (AUD) is a condition involving impaired alcohol use and dysregulated reward circuitry. AUD and CP often co-occur; for example, acute injury in AUD patients produces hypersensitivity and increases risk of CP development. This study explored supraspinal regions implicated in nerve injury-induced hypersensitivity with chronic alcohol consumption. TRAP2xAi14 transgenic mice allowed neuronal activity tracing, where endogenous cFos expression drove tdTomato fluorescence expression post-tamoxifen administration. After chronic voluntary-intermittent alcohol or water treatment for 6 weeks, male and female mice underwent sham or sciatic nerve crush injury. After 9 weeks of drinking, they received 2.5g/kg i.p. 4-OH tamoxifen. von Frey testing measuring tactile sensitivity was performed weekly over 12 weeks. Epifluorescence microscopy image-analysis showed increased numbers of activated neurons in nucleus accumbens and lateral habenula of injured and/or alcohol-drinking injured mice, contrasting with controls. These findings indicate the outlined regions' relevance to CP perception under AUD-like conditions. Future research may explore (1) involvement of limbic structures like prefrontal cortex and hypothalamus in co-occurring chronic alcohol use and persistent pain (2) cell type identification in outlined regions delineating excitatory and inhibitory influences between regions.

110. **Indira Rao**

Effects of Baclofen on Sucrose Cue-Induced Reinstatement

Advisor: Jocelyn Richard

Sponsoring Program: Pathways

Home Institution: University of Minnesota -Twin Cities

Abstract: The ventral tegmental area (VTA) is an important part of the neural circuitry underlying reward-seeking behavior and operant learning. Baclofen, a GABAB receptor agonist, has been shown to reduce relapse-like behaviors in operant models of alcohol use disorder. Research has shown that targeting baclofen to the VTA reduced relapse-like behaviors and operant self-administration in rodent models of alcohol use disorder. The goal of this study is to understand if the effects of baclofen observed on administration to the VTA in Long Evans Rats are specific to ethanol cue-induced reinstatement, by replicating with sucrose as the reward. Rats underwent a 15-day training period where lever pressed resulted in tone and light cue and 10% sucrose. Training was followed by 5 days of extinction and 2 days of reinstatement, followed by 3 days of re-training and 2 days of self-administration. Counterbalanced baclofen and saline microinfusions were administered through cannula implants ending in the VTA on the first two days of extinction, reinstatement, and self-administration. Analysis revealed that baclofen impacted some, but not all stages studied. Further research repeating this experiment on a larger sample size can reveal clearer associations between baclofen and sucrose cue-induced reinstatement.

111. **Lissi Reid**

Assessing Physicochemical and Biological Properties of Surface Modified Gold and Selenium Nanoparticles

Advisor: Dhiraj Kumar

Sponsoring Program: LSSURP

Home Institution: St. Olaf College

Abstract: Nanoparticles (NPs) are particles (spherical to oblong shape) with size in the 2-100nm range. Gold nanoparticles (AuNPs) are known to exhibit antimicrobial properties, while Selenium NPs (SeNPs) have been proven to induce antimicrobial and osteogenic responses, making them effective for controlling dental caries. This study used chemical reduction to synthesize Au and Se NPs, characterized using UV-visible spectroscopy, Dynamic Light Scattering, and Transmission Electron Microscopy to determine their size and size distribution. AuNPs (15–20nm) were synthesized using trisodium citrate as a reducing and capping agent, while SeNPs (80nm) used ascorbic acid and PVA. Both (Au and Se) NP types were functionalized with thiolated PEG (6k MW), stabilizing the colloidal suspension when exposed to NaCl (0.5 to 16mM) and adjusting the zeta potential. Pristine and PEG-modified NPs were tested on TR146-WT and SCC-CAF cells at different concentrations (0.05 to 100µg/ml) to evaluate biocompatibility, revealing concentration- and cell type-dependent cytotoxicity. Both AuNPs and SeNPs were cytotoxic at 100µg/mL to both cell types but biocompatible at lower concentrations. Future work aims to synthesize same-sized NPs and co-functionalize them with PEG and quaternary ammonium groups, enhancing stability, biocompatibility, and antimicrobial properties in co-culture (mammalian and bacterial) in vitro model.

112. **Yamina Rodríguez Montes**

Developing 3D Leptomeningeal Spheroids for Ex Vivo Modeling of Central Nervous System Leukemia

Advisor: Peter Gordon

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico Humacao

Abstract: Acute lymphoblastic leukemia (ALL) is the most prevalent pediatric cancer, and, unfortunately, refractory ALL remains a significant issue. Many patients experience relapses often detected in other microenvironments, notably the central nervous system (CNS), where ALL cells localize primarily to the leptomeninges. Treating ALL within the meninges is difficult due to blood-brain barrier, which prevents many drugs from reaching CNS, and the potential neurotoxicity of CNS-directed therapies in partially effective treatment options. Understanding the complementary roles of niches in cancer development is crucial, as they influence both physiological and pathological behaviors. Research has shown that interactions between leukemia and meningeal cells can significantly alter leukemia biology, enhancing chemoresistance. While 2D in-vitro cell cultures have been vital for studying these interactions, 3D cell culture techniques may mimic the microenvironment. This project aims to develop a novel 3D spheroid model starting by generating meningeal spheroids from BenMen-1 cells, with B-ALL NALM6 cells added later. Although most leukemia cells stayed on the spheroid's surface, some integrated within. Current tests focus on how varying assay parameters affect spheroid formation and function, and how integration leads to chemoresistance. These spheroids may represent the leptomeningeal microenvironment, aiding in testing new CNS leukemia treatments.

113.   **Wryn Rohan**
Regional Distribution of Inflammatory Molecules in the Brain Post-TBI
Advisor: Maxim Cheeran
Sponsoring Program: LSSURP
Home Institution: Goucher College

Abstract: Traumatic brain injury (TBI) is a leading cause of death and disability worldwide. Survivor recovery varies in outcome due to complications post-injury (Graham, et al., 2019). Current treatment options for TBI are limited and associated complications have been linked to chronic neuroinflammation leading to neurodegenerative disease (Parkinson disease, Alzheimer disease, Multiple Sclerosis, etc.) (Witcher, et al., 2021). Efforts to understand the TBI inflammatory cascade has become a central focus for finding new treatments. Inflammation is predominantly moderated by–but not limited to–regulatory molecules (cytokines and chemokines) and costimulatory ligands produced by primed microglia to trigger the cascade (Loane, et al., 2016). This study sought to investigate the expression of cytokines and chemokines in selected brain regions, including the hippocampus, cerebellum, thalamus, midbrain, and cortex. A controlled cortical impact model in mice using impact parameters for a moderate TBI was used. Results were analyzed at 3 days post-injury in the aforementioned regions. Selected cytokines, and chemokines were examined for change in expression using reverse transcription quantitative polymerase chain reaction. The ipsilateral cortex showed upregulation of both IL-1β and CCL2, where other regions did not. Future studies will include the localization of inflammation at the cellular level and assess chronic effects of TBI.

114.   **Jonathan Rosenthal**
Synthesis of Bisubstrate Inhibitors for TET Dioxygenases
Advisor: Natalia Tretyakova
Sponsoring Program: SCoPE
Home Institution: Bethel University

Abstract: Ten-eleven translocation (TET) family proteins are α-ketoglutarate- and Fe(II)-dependent dioxygenases that catalyze the oxidation of 5-methylcytidine (5mC) to 5-hydroxymethylcytidine (5hmC), 5-formylcytidine (5fC), and 5-carboxylcytidine (5caC). These oxidized derivatives of 5mC allow for the active de-methylation of DNA through thymine DNA glycosylase and base-excision repair pathways. Abnormal DNA methylation patterns are frequently identified in cancers, making TETs, their roles in carcinogenesis, and possible inhibitors heavily studied topics. Previous literature on TET inhibitors involve the development of either α-ketoglutarate analogues or a 5mC analogues. Described here is progress toward the synthesis of bisubstrate inhibitors for TETs, containing both α-ketoglutarate and 5mC analogues, in an effort to drive selectivity for TETs and increase binding affinity. Initial work has focused on coupling an α-ketoglutarate analogue to deoxycytidine, but we have moved toward replacing deoxycytidine with heterocyclic analogues. This will help to make the synthetic strategies more simplistic and will help prevent metabolism and accidental incorporation into nucleic acids.

115.   **Diego Ruiz**
High-Yield Production of In Vivo Modified tRNAs for Biophysical Characterization
Advisor: Kate Adamala
Sponsoring Program: C-GEM (Center for Genetically Encoded Materials)
Home Institution: University of New Mexico

Abstract: Transfer RNAs (tRNAs), which are essential for ribosome-dependent protein synthesis, contain modified nucleotides across all domains of life. These post-transcriptional modifications (PTMs) are crucial for tRNA function and ensure that translation is both accurate and efficient, which leads to optimal protein synthesis. In vivo, PTMs are carried out by a diverse set of enzymes, resulting in a comprehensive array of modifications. In vitro, however, tRNAs often lack this full range of modifications, limiting their functionality and thus limiting studies that can be conducted in related areas. Producing fully modified tRNA pools in vitro remains challenging due to insufficient methods. Developing techniques to generate modified tRNAs in vivo with high yield and purity can significantly advance synthetic biology applications and facilitate more detailed and comprehensive studies of the ribosome, and other related biological systems.

116.   **Monir Sabia**

Fostering Anti-Racism in White Children: Exploring the Relationship Between Parental Racial Socialization Strategies and Children's Evaluation and Confrontation of Discrimination

Advisor: Gail Ferguson

Sponsoring Program: UROP/URS

Home Institution: University of Minnesota Twin Cities

Abstract: Previous research indicates that higher levels of parental racial socialization are correlated with children's negative evaluations of discrimination (Scott et al., 2023). However it is not clear which specific strategies yield this finding. This study, utilizing baseline data from the CARPE DIEM Study (PI: Gail Ferguson), examines the relationship between specific, self-reported parental racial socialization strategies (i.e., Talking about general discrimination; Talking about discrimination toward particular groups; and Race mute socialization) and children's evaluations of discrimination and choices to confront a perpetrator in a lab-based task (Scott et al., 2023). Consistent with hypotheses, children whose parents talk about general discrimination ($r = 0.234$, $p = 0.044$) and discrimination against particular groups ($r = 0.251$, $p = 0.031$) were more likely to negatively evaluate racial discrimination when it occurs. Additionally, children whose parents talked about general discrimination were more likely to explicitly name racial inequities in the lab-task and to confront the perpetrator. These findings suggest that explicit socialization around discrimination is related to children's negative evaluation of discrimination and that talking about discrimination in broader, more general terms may help children recognize and confront discrimination. These findings are potentially useful in informing parents on racial socialization strategies.

117.   **Yukti Sah**

Losmapimod Mitigates Doxorubicin-Induced Cardiotoxicity by Inhibiting p38 MAPK and Reducing Inflammation in C57BL/6N Mice

Advisor: Beshay Zordoky

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota Twin Cities

Abstract:

Background: Doxorubicin (DOX), a chemotherapeutic agent, is highly effective, yet limited due to its cardiotoxicity. DOX-induced cardiotoxicity is associated with inflammation, induction of senescence, and activation of the p38 mitogen-activated protein kinase (MAPK) pathway. Losmapimod (LOSM), an orally active p38 MAPK inhibitor, is anti-inflammatory and cardio-protective. Therefore, we investigated the effects of LOSM against DOX-induced cardiotoxicity in C57BL/6N mice.

Methods: Five-week-old C57BL/6N mice were treated with a LOSM diet (estimated 12 mg/kg/day) or a control diet for four days. Thereafter, they were randomized to receive six weekly intraperitoneal injections of either DOX (4 mg/kg) or saline. Afterwards, their cardiac function was assessed by trans-thoracic echocardiography. Gene expressions of inflammatory markers were quantified using real-time PCR and the marker proteins in the MAPK pathway were detected by Western blots.

Results: We found improved left ventricular ejection fraction and heart rate, reduced expression of the cardiac stress marker Nppb gene, and decreased MAPK phosphorylation. A lower expression of the cardiac Il-1a and Il-6 genes in DOX-treated mice was present.

Conclusion: These findings suggest LOSM demonstrates cardioprotective effects, ameliorating cardiac dysfunction. By reducing DOX-induced cardiac pro-inflammatory cytokines through the inhibition of the p38 MAPK pathway, LOSM demonstrates anti-inflammatory properties.

118.   **Riyan Said and Tenzin Dedhen**

The Influence of Hot Flushes on Blood Pressure Regulation in Postmenopausal Females

Advisor: Manda Keller-Ross

Sponsoring Program: NSSA Pathways

Home Institution: University of Minnesota

Abstract: One of the leading causes of death in females is cardiovascular disease. Autonomic dysregulation, a known contributor to cardiovascular disease, has been shown in postmenopausal women. Vasomotor symptoms during menopause, namely hot flushes, are a concerning likely contributor to autonomic dysregulation and chronic elevated sympathetic activity. The study presented in this poster examines eleven participants during hot flushes where blood pressure, heart rate and muscle sympathetic nerve activity are monitored. Recognizing how blood pressure regulation is affected by hot flushes is critical to understanding cardiovascular risk in postmenopausal women.

119. **Abass Salat**

IGF-System Regulates Metabolism and Proliferation in Estrogen Receptor Positive Breast Cancer Cell Lines

Advisor: Douglas Yee

Sponsoring Program: M-ASCEND

Home Institution: University of Minneosta

Abstract: Breast cancer is the second leading cause of cancer fatalities in women. Estrogen Receptor positive (ER+) breast cancer cells use insulin-like growth factor (IGF) system ligands such as insulin, IGF-1, and IGF-2 to aid in their proliferation and optimize their metabolism for growth. We tested the effects of IGF-system ligands on proliferation and metabolism regulation on ER+ breast cancer cell lines MCF-7L, ZR-75-1, and T47D. For testing proliferation, we performed an MTT assay in which the effects of 10nM insulin, 5nM IGF-1, 10nM IGF-2, and 10nM estradiol (E2) were monitored over 5 days. For MCF-7L, all ligands had a significant increase in proliferation compared to the control except for the IGF-2 group. For testing the ligands' effects on metabolism regulation, we monitored the real-time ATP production rates of the cell lines, when stimulated by 10nM insulin, 100nM insulin, 5nM IGF-1, 10nM IGF-2, and 10nM estradiol (E2). For MCF-7L, the results showed a significant rise in glycolytic ATP production for the IGF-1 group, while none of the ligands enhanced mitochondrial ATP production. In conclusion, these ligands have a positive effect on growth and glycolytic ATP production in MCF-7L. These results will be compared with the results for other ER+ cell lines.

120. **Abraham Salazar**

Do They Share The Same Brown Eyes? A Brief Review of The Chicano Movement, Local Leaders, and Their Interactions with the Mexican Government

Advisor: Jimmy Patino

Sponsoring Program: Pathways

Home Institution: University of Minnesota-Twin Cities

Abstract: By bringing together books, articles, and primary sources, I will shed light on the obscure interactions that occurred between Chicano (Mexican-American) activists with the Mexican government. By using the Twin Cities, Minneapolis and St. Paul, as a starting point I demonstrate the significant voice the relatively small population of Mexicans and Mexican-Americans, approximately 50,000 in the 1970s, had in appealing to the Mexican government for aid. The situation in the Twin Cities was not unique and instead reflects a pattern of limited communication and bureaucratic foot-dragging that the Mexican government had in response to demands of Mexicans, Mexican-Americans, and Chicano Movement leaders, and U.S politicians. These results lead to further questions over the sincerity of the Mexican government and their foreign policy of the 1970s, especially their self-adorned claim as the protectors of "La Familia Mexicana" (the Mexican family) within "Mexico Afuera" and the differences between Mexican nationalism and Chicano nationalism.

121. **Zion Sampson**

Subsets of Myeloid Progenitors Limit Age-Associated Cortical Bone Loss

Advisor: Elizabeth Bradley

Sponsoring Program: LSSURP

Home Institution: Wofford College

Abstract: Disruptions in bone remodeling underlie numerous diseases such as osteoporosis, periodontitis, and arthritis, necessitating a deeper understanding of the mechanisms that maintain bone mass. Osteoclast-derived factors intricately link bone resorption to formation during remodeling, yet the specificities within trabecular versus cortical bone remain unclear, hindering targeted therapeutic developments. Evidence indicates that osteoclasts (Ocls) derived from erythro-myeloid progenitors (EMPs) support balanced bone remodeling. To explore the differential impact of Ocls from alternate developmental origins on age-associated bone loss, we employed age- and sex-mismatched bone marrow chimeras and aged them to 24 weeks. Using micro-computed tomography and analysis techniques, it was found young mice with aged bone marrow (BM) exhibited enhanced bone mass and thickness as compared to mice receiving age-matched BM. Using advanced techniques such as magnetic-activated cell sorting, single-cell RNA sequencing, and immunohistochemistry, we identified distinct myeloid subsets associated with cortical bone regulation. Our findings suggest that EMP-derived Ocls may play a role in mitigating age-related cortical bone loss through enhanced expression of anabolic factors. Overall, this study may contribute to the cellular mechanisms involved in cortical bone remodeling and proposes potential molecular targets for therapeutic intervention to preserve cortical bone integrity with aging. Further investigations are warranted to fully characterize these populations and their biological significance.

122. **Hector Sanchez Lopez**

Investigating the Impact of Dual Knockout of TGF-β DN and FAS DN Mutation on Human Induced Pluripotent Stem Cells through Base Editor Mediated Knockouts.

Advisor: Beau Webber

Sponsoring Program: LSSURP

Home Institution: University of Minnesota

Abstract: Induced pluripotent stem cells (iPSC) are emerging as a more ethically sourced option to perform research in the field of cancer and immunotherapies. The organization of the iPSC genome is easily accessible, which makes genetic engineering at the iPSC level ideal and ensures the edits will be present in different cell types that are further downstream in their differentiation. In this study, we will be introducing gene knockouts of FasDN and TGF-β because of their detrimental abilities of impeding tumor penetration and inducing apoptosis in lymphocytes within the tumor microenvironment (Yamamoto, et al. 2019; Kloss et al. 2022). We will be using Base Editors (BE) as an alternative to the CRISPR/Cas systems, since CRISPR has been shown to be toxic and lead to genome instability (Álvares, et al 2022). From our observations, we put forward BE RNase as an effective tool to perform gene knockouts that produce highly efficient results, and will therefore lead to further work downstream of iPSC differentiation in highly functional effector cell lines to test for their new capabilities against immunosuppressive signals. The purpose of this study is to expand upon the developing advancements being made in cancer immunotherapies, with the aim of generating more precise and personalized medicines that are effective against immunosuppressive cancers.

123. **Alison Santos Marquz**

Age-related Degenerative Changes Post-mTBI in Humanized Tau Mouse Models

Advisor: Timothy Ebner

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico Rio Piedras

Abstract: Traumatic Brain Injury (TBI) occurs when an external force damages the brain, leading to neurological issues. Alzheimer's Disease (AD), the most common type of dementia, shares similarities with TBI-induced neurodegeneration, specifically with the microtubule associated protein tau (MAPT). Research has shown that tau pathology plays a crucial role in brain dysfunction following TBI, becoming hyperphosphorylated and forming neurofibrillary tangles within neurons, disrupting transport and communication, and leading to degeneration.

To study the progression of brain degeneration due to TBI, we assessed the influence of age (6-months vs 1-year) and genotype (MAPT-H2-GR wild type and MAPT-N279K-GR mutant mice) on tau pathology following mTBI in a "humanized" mouse model, known as MAPT-GR (gene replacement) mice. We used immunohistochemistry to detect phosphorylated tau (AT8 antibody) and confocal microscopy to test whether older and/or mutant mice exhibit increased tau pathology 1 week post-mTBI. Our results showed higher global AT8 fluorescence in both genotypes, with a larger response in older animals. Interestingly, we saw lower neuronal tau mislocalization in the mutant mice, suggesting different tau clearance mechanisms. This study highlights the need for further exploration of molecular pathways of tau pathology following mTBI, which could lead to development of new therapeutic strategies.

124. **Dharsh Saravana**

Evaluating Extreme Weather and Climate Adaptation Concerns for Corn and Soybean Farmers

Advisor: Nathan Meyer

Sponsoring Program: SOAR-REEU

Home Institution: University of South Florida

Abstract: Corn and soybeans are the most economically valuable crops in Minnesota and represent significant land usage in the state with farmers reporting 14.5 million acres of corn and 7 million acres of soybeans planted in 2024. Continued warming and fluctuations between extreme weather events driven by climate change are expected to increase pest pressure, flood damage, and risk of heat stress for crops and farmworkers. Six climate-conscious commercial corn and soybean farmers located predominantly in southern Minnesota were interviewed to understand their perceived extreme weather and climate impacts, farm management responses to these conditions, and risk management concerns for their farm's future. These semi structured interviews were recorded, transcribed, and underwent a preliminary analysis of key concerns to ground the development of an interactive decision-making tool. The goal of this research is to help farmers and their agricultural advisors assess their agricultural risks due to climate change and the actions they can take to prepare for Minnesota's extreme weather and climate impacts. We expect that findings from our research will inform our ability to advise on best climate preparedness practices for short term (in season), mid term (1-3 years), and long term (10-15 year) time horizons.

125. **Masooma Sayeda**

Evaluating Cervical Cancer Screening and HPV Vaccination Efficacy in Heart Transplant Recipients

Advisor: Deanna Teoh

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota Twin Cities

Abstract: This study aims to assess cervical cancer screening and HPV vaccination in heart transplant recipients. Specifically, it compares post-transplant cervical dysplasia or cancer prevalence by pre-transplant screening results, evaluates the clinical efficacy of HPV vaccination post-transplant, and examines outcomes related to cervical dysplasia/cancer when heart transplantation is delayed.

Data from heart transplant screening databases will be used to identify women aged 18-74 considered for heart transplants within MHealth Fairview between 2015 and 2021. Medical records will be abstracted and analyzed, with data stored securely in REDCap and the AHC-IE intranet.

This retrospective cohort study involves no direct patient interaction, and data will be anonymized. The research poses minimal risk, primarily related to potential loss of confidentiality, but could provide significant insights into improving pre- and post-transplant cancer screening protocols.

The primary endpoints include the prevalence of abnormal cervical cancer screening results pre-transplant and the occurrence of high-grade cervical dysplasia or cancer within three years post-transplant. The study will also assess HPV vaccination's impact on post-transplant cancer risk. The findings aim to inform future guidelines for cervical cancer screening and management in heart transplant candidates and recipients.

126. **Nicole Schottler**

Characterizing Medulloblastoma Subgroups Through Secretome Profiling

Advisor: Okay Saydam

Sponsoring Program: Pediatrics CCRF Internship

Home Institution: University of Minnesota

Abstract: Medulloblastoma, the most common malignant brain tumor in children, exhibits significant variability in survival rates among its subtypes: Sonic Hedgehog (SHH), Wingless (WNT), Group 3, and Group 4. Effective treatment plans rely on the accurate and timely identification of these subgroups, as each responds differently to therapies and has varied prognoses. This research aims to identify circulating biomarker candidates that would enable physicians to swiftly and accurately diagnose medulloblastomas and the corresponding subtypes in a noninvasive way in patients' blood. Potential biomarkers were identified from medulloblastoma cell lines using LC-MS/MS analysis of the secretome, with top candidates independently verified through the R2 database. Further validation is being conducted via qRT-PCR. Validation in the R2 database revealed that many of the top candidates identified through secretome analysis exhibited high expression in medulloblastomas and significant differential expression compared to healthy cerebellums. These identified biomarker candidates show promise for transforming the diagnosis of medulloblastomas, with blood samples potentially replacing tissue samples for faster and less intrusive diagnostics. Further validation of these candidates in patient blood samples is underway.

127. **Enengy Schutt**

Objective Measurement of Cognitive Effort in Individuals with
Traumatic Brain Injury

Advisor: Natalie Covington

Sponsoring Program: McNair

Home Institution: University of Minnesota, Twin Cities

Abstract: Traumatic brain injury (TBI) is the result of brain damage from blunt force, and has a variable symptom profile with possible cognitive, emotional, and physical impairments. Heightened experience of effort is one commonly-reported symptom, but in clinical rehabilitation cognitive effort has typically been measured via self-report, which is subjective and variable. Pupillometry, the moment-to-moment tracking and measurement of pupil size, has been empirically shown to objectively measure cognitive effort. This study will employ pupillometry to examine moment-to-moment cognitive effort during a listening task and ecological momentary assessment (EMA) to examine the lived daily experience of cognitive effort after TBI. We aim to enroll 25 participants with mild TBI, 25 with moderate-severe TBI, and 50 demographically-matched neurotypical comparison participants. Anticipated results include assessment of the feasibility and reliability of pupillometry in this population, between-group comparisons of goal-directed momentary cognitive effort, and insight into patients' lived experience of effort.

128. **Zane Scott**

TLR7/8 Agonist Release in CAPRO for Melanoma Vaccine Applications

Advisor: Chun Wang

Sponsoring Program: LSSURP

Home Institution: The University of Texas at Austin

Abstract: Toll-like receptors (TLR) 7 and 8 are strong activators of the innate immune system, which make TLR7/8 agonists like Resiquimod strong candidates for vaccine adjuvants, as they initialize pivotal pathways required for vaccine efficacy. These are of particular interest in our melanoma vaccine development, as the TLR7/8-mediated immune response can be directed toward specific tumor sites as opposed to requiring a systemic response. However, Resiquimod has poor water solubility and requires a suitable vector for administering in vaccine form. In the Polymeric Biomaterials lab, we developed CAPROTM, a nanoparticle drug delivery system that incorporates and gradually releases poorly soluble drugs like Resiquimod. Here, we determined the bioactivity of Resiquimod released from CAPROTM over time to assess its suitability for vaccines. To test this, we used a TLR7-specific SEAP reporter assay to quantitatively measure TLR7 expression from HEK-BlueTM mTLR7 cells. Supernatants collected up to 13 days have a significant increase in TLR7 expression compared to baseline, with maximum expression in our day seven samples. This suggests that Resiquimod-loaded CAPROTM can locally upregulate an immune response and thus may be useful as a potential new vaccine treatment for melanoma.

129. **Tomas Sepulveda**

Synthesis of Novel 1,2,3-Triazole-Based HDAC/BRD4 Inhibitors for Inflammatory Pain

Advisor: William Pomerantz

Sponsoring Program: McNair

Home Institution: University of Minnesota Twin Cities

Abstract: Inflammation has been linked to pain through upregulation of pro-inflammatory cytokines which increase neurons' sensitivity to painful stimuli. Additionally, epigenetic mechanisms can modulate inflammation by regulating the expression of cytokines, correlated through high levels of histone acetylation near their promoters. Histone deacetylases (HDACs) and Bromodomain and Extraterminal (BET) proteins, which either hydrolyze or bind to acetylated lysines, are attractive therapeutic targets for a range of inflammation-driven diseases. Simultaneous targeting of these proteins has emerged as an attractive therapeutic approach. While new, SUM52 has been recently tested as a fusion of BET and HDAC inhibitors, iBET762 and Vorinostat. The goal of this study is to add to the library of dual HDAC/BET inhibitors with a triazole-based inhibitor, compound 7, developed in the Pomerantz lab. For this study, the BET inhibitor NV1127 and the HDAC inhibitor based on Vorinostat are being synthesized and linked. Progress towards these goals will be presented.

130. **Akshat Sharma**

Slow Relaxation Anomaly: Dispersive Bimolecular Recombination in Hydrogenated Amorphous Germanium

Advisor: James Kakalios

Sponsoring Program: Pathways

Home Institution: University of Minnesota

Abstract: Thermal Equilibration effects, reflected in changes in the time and temperature dependence of the dark conductivity of Hydrogenated Amorphous Germanium (a-Ge:H) thin films are investigated. Through experimental testing, we examine the effects of thermal processing on a-Ge:H, focusing on the relaxation times after fast quenching. A stretched exponential time dependence is typically used to describe the relaxation process in amorphous semiconductors. However, our results indicate that a stretched exponential function is insufficient to account for current relaxation in a-Ge:H. In particular, at 405K, the sample undergoes a transition, with the current relaxation at early times decaying as it does at 410K, and then transitioning to follow the decay at 400K. A better fit to the slow relaxation is provided by a dispersive bimolecular recombination time dependence, where the rate of change of the charge density is proportional to the square of the charge density, as opposed to varying linearly with charge density as for the stretched exponential time dependence. The identification of the dispersive bimolecular recombination process provides an important clue in order to understand the unconventional slow relaxation observed at 405K.

131.   **Silas Simpson**

Transient p300/CBP Inhibition Induces Long-Lasting Antiproliferative Effects in CIC-DUX4 Sarcoma

Advisor: Darko Bosnakovski

Sponsoring Program: Pediatrics CCRF Internship

Home Institution: University of Minnesota Twin Cities

Abstract: CIC-DUX4 sarcoma (CDS) is an undifferentiated round cell sarcoma primarily affecting the bones and soft tissues of children and young adults. This highly aggressive cancer rapidly metastasizes and develops resistance to chemotherapy, emphasizing the urgent need for novel therapeutic approaches. The histone acetyltransferases (HATs) p300 and CREB-binding protein (CBP) are essential for the proliferation of CDS. iP300w, a specific HAT inhibitor targeting p300/CBP binding, has demonstrated a significant reduction in CDS cell proliferation with continuous exposure. This study aimed to determine the optimal duration of iP300w treatment required to achieve lasting inhibition of tumor proliferation. Using CDS cell lines Kitra-SRS and NCC-CDS-X1-C1, we administered 1-, 3-, and 7-day pulse treatments followed by 0-, 3-, and 7-day recovery periods. Post-treatment, cells were fixed, immunostained, and labeled for the proliferation marker Ki67. Our findings indicate that the antiproliferative effect of iP300w is dependent on the duration of treatment, with longer exposures yielding more pronounced and sustained inhibition of tumor cell proliferation.

132.   **Jessica Sosa**

Spotlight on Suicide: A Content Analysis of Online News Media Coverage of Celebrity Suicide Death, 2012-2023

Advisor: Susan LoRusso

Sponsoring Program: McNair

Home Institution: Hubbard School of Journalism and Mass Communications

Abstract: Numerous studies have found correlational evidence between the increase of suicide rates and the reporting of a celebrity suicide. The phenomenon is called the copycat effect. To combat the copycat effect, several public health organizations created the Recommendations for Reporting on Suicide (RRS), which provides guidance on good- (e.g., providing prevention information) and poor-reporting practices (e.g., including suicide in the headline). Previous content analyses have found that news organizations do not typically adhere to the RRS. The current study expands on this research by analyzing 497 online news stories of 96 celebrity suicide deaths from 2012 - 2023 from six news organizations. Preliminary results indicate that the news organizations generally did not adhere to the good reporting recommendations. High numbers of poor reporting practices were not found, but content which describes the method of suicide, information influential to the copycat effect, was found in 60% of the news coverage.

133.   **Rikka Tagayuna**

Novel Treatment of Colorectal Cancer Peritoneal Metastasis Using CD133- Targeted Oncolytic Adenovirus in Combination with CD133-Inducing Chemotherapy

Advisor: Masato Yamamoto

Sponsoring Program: LSSURP

Home Institution: California State University, Los Angeles

Abstract: Colorectal cancer (CRC) is a prevalent cause of cancer-related death in the United States with 10% of those patients having peritoneal metastasis (PM) during diagnosis and 20% developing PM along the course of the disease. Due to the limited therapeutic options, developing a novel therapy for PM is needed. We chose CD133, a cancer stem cell marker present on the cell membrane, as the therapeutic target. Oncolytic virus therapy using CD133-targeted oncolytic adenovirus (OAd) with cancer-specific promoter-based transcriptional control will be used to lyse the CRC cells. To induce CD133 expression, Mitomycin C (MMC), a type of chemotherapeutic, will be administered in this project, because treatment with other chemotherapeutic (5-FU) induced CD133 expression in the previous study. Therefore, we will investigate the feasibility of MMC treatment as a CD133-inducer, as well as checking the status of COX2-, CXCR4-promoter after MMC treatment in this project in-vitro and in-vivo. Using RT-PCR and flow cytometry, we observed an increase in CXCR4-promoter and CD133 expression with minimal effect on COX2-promoter in LS174T and SW480 CRC cell lines. Further, we demonstrated the efficacy of the combination therapy. This study highlights the potential of CD133 targeted OAd and MMC for CRC PM.

134. **Aalunya Teso**

Comparison of Minimal Inhibitory Concentrations Between Parent and Inner Colonies of Escherichia coli During Fosfomycin Broth Microdilution Testing

Advisor: Elizabeth Hirsch

Sponsoring Program: SCoPE

Home Institution: University of Minnesota Rochester

Abstract: Previous studies conducted on uropathogenic Klebsiella pneumoniae have shown that inner colonies (IC) that arise during fosfomycin disk diffusion testing are highly resistant when compared to their parent isolates. The frequency and resistance of IC among uropathogenic Escherichia coli isolates are poorly defined and their clinical implications are unclear. Our study aims to determine minimal inhibitory concentration (MIC) values of IC and compare them to the parent isolates from which they arose. Virginia Commonwealth University parent isolates (n = 69) and their corresponding IC (n = 69) underwent BMD testing in technical triplicate twice, on different days. The BMD for parent isolates consisted of concentrations ranging from 0.5 µg/mL to 64 µg/mL. For IC, concentrations ranged from 8 µg/mL to 1024 µg/mL. Glucose-6-phosphate (25 µg/mL) was supplemented into all testing, as recommended per CLSI. The parent isolates had a MIC range of 2 to >64 µg/mL. The IC had a MIC range of <8 to >1024 µg/mL. The average difference in MIC was five dilutions higher in the IC versus the parent isolates. Further investigation is needed using a larger collection of isolates from varying geographical locations to better understand antimicrobial resistance in uropathogenic bacteria.

135. **Kaitlyn Thorne**

The Role of p53 in Regulating Senescence Induction in Breast Epithelial Cells in Response to Doxorubicin

Advisor: Eric Batchelor

Sponsoring Program: LSSURP

Home Institution: Belmont University

Abstract: Doxorubicin is a DNA-damaging agent that is a common chemotherapeutic for breast cancer. Although the intent is to kill fast-growing cancer cells, in addition to cell death, several other cellular responses can be induced in breast cancer cells following doxorubicin treatment. One potential response is cellular senescence, in which cells are not actively dividing but are still metabolically active and secreting pro-inflammatory signals that promote a favorable cancerous microenvironment. Such a heterogeneous response poses a challenge to therapy; the transcription factor p53 is an important regulator of cell fate decisions and is upregulated in response to doxorubicin. Previous research showed senescence-associated p53 targets are upregulated with sustained p53 protein levels but not with pulsed p53 protein levels. We hypothesize that cells with sustained p53 dynamics initiate senescence in breast epithelial cells. To test this, we used fluorescence microscopy to image MCF10A (non-cancerous) and MCF7 (cancerous) breast epithelial cell lines expressing a functional p53-Venus fluorescent reporter. Immunofluorescence (IF) and single molecule RNA fluorescence in situ hybridization (smRNA FISH) were used to examine p53 targets p21, MYC, and SESN1 following tracking of p53 dynamics in single cells. This project aims to delineate methods to control senescence activation in response to chemotherapeutics.

136. **Isabel Torcivia**

Precision Immunotherapy: Development of a Dual Nanobody Based Chemically Self Assembled Nanoring's to Eradicate Trop2+ Solid Tumors

Advisor: Rick Wagner

Sponsoring Program: SCoPE

Home Institution: Viterbo University

Abstract: The current immunotherapies targeting the overexpression of a single tumor antigen have difficulty eliminating diverse tumors. Targeting the correct tumor antigen without affecting healthy tissue and the tumor's ability to escape treatment often reduce the effectiveness of these therapies, leading to tumor recurrence. New treatments with the ability to target multiple antigens have demonstrated remarkable anti-cancer potency leading to significant tumor eradication, as well as reducing off-target effects of healthy tissue. Our research team has previously developed chemically self-assembling nanorings, or CSANs, that can direct cell-to-cell interactions with T cells and cancers expressing specific tumor antigens without genetically altering the T cells. These multivalent CSAN constructs have proven effective in generating T-cell cytotoxicity using various tumor biomarkers. Their precise killing ability can be regulated using the FDA-approved trimethoprim, a significant factor in ensuring the safety and regulatory approval of our proposed treatment. Here, we report our progress towards the development of an aTCR-1DD-aTrop2 to target TROP2+ cancer cells.Moreover, our pioneering aTCR-1DD-aTrop2 protein, which integrates a specific construct within a single protein monomer, represents a significant leap forward.This innovation opens the door to the creation of CSANs with multiple targeting ligands, offering a promising strategy to combat tumors from multiple angles.

137.   **Aurora Torres**

Effects of NMDA Receptor Ablation at mPFC Synapses on Dendritic Spines

Advisor: Patrick Rothwell

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico Rio Piedras

Abstract: Schizophrenia, affecting around 24 million people globally, is a psychiatric disorder marked by significant emotional distress, disability, and a shortened lifespan. Cognitive dysfunction, particularly working memory deficits, is a key predictor of patient outcomes, yet current treatments fail to address these cognitive issues. Previous studies have shown that neuronal spines, morphological markers for excitatory synapses, have decreased density in certain neuronal populations in patients with schizophrenia. A critical gap in understanding remains regarding how decreased NMDA receptor expression affects brain circuitry over a patient's lifespan. This research aims to investigate the effects of chronic NMDA receptor loss on synaptic function and architecture in the prefrontal cortex, focusing on excitatory-to-excitatory synapses essential for working memory. Using confocal imaging, this study will measure structural changes in dendritic spine morphology and density, observing any weakening or loss of spines after NMDA receptor removal. Insights from this experiment will inform the development of a spiking network model to predict the stability and synchrony of brain activity. Ultimately, this project aims to uncover how NMDA receptor loss leads to cognitive deficits in schizophrenia, guiding the development of therapies to restore neural circuits and cognitive function in patients.

138.   **Dorothea Tse**

Uncovering Mechanisms of Neurodegenerative Diseases by Measuring Cerebrospinal Fluid Flow in Mice

Advisor: Jeff Tithof

Sponsoring Program: McNair

Home Institution: University of Minnesota, Twin Cities

Abstract: The discovery of the glymphatic system about a decade ago has revolutionized our understanding of the metabolic waste removal process in the brain. The glymphatic system involves flow of cerebrospinal fluid (CSF, a colorless fluid composed primarily of water) through the brain to remove waste molecules. Rapidly growing research on the glymphatic system continues to reveal how its dysfunction plays an important role in neurodegenerative diseases such as Alzheimer's disease. However, the driving mechanism of the glymphatic system is still poorly understood because of the complexity of performing in vivo quantitative measurements to accurately characterize CSF flow. This study employs surgical methods and two-photon microscopy to collect in vivo videos of fluorescent microspheres flowing in CSF. Data analysis is conducted by performing particle tracking velocimetry to compare mean particle flow speeds between mice of different ages. Prior studies demonstrate that glymphatic transport decreases with age, but our preliminary results suggest there is no significant difference in mean flow speed between young and old mice. Our research provides valuable insights for conducting more experiments on old mice and quantifying the CSF flow at the surface of the brain.

139.   **Kayla Tucker**

Characterization of Cisplatin-Induced Mitochondrial DNA-Protein Crosslink Formation in Human Cells

Advisor: Colin Campbell

Sponsoring Program: Bio-LEAP

Home Institution: University of Minnesota Twin Cities

Abstract: There is limited research regarding the removal of DNA damage to the mitochondrial genome compared to the removal of DNA damage in nuclear DNA. Increased understanding of how mammalian cells recognize and remove mitochondrial DNA damage could improve the diagnostic and treatment options for patients suffering from inherited or acquired mitochondrial diseases by providing more timely diagnoses and employing targeted treatments. Recent research has provided the first direct evidence of homologous recombination, a DNA-protein crosslink (DPC) repair pathway, in the mitochondria of mammalian cells. These studies suggest that mammalian mitochondria are capable of recognizing and removing xenobiotic-induced DNA damage. In my experiments I used a quantitative PCR-based assay to determine the relative abundance of mitochondrial DNA-protein crosslinks following cellular exposure to the DNA- damaging agent cisplatin. My results show that cells exposed to cisplatin, a chemotherapy drug, had more mitochondrial DPCs than did non-drug treated controls. Additional experiments are underway to test the hypothesis that treating cisplatin-exposed cells with B02, a protein that inhibits homologous recombination will result in increased levels of mitochondrial DPCs. Finally, similar experiments will be performed with formaldehyde, a known endogenous and exogenous DNA-protein crosslinking agent, used in place of cisplatin.

140.   **Natalia Useche Paredes**

Presence of Hemoglobin-Acrylamide Adducts in Smokers and Non-Smokers

Advisor: Natalia Tretyakova

Sponsoring Program: M-ASCEND

Home Institution: University of Minnesota Twin Cities

Abstract: Background: Acrylamide is a reactive organic compound and a carcinogen produced in cigarette smoke. It can also be produced in food through the Maillard Reaction. All humans, but especially smokers are exposed to acrylamide. When the body is exposed to this compound, it binds to different biomolecules and creates a covalent adduct, which in turn can interfere with their function. A highly abundant biomolecule that forms these adducts is Hemoglobin which demonstrates a dose-dependent response of adduct formation to blood-acrylamide concentration. We propose to analyze smokers and non-smokers hemoglobin-acrylamide adducts. In order to do this, the Globin must be separated from the whole blood, and then the Globin must be digested with the use of a protease–Trypsin.

Purpose: To observe differences in hemoglobin-acrylamide adducts between smokers and non-smokers.

Methods: Globin was isolated from whole blood. Then it was digested using immobilizedTrypsin. Finally, the digested samples were analyzed by a Q-Exactive.

Results: A t-test was performed on the difference of the percentage of crylamide-hemoglobin adducts for both smokers and non-smokers ($p < 0.0001$).

Discussion: There is a significant difference between the percentage of acrylamide-hemoglobin adducts between smokers and non-smokers. Demonstrating that the excessive consumption of acrylamide can lead to more adducts.

141.   **George Van Nice**

Too Much Screen Time? The Effects of Digital Leisure on Child Cognitive Outcomes

Advisor: Per Malmberg

Sponsoring Program: UROP/URS

Home Institution: University of Minnesota - Twin Cities

Abstract: Using the PSID Child Development Supplement (CDS), I investigate the impact of digital leisure activities on children's cognitive outcomes, as measured by the Woodcock-Johnson Revised Tests of Achievement. My study reveals a significant negative correlation between digital leisure and children's test scores, even when accounting for demographic and household characteristics. Further analysis indicates that this relationship is primarily driven by one category of digital leisure: watching (TV, movies, and online videos). The other components of digital leisure, namely video games and online communication, did not significantly predict children's test scores. The main policy implication of this study is that reducing children's passive media consumption could enhance test scores, though additional research is required to establish causation. Lastly, I demonstrate that in the CDS, the approach to weighting is crucial for interpreting the results related to digital media and test outcomes.

142.   **Laichia Vang**

From Participants to Leaders: Unpacking the Journey of Youth Leaders in Out-Of-School Programs

Advisor: Teresa Swartz

Sponsoring Program: McNair

Home Institution: University of Minnesota, Twin Cities

Abstract: What are young people's experiences and feelings towards leadership roles in an out-of-school activity? This ethnographic study involves youth leaders and facilitators known as Emerging Professionals (EPs) and Program Directors (PDs) at a youth arts non-profit organization based in the Midwestern United States. Using ethnographic observations, interviews, and archival analysis, this study reveals who these youth leaders are, their roles and experiences, and how adults support youth leadership. Leadership is a critical component to the roles and responsibilities of EPs and PDs, yet they experience ambivalence about identifying oneself as a leader due to their perceptions of leadership. Thus, this research holds the potential to transform the way youth workers, educators, and organizations approach youth engagement and leadership development in various settings.

143.   **Karina Vargas Ortiz**

Designing a Live Virus Vaccine Against Cytomegalovirus (CMV) Infection Using the Guinea Pig CMV (GPCMV) Congenital Infection Model: Striking the Balance Between Immunogenicity and Safety

Advisor: Mark Schleiss

Sponsoring Program: LSSURP

Home Institution: University of Puerto Rico at Ponce

Abstract: Production of double-stranded RNA (dsRNA) during viral infection promotes activation of protein kinase R (PKR), which inhibits viral replication. The CMV genome has evolved immune evasion genes that can block the PKR response. We hypothesized that a virus with targeted genomic deletions of these PKR "evasins" could result in significant attenuation in a live vaccine. To test this hypothesis, GPCMV PKR evasin ORFs GP144-146 were deleted, generating vaccine candidate Δ144-146. Attenuation and immunogenicity of Δ144-146 was analyzed. Groups of 15 guinea pigs were challenged with either a single PKR evasin deletion virus, Δ145; the triple PKR evasin deletion virus, Δ144-146; or a wild-type virus (RFPr129). Viral load and immune response were compared. At day 7, viral load was higher in the blood of wild-type challenged animals, with 8.9×10^4 copies/mL, compared to animals in groups Δ145 or Δ144-146 (3.6×10^4, and 9.8×10^3 copies/mL, respectively; p<0.0001). All viruses induced humoral responses. At day 14 and day 28, antibody titers were higher in RFPr129-challenged animals compared to groups Δ145 or Δ144-146 (p=0.01). Western blotting confirmed that both vaccine groups induced responses to glycoprotein B and GP83. This confirms that vaccines Δ145 and Δ144-146 are attenuated for replication in vivo yet can induce immune responses.

144.   **Shridhar Vashishtha**

Robustness in Selective Classification

Advisor: Ju Sun

Sponsoring Program: Pathways

Home Institution: University of Minnesota-Twin Cities

Abstract: Selective Classification is a machine learning method that abstains from making predictions when uncertain about making them. Thus, it improves reliability and performance. This method has valuable applications where erroneous predictions can have significant consequences. However, the robustness of Selective Classification models, especially under adversarial conditions, remains an area of research. This work presents ways to improve the robustness of selective classification tasks.

145.   **Ricardo Vazquez Montero**

Associations Between Neighborhood Deprivation and Brain Regions Linked to Emotion Regulation Processes in Adolescence

Advisor: Sylia Wilson

Sponsoring Program: McNair

Home Institution: Institute of Child Development

Abstract: Adolescence is a critical period of development with significant changes in the brain that occur within the context of environmental supports and challenges that may influence this neurodevelopment. Neighborhood deprivation (limited access to environmental resources) has emerged as a potentially key contextual influence on adolescent brain development. Using the Adolescent Brain and Cognitive Development (ABCD) Study database of over 11,000 adolescents, we examined associations between neighborhood deprivation in late childhood and the volume and thickness of brain regions linked to emotion regulation, including the prefrontal cortex, amygdala, hippocampus, and nucleus accumbens, in early adolescence. In addition, we examined whether greater school engagement or community cohesion may moderate negative associations. Structural MRI data were acquired on a 3T scanner. Our data analyses found significant associations between neighborhood deprivation and all brain regions analyzed except for the medial orbitofrontal cortex. Additionally, we found slight but not significant improvements when the community cohesion and school engagement measures were added with community cohesion having a stronger buffering effect. The findings of this study could help inform future policies on funding and allocating resources to areas of high deprivation and minimize inequities on the neighborhood level to ensure healthy neurodevelopment for all children and adolescents.

146. **As'Shaunté Walker**

Effects of the Estrous Cycle on Kisspeptin in Hamsters and its Relation to Hypoactive Sexual Desire Disorder

Advisor: Robert Meisel

Sponsoring Program: LSSURP

Home Institution: Tennessee State University

Abstract: Kisspeptin is a hormone that plays a crucial role in the reproductive system alongside its receptor Kisspeptin 1. While the role of KP has been extensively studied in rats and mice, there is a lack of comprehensive research on Syrian hamsters, an important model for studying a variety of components of the reproductive cycle. Our goal is to map out mRNA expression of kisspeptin and its receptor in the Arcuate Nucleus (ARC) and Anteroventral Periventricular Nucleus (AVPV) during the diestrous and estrous stages of the female Syrian hamster's cycle using in-situ hybridization, RNAscope technology. We used confocal microscopy to capture high-resolution images of mRNA expression in the ARC and AVPV. Additionally, employed Imaris software to quantify mRNA expression levels within the identified regions. We also investigated the distribution of kisspeptin 1 receptor mRNA to gain insight into the effects of the reproductive cycle on the targets of the kisspeptin neurons in Syrian hamsters. Based on studies in mice, we anticipate observing higher AVPV levels of kisspeptin in the estrous stage and, conversely, higher levels of kisspeptin in the diestrous stage in the ARC in Syrian hamsters. Insights gained from this research could contribute to therapeutic advancements in women's reproductive health.

147. **Rene Walsh**

Evaluating the Tumor Suppressor Role of FBP1: A Gluconeogenic Enzyme

Advisor: Ameeta Kelekar

Sponsoring Program: LSSURP

Home Institution: Florida State University

Abstract: Fructose 1,6-bisphosphatase (FBP1) is an enzyme that catalyzes the dephosphorylation of fructose 1,6-bisphosphate to fructose 6-phosphate during gluconeogenesis The enzyme has a C-terminal catalytic domain and an inhibitory N-terminal regulatory domain. Our lab found that a short isoform of FBP1 lacking the regulatory domain was enzymatically active in stimulated T cells. The FBP1 gene has also been identified as a tumor suppressor and is lost or mutated in several cancers. We hypothesized that this novel short form would be a more potent suppressor of growth than wildtype FBP1.

We could translate both wildtype and short isoforms of FBP1 from cDNA plasmid constructs using cell free translation systems. However, the short isoform was undetectable in two independent transiently transfected adherent cancer cell lines, suggesting that constitutive FBP1 enzyme activity is not tolerated in these cells. To test this possibility, we have generated a catalytically inactive mutant of the short isoform and will transiently transfect it into the two cell lines to determine whether it can be expressed as an inactive protein. Understanding the tumor-suppressing mechanisms of FBP1 could lead to new therapeutic strategies for cancer treatment. The objective of this study is to evaluate the tumor suppressor potency of the short isoform of FBP1 compared to the long form. We hypothesize that the short isoform will exhibit enhanced tumor suppressor activity since of regulatory domain. This hypothesis will be tested using the FBP1-null cell line PLC/PRF/5, into which the short isoform will be transfected. Subsequent inhibition assays will be conducted to compare the enzymatic activity and cellular viability between the short and long forms of FBP1. These findings will elucidate the potential of the short isoform as a superior tumor suppressor.

148. **Amy Wang**

Incorporation of a Peptide Tag into the Adeno-Associated Virus Capsid to Facilitate Purification of Infectious Particles

Advisor: Daniel Schmidt

Sponsoring Program: Directed Research

Home Institution: University of Minnesota Twin Cities

Abstract: Adeno-associated virus (AAV) is the main viral vector used in gene therapy because of its broad tropism and low immunogenicity. AAV capsids, formed by stochastic assembly of viral proteins VP1, VP2, and VP3, must contain VP1 to be infectious. This project aims to purify infectious from non-infectious capsids by selecting for incorporation of the small ALFA peptide tag into VP1. Constructs encoding the ALFA peptide in positions T456, N664, or K708 of VP1 were used to produce recombinant AAV of the serotype AAV-DJ. AAV was purified from HEK293AAV cell lysates using an affinity resin containing magnetic agarose beads conjugated to anti-ALFA-peptide nanobodies, with elution being achieved through addition of free ALFA peptide. Purified AAV was characterized using qPCR and infectivity assays. Preliminary results suggest that, while the ALFA-tagged variants are less infectious than wild-type AAV-DJ, purification of the ALFA-N664 variant increases infectivity relative to its crude lysate. Optimization of the elution temperature suggests that capsid populations with differing infectivity are eluted with increasing temperature. The use of the ALFA tag for purification of AAV represents a promising approach to isolate AAV based on capsid composition.

149. **Katherine Wetmore**

Reaction Optimization to Synthesize C-25-Modified Rifamycin Analogs

Advisor: Courtney Aldrich

Sponsoring Program: SCoPE

Home Institution: Hamilton College

Abstract: Rifamycins are a class of FDA-approved antibiotics with potent sterilizing activity and are the backbone of combination drug regimens for Mycobacterium tuberculosis. Rifamycins selectively inhibit bacterial RNA polymerase (RNAP), preventing transcription and thus disabling bacteria from mounting a transcriptional response to the antibiotic. However, in rifampicin-resistant tuberculosis, mutations in the rpoB subunit of RNAP introduce repulsive steric and electrostatic interactions that destabilize binding. Prior studies have explored the modification of rifamycins at the C-3 and C-4 positions to regain activity with limited success. Our recent co-crystal structure of a rifamycin derivative with RNAP (PDB: 7U22) revealed an induced-fit rearrangement of a conserved phenylalanine residue at the dominant RNAP-rifamycin interface, allowing an opportunity to introduce p-p stacking interactions through the incorporation of heteroaryl groups through a carbamate linker at the C-25 position of rifamycins. In this work, we evaluated different reaction conditions for installing carbamates at the C-25 position using the Curtius rearrangement. Our results have shown that the reactions proceed best in toluene where rifamycins adopt a closed conformation and in the presence of a 4-dimethylaminopyridine catalyst (DMAP) for all substrates. Thus, the optimized Curtius rearrangement conditions will result in more robust, high-yielding syntheses of novel C-25-modified carbamate rifamycin antibiotics.

150. **Callista Whitehead**

Elucidating the Natural Ligand for the CD200 Activation Receptor

Advisor: Michael Olin

Sponsoring Program: Pediatrics CCRF Internship

Home Institution: University of Minnesota

Abstract: The uncharacterized CD200 immune checkpoint maintains homeostasis through inhibitory (CD200R1) and activation (CD200AR) receptors. The inhibitory CD200 protein is the natural ligand for the CD200R1, suppressing the immune system. However, no known natural ligand exists for the CD200AR. A simulation model of CD200 protein suggests that the cleavage of the CD200 protein by proteases leads to the release of peptides and/or changes in CD200 protein folding. This exposes different epitope sequences predicted to bind the CD200ARs. The central hypothesis is that the natural ligand capable of immune activation is within the CD200 protein. The goal of this study is to determine if exposure to the supernatant of CD200 protein with matrix metalloproteinases can release a novel ligand for CD200ARs in Raw cell line. The following groups of Raw cells were used for this study: Saline, CD200, CD200+ matrix metalloproteinases. Western blotting was performed on the cell lysates and NF-κB expression was analyzed with ImageJ software. In the present study, changes have been observed in NF-κB expression in response to matrix metalloproteinases with CD200 combined treatment.

151. **Anke Wiersma**

Co-Design: Culture in Conversation with Community Design

Advisor: Thomas Fisher

Sponsoring Program: Pathways

Home Institution: University of Minnesota- Twin Cities

Abstract: This paper aims to add to ongoing conversations concerning community-founded design, focusing on decolonization. I use the Rise-Up Center's design efforts as a basis for my analysis to outline potential innovations within the community engagement process as well as various examples of community engagement materials from multiple projects within Minneapolis, Minnesota. Using various texts from the field of anthropology and design anthropology, this paper focuses on building a decolonizing framework for the discussion of "cultural competency" within the design process. In the context of Minnesota, and the US on a larger scale, colonialism and white supremacy plague the principles of modern design and have a deep influence on how a designed space might be experienced. To create a "culturally competent" space that is not attuned to one particular group or experience, working with decolonizing principles helps combat the historic harms that affect all people. Part of this paper aims to identify a few pathways in which communication and design thinking can be used to bridge the gap between designers and community members in an authentic manner. I aim to align academic and theoretical frameworks to the goals identified by the Rise-Up Center and ways of communicating future goals and values.

152. **Kendrick Williams II**

Investigation Into The Role BRG1 Plays in the Craniofacial Development Of Zebrafish

Advisor: Kim Mansky

Sponsoring Program: LSSURP

Home Institution: Morehouse College

Abstract: The experiment engaged in analyzation of craniofacial development with the experimental organism Zebrafish. Zebrafish serve a great role in genetic research as data shows that humans and these organisms share 70% of genetic similarities. Research shows cranial neural crest cells development help the formation of chondrocytes that form the basis of the craniofacial skeleton. The growth of these cartilaginous structure is dependent on the positional chondrocyte organization and orientation that aid in recruitment of osteoblasts to deposit bony matrices. PRDM a chromatin modifier has been found to play an important role in neural crest cells and craniofacial development in humans. In the human genome Prdm3 and Prdm16 have been found to be associated with craniofacial abnormalities including things such as cleft lip palate and effect facial morphology. Brg1 the chromatin modifier of interest is found to be a chromatin remodeler in craniofacial development, and the experiment looked to analyze the phenotypical differences between Brg1 and Prdm 3/16 mutant zebrafish. With this data the experiment allowed for analysis of the various phenotypical differences between the genotypes.

153. **Porshia Woods**

Examining the Involvement of Ventral Pallidal to Lateral Habenula Circuitry in Aversion-Resistant Ethanol Consumption

Advisor: Jocelyn Richard

Sponsoring Program: LSSURP

Home Institution: The University of Michigan - Ann Arbor

Abstract: Alcohol use disorder (AUD) is a major public health issue. Aversion-resistant alcohol consumption, defined as alcohol consumption despite negative consequences, is a hallmark of AUD. The lateral habenula (LHb) processes and responds to aversive stimuli, and is innervated by several reward-related regions including the ventral pallidum (VP). Previous studies have shown that VP-to-LHb circuitry becomes dysregulated during substance misuse. In this study, we performed intracranial surgery in rats using a chemogenetic dual viral approach to inhibit the VP-to-LHb pathway. Consumption of 15% alcohol and 15% alcohol adulterated with quinine was then assessed during chemogenetic inactivation of VP-to-LHb projections. We hypothesized that VP-to-LHb inhibition will promote aversion-resistance in Long-Evans rats in the non-compulsive group. However, our results showed a similar decrease in alcohol consumption in response to quinine adulteration across the experimental and control groups. This suggests that inhibiting VP-to-LHb neurons may not alter aversion sensitivity during alcohol consumption in rats with limited alcohol pre-exposure. We observed a potential effect of sex on baseline aversion-sensitivity and the impact of inhibiting VP-to-LHb neurons, but more rats are needed to fully evaluate this effect.

154. **Kris Xiong and Sara Abdillahi**

A More Objective Way to Measure Movement Disease Progression

Advisor: Robert McGovern

Sponsoring Program: NSSA Pathways

Home Institution: St. Olaf

Abstract: The aim of this methodology poster is to explore a more objective way in which to measure the progression of movement disorders. To do this, the movement data of the presenters were taken with an Xsens motion capture program which will be able to be imported into visual 3d. Visual 3d will then run a program to transform the collected data into a video that can be annotated. This annotated data is then transformed into graphs and figures with additional code, so that they can be analyzed for a less subjective rating of disease progression than the widely used UPDRS questionnaire.

155. **Andrew Yates**

The Effect of Neobiguanides on Metabolic and Signaling Pathways in a Triple Resistant Breast Cancer Cell Line

Advisor: David Potter
Sponsoring Program: LSSURP
Home Institution: Washington University in St. Louis

Abstract: While there's a wide range of treatment options for ER+ HER2- breast cancer, the emergence of hormone therapy resistance in 30-40% of cases remains concerning. Currently, the mechanisms of hormone therapy resistance is poorly understood, but it's been hypothesized that Cytochrome P450 epoxygenase-mediated epoxyeicosatrienoic acids (EETs) contribute to breast cancer progression and survival by promoting mitochondrial oxidative phosphorylation (OXPHOS). However, the connection between EETs and hormone therapy resistance remains unclear. This study aims to counteract those EETs by using synthetic CYP3A4 arachidonic acid epoxygenase inhibiting biguanides. Hexyl cuban-1-yl biguanide (HCB) and fluorinated derivatives C5F2-HCB and C6F3-HCB were previously developed through structure activity studies and computational crystallography modeling. The hexyl portions were fluorinated as they led to broader inhibition of EET regioisomer biosynthesis. This study uses a variant of the well-known aromatase overexpressing MCF-7 AC1 cell line that has been selected for fulvestrant resistance (FR) and exhibited palbociclib resistance (PR). Using primarily western blot analysis, MTT assays, and Agilent Seahorse extracellular flux analysis, inhibition of proliferation, signaling, and OXPHOS/glycolysis balance were determined. This information could prove valuable as successful biguanides could introduce new clinical tools as either primary treatment or accessories to current treatments in LR/FR/PR breast cancers.

156. **Ashley Ynglada**

Measuring Bilingual Children's Grammatical Development in Spanish
Advisor: Kerry Ebert
Sponsoring Program: McNair
Home Institution: University of Minnesota

Abstract: The language development of bilingual children is complex and as such, more research and data is required to discover patterns. The purpose of this current study is to examine grammatical patterns of Spanish-English bilingual children through language samples to better understand their development. For this study, narrative language samples in Spanish from 30 children ages 5 to 7 were transcribed and coded. The coding focused on correct and incorrect instances of grammatical forms that have varying degrees of "difficulty" in bilingual children's language development, such as the preterite, plural nouns and articles, and prepositions. After coding was completed, the frequency and the accuracy of the grammatical forms were analyzed. We also analyzed patterns based on home exposure and age. The findings of this study serve to contribute information on grammatical patterns of developing bilingual children.

157. **Min Yu**

Visualizing Inequity: Equal Opportunity Assessment for Public Education
Advisor: Sungduck Lee
Sponsoring Program: Pathways
Home Institution: University of Minnesota, Twin Cities

Abstract: Traditional high school evaluation systems heavily rely on metrics such as test scores, graduation rates, and college enrollment – factors that often favor students of certain racial and socioeconomic backgrounds. This research evaluates public education systems through a different lens of social justice and student wellness, especially for minority and underperforming students. By examining high schools in Minneapolis and Saint Paul, the study explores each school's attributes such as demographics, nutrition support, after-school programs, and test scores, and analyzes inclusivity, equity, and academic wellness. This study aims to discover a difference between conventional grade-based evaluation systems and equal opportunity assessment. The findings will be visualized on an accessible map, presenting data accessible to various stakeholders in public education.

158. **Bella Zerafa**

Parental Influence on Tauopathy Progression in PS19 Mice

Advisor: Ling Li
Sponsoring Program: SCoPE
Home Institution: Macalester College
Abstract: Alzheimer's disease (AD) is an irreversible form of age-related dementia that is characterized by the presence of extracellular amyloid-beta plaques and intracellular neurofibrillary tangles (NFTs). NFTs are formed through the self-aggregation of hyperphosphorylated tau proteins that disrupt neuronal transport systems, ultimately leading to neurodegeneration. To better understand the effects of tau in AD progression, many studies use the PS19 mouse model, a transgenic mouse model that expresses MAPT - a mutant human microtubule-associated protein tau. Current studies on PS19 mice have revealed sexual dimorphisms in tau pathology onset and progression, although the underlying factors, specifically the influence that parental inheritance may have in contributing to these differences are unclear. This project aims to compare 4, 6, and 8-month-old offspring from a PS19-positive dame or sire to assess the effects of parental inheritance on the progression of tauopathy. Results from this study are expected to highlight how parental inheritance may influence changes in AD pathogenesis and overall disease progression.

159.   **Nichole Zhang and Shelby Tisdale**
An Interactive Dashboard for Distributional Modeling of Adolescent Brain Development
Advisor: Mark Fiecas
Sponsoring Program: Equitable Data Science
Home Institution: Duke University
Abstract: Distributional, or normative, modeling allows us to create centile curves to visualize the variation of a developmental phenotype as a function of age. Previous studies have developed centile curves through a variety of modeling approaches, typically incorporating a cross-sectional design to model trajectories throughout the human lifespan. Such designs typically include only baseline data from longitudinal studies, failing to account for within-person changes. Additionally, while many studies plot centile curves separately for each sex and account for site- and/or study-related variability, other demographic factors, such as race, are not considered. This project seeks to address these limitations using fMRI data from the Adolescent Brain Cognitive Development (ABCD) study. The GAMLSS R package was used to calculate centile curves for cortical thickness and surface area for over 60 different brain regions. Models were developed separately for each sex and racial category and visualized through an interactive dashboard. Preliminary findings suggest that adolescent developmental trajectories for cortical thickness and surface area vary widely by sex and race, implying that normative benchmarks for individual- and population-level variation would be improved with the inclusion of demographic variables. Future research should identify mediating factors that may contribute to divergent trajectories across demographic groups.