UNIVERSITY OF MINNESOTA

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Summer Undergraduate Research Expo

August 10, 2023
McNamara Alumni Center
Memorial Hall
9:20 – 11:30 AM

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UNIVERSITY OF MINNESOTA

2023 SUMMER UNDERGRADUATE RESEARCH SYMPOSIUM

August 10, 2023
McNamara Alumni Center

Program Overview

9:00 a.m. – 9:30 a.m.	Poster Set-Up
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Presenter: Rasa Abbas
Poster Number: 60
Home Institution: Maple Grove Senior High
Program: M-ASCEND
Faculty Mentor: Silvia Balbo
Poster Title: How Does the Rate of Salivation Affect the Concentration of 8-Hydroxy 2-Deoxyguanosine Present in the Oral Cavity?
Abstract: The purpose of our study was to determine if a rapid rate of salivation decreased the amount of DNA damage in the oral cavity. To do this, we sampled 49 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 using an ELISA assay for 8-OHdG, a common DNA adduct. We found that DNA damage was not correlated with participants' salivation rates (t test, $p > 0.05$). Therefore our hypothesis was not supported. This likely occurred due to a small sample size and inconsistent collection of saliva samples.

Presenter: Hassania Ahmed
Poster Number: 61
Home Institution: Osseo Senior High
Program: M-ASCEND
Faculty Mentor: Silvia Balbo
Poster Title: Does Stress Cause DNA Damage?
Abstract: This investigation aimed to determine the relationship between stress, social interactions, and DNA damage; we expected that people with higher stress levels would have more DNA damage than people with lower stress levels. We sampled 49 participants on the University of Minnesota campus. They completed a survey about their demographics and lifestyle factors as well as providing a 5mL saliva sample. The saliva was then analyzed using an ELISA for 8-OHdG, a common DNA adduct. We found no significant difference between stress levels and their 8-OHdG concentrations (ANOVA $p = 0.60$). However, we did find a significant relationship between stress levels and social interactions (Chi-squared test for independence, $p = 0.04$). Therefore our hypothesis was partially supported. Although other studies have found a relationship between 8-OHdG and stress, our results likely occurred because there were other factors affecting DNA damage besides stress.

Presenter: Habsa Ahmed
Poster Number: 128
Home Institution: University of Minnesota
Program: UROP/URS
Faculty Mentor: Patrick Rothwell
Poster Title: Investigating whether NMDA receptor hypofunction in medial prefrontal cortex pyramidal neurons leads to synaptic deficits.
Abstract: Working memory deficits is a very disruptive symptom in patients with schizophrenia that may be caused by dysfunction in the brain's medial prefrontal cortex (mPFC). Previous studies have shown that neuronal spines are morphological markers for excitatory synapses and have decreased density in certain neuronal populations in patients with schizophrenia. Knocking out NMDA receptors in medial prefrontal cortex (mPFC) pyramidal neurons has allowed for the observance of any loss of coordinated neural activity and deficits in working memory. We utilized CRISPR technology via intracranial surgery to target NMDA receptor ablation to a specific population of neurons and produce chronic NMDA hypofunction. We used confocal imaging and electrophysiology to observe the effects of NMDA receptor loss in mPFC pyramidal neurons. We initially hypothesized that NMDA receptor loss in mPFC pyramidal neurons will lead to fewer and/or weaker spines. Our initial findings show that spine strength remains the same but there may be changes in spine density.

Presenter: Rahma Ali
Poster Number: 62
Home Institution: University of Minnesota Twin Cities
Program: M-ASCEND
Faculty Mentor: Jerica Berge
Poster Title: Exploring the Interplay of Generational Trauma, Mental Health, and Parenting Styles in Somali-Diasporic Communities
Abstract: Due to the Somali Civil War, the refugee crisis, and other issues, Somali people have faced enormous trauma in recent decades. This trauma can have a significant impact on individuals' and communities' psychological wellness as well as their parenting approaches. Traumatized parents are more prone to utilize restrictive parenting techniques, which include harsh regulations, demanding standards, and minimal psychological assistance. This parenting style can be hazardous to the psychological well-being of kids since it can cause anxiety, depression, and low self-esteem. Furthermore, through inheritance and acquired habits, generational trauma may have been handed down from parents to offspring. This means that children who grow up in traumatized households are more inclined to have psychological disorders themself. In Somali communities, there exists an increasing amount of study on the interaction of generational trauma, psychological wellness, and methods of parenting. According to studies, there is a need for interventions that can help Somali families break the cycle of trauma and enhance their mental health. Trauma-informed classes for parenting can assist parents develop strategies to cope with their individual trauma while offering improved upbringing towards their kids. Other treatments consist of psychological programs for the kids and parents and culturally specific counseling sessions.

Presenter: Karly Allison
Poster Number: 129
Home Institution: University of Minnesota - Twin Cities
Program: UROP/URS
Faculty Mentor: Stephen Engel
Poster Title: Most common symptom-triggering factors found in people with Visual Snow Syndrome
Abstract: Visual Snow Syndrome, VSS, is characterized by tiny tv-static-like specs that cover the entire visual field. VSS is also characterized by poor night vision, floaters, light sensitivity, and more (Schankin et. al., 2014). There is still much unknown about VSS, but no studies at this time have investigated how daily activities impact the expression of VSS symptoms. We examined participants' responses to what worsens/lessens their symptoms to identify common triggering and alleviating factors. For example, someone who does not have VSS may not experience changes to their vision due to lack of sleep or a change in lighting, but an individual with VSS may experience a difference due to these factors. Participants with VSS completed a 24-question survey about their experience with VSS symptoms (N=48). Free response questions were analyzed via thematic analysis to identify common situations that trigger or alleviate symptoms . Lighting extremes (bright and dark) were common triggers. This suggests that varying levels of lighting impact how severe participants' symptoms are. Simple changes to participants' daily lives, such as controlling the types of lighting they use and how bright the lighting is may heavily impact their visual snow.

Presenter: Manuel Alvarez
Poster Number: 1
Home Institution: University of Colorado Boulder
Program: LSSURP
Faculty Mentor: Michael-Paul Schallmo
Poster Title: Examining Differences in Early Visual Processing Among People with Psychosis vs. Healthy Controls using fMRI
Abstract: Schizophrenia is a psychiatric disorder characterized by recurrent episodes of psychosis. With genetics failing to account for nearly two-thirds of onset cases, recent theories regarding the etiology of schizophrenia point towards abnormal oscillatory synchronization as a potential neurological deficit underpinning the disorder. Neural oscillations are rhythmic patterns of activity between neural networks that are associated with specific brain functions, including visual-information processing. This study aims to examine the potential differences in the early visual processing system of people with psychosis (PWP) versus neurotypical healthy controls (HC). Participants were shown perceptual illusions, particularly the Ball-in-the-Hall illusion to assess perceptual context processing. FMRI data were collected during a functional localizer paradigm, to facilitate functional mapping of the response to various illusion conditions (e.g., hallway vs. no hallway) in early visual cortex (e.g., area V1). These data were used to define regions of interest, which were used to quantify the extent of the fMRI response across cortex. This study expected to find a statistically significant difference in the early visual cortex between groups, but this effect was not found in this study. Future directions include increasing statistical power and adding a control condition accounting for surround suppression of the perceptual tasks.

Presenter: Fatuma Arab
Poster Number: 78
Home Institution: University of Minnesota - Twin Cities
Program: McNair
Faculty Mentor: Saida Abdi
Poster Title: Designing a participatory model for integrating well-being and climate leadership with Somali American Youth.
Abstract: The Somali community in the U.S. demonstrates leadership in various areas like civic engagement, policy work, and research. However, they are underrepresented in climate justice activism and mental health awareness. With Somalia ranked one of the top countries for global vulnerability to climate change, what barriers do Somali Americans face to being involved in climate justice? Additionally, as refugees/immigrant descendants from a conflict-ridden country, Somali youth lack resources to discuss mental health and address community challenges such as climate change. This project aims to explore the connection between neighborhood/cultural identities, climate justice, and psychological trauma/belonging. Through the participatory experience-based co-design (EBCD) methodology, seven resilient Somali youths aged 20-24 will learn research and climate change activism principles. The result that we hope this study to have is that these youths will then apply their knowledge in community-based research, ultimately educating others and promoting positive change.

Presenter: Hailee Aro
Poster Number: 144
Home Institution: Hamline University
Program: Independent Research
Faculty Mentor: Kate Adamala
Poster Title: Investigating the First Steps in Biological Computational Methods
Abstract: Biological computing uses biological parts as the building blocks of a computational device. These devices are able to receive an input and then output a corresponding signal. Trumpet (Transcriptional RNA Universal Multi-Purpose GatE PlaTform) is being used as a cell-free and enzymatic logic gate system. This platform recognizes single-stranded DNA inputs as Boolean logic gates, and outputs either DNA or a fluorescent aptamer. Template DNA encoding for the logic gate and a measurable output serve as the wires and circuit of the device. Restriction enzymes are used to cut DNA templates to turn on or off gates. RNA polymerase synthesizes RNA strands from these templates, which include sequences for fluorescent RNA aptamers to be used as a readout for the logic gate reaction. Specific sequences of DNA are needed to serve as the template strand of this device. This DNA must contain a promoter sequence for RNA polymerase to recognize, restriction enzyme cut sites, and a fluorescence aptamer sequence. Multiple DNA templates are essential to this device in order to produce multiple inputs for various outputs. This project aims to create these complex single-stranded DNA sequences, through cloning, in order to serve as a template for the Trumpet system.

Presenter: Alexandria Aromolaran
Poster Number: 2
Home Institution: Georgia Institute of Technology
Program: LSSURP
Faculty Mentor: Lucy Vulchanova
Poster Title: Effects of Optogenetic Stimulation as a Route to Recovery after an Acute Spinal Cord Injury
Abstract: Spinal cord injury (SCI) carries a heavy toll by negatively impacting both sensory and motor function. Neuromodulation is a method that specifically targets and changes the activity of neurons and has previously been shown to promote corticospinal tract regeneration after SCI. This project uses optogenetics as a novel means of neuromodulation to stimulate descending corticospinal tract (CST) neurons. We hypothesize that optogenetic stimulation will lead to neuroanatomical and behavioral recovery after SCI. Previously, twelve Long Evans rats were given viral injections with and without the light reactive channelrhodopsin (Chr) protein, then a contusion spinal cord injury. The rats underwent optogenetic stimulation 3 times a day for 4 weeks. To assess behavioral recovery, the rats received a weekly locomotor activity evaluation using the Basso, Beattie, Bresnahan (BBB) rating scale. To assess neuroanatomical recovery, immunohistochemistry was performed to evaluate effects on axon regeneration and glial scar formation. This work provides insights on the role of neuromodulation in a rat model of contusion SCI.

Presenter: Salma Awale
Poster Number: 91
Home Institution: University of Minnesota - Twin Cities
Program: MSROP
Faculty Mentor: Michael Lee
Poster Title: Effects of Microbeam Radiation Therapy On Disease Pathology in APP/PS1 Mice Model of Alzheimer's Disease.
Abstract: Alzheimer's Disease (AD) is a neurodegenerative disease that is the most common cause of dementia. It is a concern affecting millions of people over the age of 65 in the United States. AD is clinically characterized by its main pathogenic protein: amyloid-β (Aβ). The generation of Aβ significantly influences the progression and prognosis of AD. Microbeam radiation therapy (MRT) has been proven to suppress the growth of cancer cells while maintaining the function of healthy tissues. We have employed this well-tolerated low-dose MRT as a novel treatment strategy to target multiple aspects of AD pathogenesis in a mouse model. The irradiated/nonirradiated brains of non-transgenic and transgenic APP/PS1 mice were harvested and sliced coronally at 40 um. The tissue sections were stained with three different antibodies: Aβ, GFAP (stains for astrocytes), and IBA1 (stains for microglia). These proteins were visualized with a DAB chromogen (brown) visible under a bright-field microscope. Lastly, the brains were mounted onto a slide, counterstained with cresyl violet, imaged, and analyzed for neuropathology and levels of Aβ plaques. Currently, there are no disease-modifying methods to significantly alter the clinical course of AD. The outcomes of this experiment could potentially allow considerations for new treatments for Alzheimer's patients.

Presenter: Alexey J. Badillo-Guzmán
Poster Number: 3
Home Institution: University of Puerto Rico- Mayagüez
Program: LSSURP
Faculty Mentor: Mark R. Schleiss
Poster Title: Evaluation of immunogenicity of disabled infectious single cycle (DISC) vaccine for cytomegalovirus CMV in Hartley guinea pigs
Abstract: Cytomegalovirus is one of the most common infectious diseases in the United States, which can be a potential risk for immunocompromised individuals and pregnant women. Similarly, congenital cytomegalovirus (cCMV) is the most common intrauterine infection in the US, with some of the manifestations being hearing loss, visual disorders, and cognitive defects. This is why developing a vaccine to prevent its transmission is crucial to public health. In the lab, disabled infectious single cycle (DISC) vaccines for CMV were developed by knocking down the genes GP51 and GP52, which have been demonstrated to stop the virus' replication cycle. The outbred Hartley guinea pigs were given two doses of the vaccine, and samples were taken from the days after each immunization. Then they were mated and given the CMV virus when confirmed pregnant. Finally, samples were taken after the delivery of the pups. To test the vaccine's immunogenicity, the samples' avidity was measured using enzyme-linked immunosorbent assay (ELISA). Avidity being defined as the net strength at which antibody molecules bind to antigenic protein epitopes. Results showed that the vaccine provoked a similar immune response to the one caused by the CMV wild-type virus because there was no significant difference between the groups.

Presenter: Irene Bensus
Poster Number: 92
Home Institution: Institute of Child Development
Program: MSROP
Faculty Mentor: Charisse Pickron
Poster Title: Multiple Methods to Evaluate Racial Biases in Multiracial Children
Abstract: Several studies have shared that an important part of many children's development of explicit racial biases are influenced by the social context. Majority of our understanding about development of social biases has been based on monoracial children. There are many unanswered questions on the way being raised in a multiracial household may shape racial biases in early childhood. We are developing a study that investigates race related biases in Multiracial children. The study includes 3 measures of explicit racial bias and 1 implicit racial bias task. Data will be collected over Zoom with children aged 4-8 years of age. For explicit biases we will evaluate how much participants like someone of a different race, who children want to learn novel information from, and who children prefer to socialize with. The implicit racial bias task evaluates racial attitudes of positive and negative associations of white and black faces. The next step of this project is to pilot tasks with adults and children. This project is important because to equip and support Multiracial children we must understand the changes and development of racial biases in earlier stages of life. We anticipate, Multiracial children having weaker racial bias.

Presenter: Eleni Beshsah
Poster Number: 63
Home Institution: University of Minnesota- Twin Cities
Program: M-ASCEND
Faculty Mentor: Beshay Zordoky
Poster Title: Doxorubicin-induced Cardiotoxicity is aggravated by psychosocial stress
Abstract: Psychosocial stress significantly raises cardiovascular risk and burdens cancer patients. However, it remains uncertain whether psychosocial stress can exacerbate the cardiotoxic effects of chemotherapeutic agents such as doxorubicin (DOX) in translationally relevant animal models. This study used a 'two-hit' mouse model, combining chronic subordination stress (CSS) with DOX-induced cardiotoxicity. Male C57BL/6N mice, aged 12 weeks, experienced 28 days of daily social defeat. After one week of CSS exposure, mice received DOX for three weeks to induce cardiotoxicity. Cardiac function was evaluated with echocardiography, and real-time PCR measured gene expression of inflammatory and pro-fibrotic markers. Mice exposed to both DOX and CSS exhibited impaired heart function, with reduced ejection fraction and cardiac output. The gene expression of the atrial natriuretic peptide, interleukin-6 and β-myosin heavy chain increased significantly only in mice exposed to both DOX and CSS. As for cardiac morphometry, DOX led to cardiac atrophy and reversed the CSS-induced cardiac hypertrophy, which was confirmed by measuring the heart weight in relation to tibia length. Exposure to CSS exacerbated the cardiotoxic effects of DOX. These findings emphasize that psychosocial stress can increase the risk of adverse cardiovascular outcomes in cancer patients undergoing cardiotoxic treatments.

Presenter: Tasha Beyioku-Alase
Poster Number: 64
Home Institution: Department of Family Medicine and Community Health
Program: M-ASCEND
Faculty Mentor: Michele Allen
Poster Title: Evaluating The Experiences of Community and Academic Members on Advisory Boards
Abstract: *Background* Community engagement (CE) improves scientific discovery, identifies priorities for medical education, and enhances clinical care. Within CE research, partnership processes enhance community members' commitment to the group and improve group outcomes. This pilot survey evaluates community experiences on academic health center advisory groups. *Methods* We used a participatory process, including 6 community and 8 academic members, to review questions from 3 existing CBPR partnership process evaluations. We then piloted the survey with 3 existing advisory groups to assess their experiences and elicit survey feedback. *Results Of the 12 respondents, 58% were community members on an advisory group. 58% of the respondents had been involved on the advisory board for 2 years or less. Community and academic respondents scored similarly and positively about their experience. There were 2 exceptions. First, community members felt their involvement influences the group to be more responsive compared to academic members on the same topic. 43% of community members describe the type of trust in the group as role based whereas no academic members described their trust in that way. Conclusion* In this pilot, community and academic respondents largely ranked their community academic groups positively and similarly. Future research should link group processes to outcome.

Presenter: Dechen Bhuming
Poster Number: 4
Home Institution: Wellesley College
Program: LSSURP
Faculty Mentor: Timothy Griffin
Poster Title: Clinical Metaproteomic Data Analysis using Galaxy Training Network
Abstract: Metaproteomics, a cutting-edge method for studying microbiota-expressed proteomes, holds immense potential in understanding disease-related microbial contributions in clinical samples. However, a current challenge in analyzing clinical samples using metaproteomics is the interference caused by abundant human proteins, which hampers the identification of less abundant microbial proteins. To tackle this issue, we have developed bioinformatic workflows that can be used within the Galaxy bioinformatics platform on mass spectrometry (MS) data of clinical samples. As an example, we have analyzed MS data from a subset of pap-test fluid (PTF) samples collected from ovarian cancer (OC) patients. By leveraging the bioinformatics workflows that use a) Database generation workflow b) Discovery workflow c) Verification workflow and quantitation workflow, we successfully detected 306 microbial peptides out of which 64 peptides were verified for their spectral quality. The outcomes of our workflow could contribute valuable insights into the application of metaproteomics tools in characterizing microbial communities in clinical settings. As a future step, we plan to share our approach through a detailed training module on the Galaxy Training Network, aiming to foster reproducibility and enhance the widespread adoption of this method in clinical metaproteomic research.

Presenter: Kyra Boorsma Bergerud
Poster Number: 65
Home Institution: University of Minnesota
Program: M-ASCEND
Faculty Mentor: Subbaya Subramanian
Poster Title: Sequential Colorectal Cancer Driver Gene Mutations Alter Longitudinal Gut Microbial Compositions
Abstract: Sequential driver mutations promote colorectal cancer (CRC) pathogenesis and progression. As CRC-driver mutations accumulate, they contribute to increased tumorigenesis. While cancer is regarded as a genetically driven disease, it is likely that tumor-extrinsic factors contribute to CRC progression, as early-onset and late-onset CRC have similar genetic compositions but confer different prognoses. The role of the microbiome in driving the accumulation of sequential mutations in CRC progression remains unknown. In this study we investigated how the addition of a SMAD4 mutation modulates the microbiome composition and diversity. We generated an orthotopic organoid mouse model to compare longitudinal microbiome alterations in *APC, KRAS, P53* (AKP) and *APC, KRAS, P53, SMAD4* (AKPS) tumors. AKP and AKPS organoids were implanted into the colons of C57BL/6 mice for 8 weeks, fecal samples were collected weekly and sequenced with 16S analysis. In both AKP and AKPS tumors, longitudinal compositional changes were observed in the microbiome from early and late samples. When comparing AKP versus AKPS tumors, CRC progression was marked by longitudinal alterations in microbiota abundance and composition. These results indicate that the presence of a *SMAD4* mutation modulates the intestinal microbiome.

Presenter: Vivian Bui
Poster Number: 66
Home Institution: Barnard College, Columbia University
Program: M-ASCEND
Faculty Mentor: Rachel Vogel
Poster Title: Experience of Financial Toxicity Among Individuals Who Have Been Treated with Immunotherapies for Cancer
Abstract: Introduction: Treatment for cancer can result in significant financial burden. We sought to describe the experience of financial toxicity among individuals who received immunotherapy as part of their cancer treatment.
Methods: Participants from the Minnesota Immunotherapy eXperience (MiX) study, an ongoing prospective longitudinal cohort study of cancer survivors who received immunotherapy as part of their treatment, were invited to complete a follow-up cross-sectional survey in July 2023 (n=109). Financial toxicity was measured using the Comprehensive Score for Financial Toxicity (COST) instrument. Data were summarized using descriptive statistics.
Results: 76 (70%) completed the survey; 60.5% were male, 94.6% non-Hispanic white, and 30.7% reported having dependents. Half were retired (50.0%) and 31.6% reported working full-time; all reported having health insurance. 21.3% stated being not at all satisfied with their current financial situation and over half (55.4%) reported being at least a little financially stressed. COST scores indicated that increased financial toxicity was associated with lower income and poorer quality of life.
Discussion: Individuals who have undergone immunotherapy for cancer report some level of concern with finances and this is associated with QOL. Further research among a larger and more diverse population is needed.

Presenter: Awa Ceesay
Poster Number: 5
Home Institution: UMN
Program: LSSURP
Faculty Mentor: Sivaraj Sivaramakrishnan
Poster Title: Role of intracellular loop 3 in agonist trafficking of G-Protein coupled receptors
Abstract: G-protein coupled receptors(GPCR) are responsible for most of the cell's signal transduction making them major targets in pharmacology. Once activated by an agonist, the GPCR binds to a G-protein at its intracellular loops (ICLs) , igniting activation. The signal produced by the activation of the receptor is frequently followed by internalization which terminates membrane signaling of GPCR (2). ICL3 is known to facilitate the binding of the G-protein but its involvement in signal transduction is not fully designated due to its high sequence divergence across different GPCRs, its disordered regions and undefined structure (1).
Here we investigate the involvement of ICL3 in the agonist trafficking of GPCR. Using the beta-adrenergic receptor 2(β2AR), we observe internalization with and without its ICL3 upon partial agonist or full agonist treatment. Partial agonists lower the efficacy of the receptors and are advantageous medication. Our results show no statistically significant difference of internalization between the wild type β2AR and β2AR-ICL3 although a slightly higher number of internalized particles in the β2AR-ICL3 when treated with the partial agonist. We speculate that with further experimentation we will be able to determine the role of ICL3 on internalization.

Presenter: Nyomi Charleston
Poster Number: 6
Home Institution: Howard University
Program: LSSURP
Faculty Mentor: David Redish
Poster Title: Sex Differences in an Approach-Avoidance Conflict in Rats
Abstract: A large percentage of Americans struggle with anxiety disorders. Anxiety disorders show well-documented sex differences but it is unknown to what extent these differences are sociological or biological. In order to examine biological bases for sex-differences in anxiety, we used an innovative approach-avoidance paradigm to investigate how sex impacts fear and anxiety responses in Brown Norway rats. To induce fear, worry, and anxiety, a robotic predator designed to mimic real threats interposed itself (attacked the rat) between a rat and its food. We closely observed the behavior and measured parameters of the behavior, including (1) hesitation at the nest, (2) inbound (safe) vs. outbound (into danger) travel speed, (3) how much food the rat was able to gather, and (4) frequency of mid-track aborts (where the rat approaches the robot but returns to the nest before completing its journey to food). Differences in these behavioral measurements were compared across male and female rats before and after encountering the robot.

Presenter: Madison Cocker
Poster Number: 7
Home Institution: University of Minnesota
Program: LSSURP
Faculty Mentor: Ameeta Kelekar
Poster Title: Characterization of a novel short isoform of fructose-1,6-bisphosphatase
Abstract: Evidence in the Kelekar laboratory shows that fructose 1,6-bisphosphatase 1 (FBP1), a gluconeogenic enzyme, is active in T lymphocytes when they undergo a rapid proliferative burst following antigenic stimulation. FBP1 is a tetramer with a regulatory and a catalytic domain but a novel, short isoform of FBP1 (M83), encompassing only the catalytic domain, is the functional enzyme in activated T cells. Whether this isoform is tetrameric or enzymatically active as a dimer or monomer remains to be determined. For my project, I will characterize FBP1-M83 and test the hypothesis, that this isoform is active as a dimer and resistant to inhibitors that would inactivate FBP1. To do this, I have (a) translated the V5 epitope-tagged M83 in vitro, and (b) expressed the tagged short and long isoforms in THLE-2 liver cells, and evaluated its ability to form a tetramer, dimer, or monomer in native gels. I have also assayed the enzymatic activity of FBP1-M83 and its response to inhibitors in THLE-2 cells. Additionally, I am generating FLAG-tagged constructs for immunoprecipitation and western blotting to confirm dimerization of M83.
These studies could offer insights into the structure and function of the unique FBP1 isoform and its potential as a therapeutic target.

Presenter: Cecilia Cole
Poster Number: 112
Home Institution: Augsburg University
Program: SOAR-REEU
Faculty Mentor: Nic Jelinski
Poster Title: Weed Species Identification: Telling the Story
Abstract: Urban Gardeners are in need of an adequate way to suppress weeds and maintain soil moisture. In particular, Shredded Cardboard Mulch is a good option for those trying to lower time spent weeding and lower their water usage. The Shredded Cardboard Mulch Project is testing the Carbon and Nitrogen cycles within the different Mulch treatments of 3 common species found in Urban Gardens. We are working to identify and quantify the weeds that do grow up through the different mulch treatments through random biomass sampling. This process entails random placement of a 0.25 m^2 quadrat. Finding the stories of these weeds could let us know how, why and what other weeds may be able to break through the different mulch treatments.

Presenter: Olivia Cuoco
Poster Number: 79
Home Institution: University of Minnesota
Program: McNair
Faculty Mentor: Kay Simon
Poster Title: Recollections of Sexual Education from Parents among Sexual Minority Adults
Abstract: Providing adolescents sexual education is essential to helping them grow into sexually healthy adults. However, sexual minority youth (SMY) report receiving less sexual education than their cisgender heterosexual peers. Further, sexual education research is mainly done on school curriculum and is often heteronormative. Research is limited in exploring SMY's experiences receiving sexual education from their parents. The current study analyzes open-ended responses of 432 SM and childfree adults' recollections of sexual education from their parents. We hypothesize that sexual education from parents for SMY will be associated with heteronormative themes. Thematic analysis of responses is ongoing but preliminary results suggest sex education often centers around functional education and safety while positive regard to sex seems to be a rare occurrence. Understanding SMY's experiences with sexual education provides information to parents on how to better educate their children about empowering sexual practices and planned family formation.

Presenter: Ever Curry
Poster Number: 8
Home Institution: University of South Carolina
Program: LSSURP
Faculty Mentor: Kathryn Cullen
Poster Title: Correlation between Verbal Task Fluency Scores and self-reported depression scores in adolescents
Abstract: Depression is a mental health illness that commonly develops during adolescence. There has been little research on the correlation between self-reported adolescent depression and Verbal Task Fluency scores. Verbal Task Fluency (VTF) is used to identify verbal functioning and word-letter retrieval abilities under specific, restrictive conditions. The Children's Depression Inventory 2 (CDI-2) is a comprehensive survey measuring self-reported depressive symptoms on a sliding scale from least to most severe. The goal of our study was to analyze the correlation between VTF scores and the four depression categories of self-reported CDI-2 scores. 39 participants completed both the CDI-2 and VTF measures at five distinct timepoints. Each session was separated by two weeks, except for the fifth session, which took place six months after the fourth session. Post-data collection, participants were separated into groups based on the severity of their depression scores. Our results showed that the low depression group had the lowest VTF scores for sessions 1 and 3, and every group was on or around the grand median of 30 words per cluster (the norm for adolescents). These findings suggest that depression was not significantly correlated with VTF scores, but age and vocabulary could be the reason for unexpected results.

Presenter: Vanessa Czerniecki
Poster Number: 9
Home Institution: Carleton College
Program: LSSURP
Faculty Mentor: Bryce Binstadt
Poster Title: Developing assays for the study of CCL21 and CCR7 in autoimmune valvular carditis
Abstract: The link between autoimmune disease and valvular heart disease is recognized but an understanding of the associated mechanisms is still needed. It has been identified that capillary lymphatic vessels develop from valve endothelial cells (VECs) and expand into the mitral valve as valvular carditis progresses. Single-cell RNA sequencing (scRNA-seq) analysis shows that the capillary lymphatic vessels express markers of lymphatic ECs. Among these markers is CCL21, a chemokine that recruits CCR7-expressing immune cells to lymphatics. Interestingly, the scRNA-seq data shows that CCL21 is expressed in VECs, while CCR7 is expressed in B cells. In this study, we aim to validate these findings and optimize assays to address CCL21 and CCR7's interactions. Immunofluorescence staining revealed that CCL21 expression increases with inflammation in the mitral valve, specifically, in the lymphatics. To validate whether CCL21 recruits CCR7-expressing cells and how increased expression affects this, a transwell migration assay was designed. These assays will be especially useful alongside the CCR7-floxed mice designed to generate cell-specific CCR7 knockout lines. A TAT-Cre recombinase delivery system was optimized and will be used to validate the CCR7-floxed construct. These assays and subsequent flow cytometric analysis will permit the study of CCR7 and CCL21's interactions in valvular heart disease.

Presenter: Blaine Damte
Poster Number: 93
Home Institution: University of Minnesota - Twin Cities
Program: MSROP
Faculty Mentor: Melissa Horning
Poster Title: The Effects of Discrimination on Food Security and Food Accessibility in the Twin Cities Region
Abstract: Background: This study assesses the link between everyday discrimination experiences and food access among residents of public and private subsidized housing in the Twin Cities Reason. Methods: This cross-sectional study includes 131 participants, who completed informed consent and psychosocial surveys containing measures of everyday discrimination and food access (e.g., perceived food access scale, frequency of grocery shopping, food and nutrition security). Everyday Discrimination Scale scores were split into no/low, moderate, and high levels of discrimination. Chi Square and ANOVA analyses assessed associations between level of discrimination and food access measures.
Results: There was significantly lower mean Perceived Food Access as level of discrimination increased. Both nutrition security scores and food insecurity levels were also significantly different by level of discrimination with lower nutrition security in those with higher experiences of discrimination. All other food access measures were not significantly associated with the everyday discrimination categories.
Conclusions: Results indicate some measures of food access are related to levels of discrimination in populations and help us better understand the relationship between experiences of everyday discrimination and food access. Results indicate the need to further explore these relationships in adjusted analyses to inform future work to improve equitable food access.

Presenter: Loren De Jesús
Poster Number: 113
Home Institution: Universidad de Puerto Rico en Utuado
Program: SOAR-REEU
Faculty Mentor: Eric Watkins
Poster Title: Exploring species abundance and richness of vegetables, fruits, and herbs in Twin City home gardens
Abstract: Home gardening is a common practice in the Twin Cities Metropolitan Area. Thus far there has been no inquiry on the horticultural crop preferences of homeowners. This research delves into the current abundance, density and species richness of vegetables, fruits, and herbs found at 40 residential properties participating in the Twin Cities Long-Term Ecological Research project. Relationships between horticultural crops and property attributes such as the amount of nearby grocery and restaurant options, estimated property value, household average income, house age, and property size were explored.

Presenter: Aiden Deacon
Poster Number: 10
Home Institution: Augsburg University
Program: LSSURP
Faculty Mentor: Justin Hwang
Poster Title: RSPO2 as a Driver of AR Independent Metastatic Prostate Cancer
Abstract: Patients with metastatic prostate cancer (mPC) still have poor clinical outcomes. Therapies that target specific oncogenic pathways, such as the androgen receptor (AR), are initially effective, but patients generally develop resistance and require alternative treatment options. *RSPO2* mediates sustained activation of Wnt signaling, which is a known resistant mechanism in mPC. We conducted an *in silico* multi-prostate cancer study to map alterations of genes in the Wnt pathway. Of all Wnt genes, *RSPO2* had the greatest alteration frequency and was observed in over 20% of mPC patients. In mPC, *RSPO2* alterations generally consisted of gene amplifications and overexpression events, whereas *RSPO2* deletions were <1% of the total cases. Given the unknown functional contribution of *RSPO2* in mPC, we sought to evaluate functional and signaling properties of RSPO2 *in vitro*. We overexpressed *RSPO2* in multiple mPC cell line models (LNCaP, 22RV1, PC3) and we are currently assessing tumor forming, proliferative, and drug resistant functions. Preliminarily, we find that *RSPO2* led to morphological changes in cells and drives resistance to enzalutamide, an AR targeted therapy. While we are confirming each laboratory observation, *RSPO2* appears to be a promising therapeutic target in mPC.

Presenter: Meera Dear
Poster Number: 94
Home Institution: UMN - TC
Program: MSROP
Faculty Mentor: Patricia Frazier
Poster Title: The Impact of Adverse Childhood Experiences On Student Athlete Mental Health
Abstract: A recent survey found that many student athletes experience feelings of being overwhelmed by their responsibilities and mental exhaustion “constantly or on most days” (NCAA 2023). In addition, research has shown that participating in college athletics can result in the exacerbation or development of mental disorders (Xanthopoulos et al., 2020). One factor that has been found to be associated with the mental health of student athletes is Adverse Childhood Experiences (ACEs; Bennett, 2020). However, existing research on ACEs among college athletes is limited due to the lack of non-athlete comparison groups. This study aimed to compare student athletes to nonathletes in exposure to ACEs and mental health and examine the relation between ACEs and mental health in both groups. The sample was 814 NCAA student-athletes and 8410 nonathletes at several colleges and universities in Minnesota who completed an online survey assessing ACEs, perceived stress, and mental health in 2021. Both samples were primarily cisgender women, White and heterosexual. The athlete group reported significantly fewer ACEs than the nonathlete group, less stress, and fewer days with poor mental health. The total number of ACEs experienced was positively associated with more stress and poorer mental health in both groups.

Presenter: Andrea Del Castillo
Poster Number: 11
Home Institution: University of Minnesota Rochester
Program: LSSURP
Faculty Mentor: Donald Simone
Poster Title: Use of Place Preference Testing to Determine Rewarding Properties of N_2O
Abstract: Opioid analgesics are used to treat pain, but approximately 3 million people in the U.S. have suffered from opioid use disorder. Nitrous oxide (N2O), also known as laughing gas, is an inhaled anesthetic with analgesic properties commonly used in dentistry and other minor surgery procedures. We are currently investigating analgesic efficacy of a liquid formulation of N2O that can be used as an alternative to opioids to treat pain. We found that the liquid N2O administered by oral gavage decreased sensitivity to mechanical and heat stimuli in mice. We then used a Place Preference test to assess the risk of dependency with N2O. Mice were placed in a dual-sided chamber with different visual cues and were restricted to one side of the chamber after receiving the drug daily for 5 days. After this 5-day conditioning with N2O, mice were given access to both sides of the chamber. Mice treated with N2O failed to show preference towards either side of the chamber. These results suggest that the liquid N2O given by oral gavage is not rewarding and may therefore not produce dependence. If true, N2O may be an effective alternative to opioids.

Presenter: Swesh Dhungel
Poster Number: 12
Home Institution: Vanderbilt University
Program: LSSURP
Faculty Mentor: Kaylee Schwertfeger
Poster Title: LYVE-1 macrophage-produced signal protein (Gas6) selectively modulates hyaluronan regulation in the breast cancer tumor microenvironment
Abstract: Breast Cancer tumors and their structural surroundings are comprised of many cells in addition to tumor cells. Understanding this tumor microenvironment and the surrounding extracellular matrix is essential to combating tumor metastasis and proliferation. More specifically, prior literature establishes cancer-associated fibroblasts (CAFs) as hyaluronan (HA) producers and illustrates the critical role of cell surface protein LYVE-1expressing macrophages in regulating hyaluronan levels and tumor progression. While the functions of LYVE-1 macrophages and CAFs have been researched independently, the nature of the relationship between these cell types remains unknown. To explore this relationship, we treated NIH-3T3 fibroblast cells with LYVE-1 macrophage-produced recombinant protein: Gas6. qRT-PCR analysis from fibroblast lysates illustrates reduced expression levels for HA synthase gene Has3 and HA degradation gene Hyal2, suggesting a decrease in HA internalization and reduced production of low molecular weight HA. ELISA results reflect no change in HA production by fibroblasts after treatment with Gas6. Ultimately, our data suggest an interaction between LYVE-1 macrophages and CAFs and, more specifically, illustrate that Gas6 is affecting fibroblasts and HA regulation in a selective manner. The presence of such a communication pathway between CAFs and LYVE-1 macrophages could allow for a new and promising target for cancer therapies.

Presenter: Gabriella Diaz
Poster Number: 80
Home Institution: College of Liberal Arts
Program: McNair
Faculty Mentor: Nancy Luxon
Poster Title: Education and Political Consciousness: A Comparative Analysis of Chile and Cuba
Abstract: The 1960s and 1970s were a politically tumultuous time in Chile, Cuba, and the United States. The dictatorship of Augusto Pinochet in Chile, the rule of Fulgencio Batista in Cuba, and the counterculture movement in the United States all ignited political and social movements that transformed the socio-political landscape in each country. At the same time, education underwent profound changes at all of its levels. This study analyzes both countries' principled rationale and practical educational curriculum in the 1960s and 1970s, and the relationship between society and government. To do so, I will analyze each country's model of education, along with the level of political consciousness, and how these concepts reveal definitions of growth and political values.

Presenter: Jack DuFauchard
Poster Number: 13
Home Institution: University of Minnesota, Twin Cities
Program: LSSURP
Faculty Mentor: Carol Lange
Poster Title: Ligand-independent GR signaling in ovarian cancer cells
Abstract: Platinum-based chemotherapy is commonly used for treating hematological malignancies and solid tumors, including breast and ovarian cancers. To mitigate the adverse effects of these therapies, corticosteroids (i.e. dexamethasone) are often co-administered. However, these agents can compromise the efficacy of chemotherapy. Glucocorticoid receptors (GR) function as ligand-activated transcription factors that promote cancer cell survival and contribute to metastasis. Similarly, Transforming Growth Factor Beta 1 (TGFβ1) has comparable effects on tumor survival and metastasis. In triple negative breast cancer (TNBC), in the absence of GR ligands, TGFβ1 activates the p38-dependent phosphorylation of GR on Ser134 (p-GR). This event induces the transcriptional regulation of p-GR-dependent genes crucial for cell survival and migration. This study aimed to investigate the ligand-independent actions of p-GR in OC. Western blot analysis demonstrated rapid phosphorylation of GR on Ser134 in OVCAR-8 and PEO4 cells upon treatment with either TGFβ1 or dexamethasone; GR Ser134 phosphorylation was blocked with the p38 inhibitor, SB202190. Additionally, TGFβ1 or dexamethasone induced the upregulation of pro-survival genes and increased soft agar colony formation, suggesting that OC cells, like TNBC cells, employ p-GR-driven mechanisms to promote advanced cancer phenotypes. Future directions will examine the mechanisms of gene regulation by p-GR in additional OC models.

Presenter: Catherine Duffy Shaw
Poster Number: 14
Home Institution: St. Olaf College
Program: LSSURP
Faculty Mentor: Tanya Freedman
Poster Title: Effects of varied Fc receptor aggregation on pSHIP1 and pSHP1 protein levels in bone marrow derived macrophages
Abstract: Macrophages are an essential constituent of the human immune system, clearing cellular debris and eliminating pathogens that pose a threat to biological homeostasis via phagocytosis. In vivo, macrophages encounter various extracellular signals, such as growth factors and interferons, which initiate intracellular signaling cascades. Receptors embedded in the macrophage membrane are key in mediating the transduction of extracellular signals into the intracellular environment. Previous research has established that receptor microclusters are needed to properly activate some signaling cascades. Receptor clustering may be a method of regulating nonspecific signaling activation and enhancing ligand specificity by macrophages; only ligands of a threshold size will cause receptor activation (Iron & Rumsey, 2017). Aggregation of macrophage receptors CD16, CD32, and Dectin1 are associated with the phosphorylation of SHIP1 and SHP1 proteins. Upon phosphorylation, SHIP1 and SHP1 act as effector proteins in inhibitory signaling pathways, preventing macrophage proliferation, differentiation, migration, etc. Obstructing the inhibitory effects of SHIP1 and SHP1 is a potential immunotherapeutic method of combatting oncogenesis; disarming SHIP1 and SHP1 will promote macrophage proliferation and migration necessary to phagocytose cancerous cells (Pedicone et al., 2021). This study investigates the effect of various degrees of CD16/32 and Dectin1 Fc receptor aggregation on pSHIP1 and pSHP1 levels.

Presenter: Lydia Erie
Poster Number: 102
Home Institution: University of Minnesota
Program: SCoPE
Faculty Mentor: Angela Birnbaum
Poster Title: Opioid SPE Extraction Format Comparison
Abstract: Sample extraction is an important phase in bioanalysis. Solid-phase extraction is used to aid in extraction and isolation of compounds of interest in biospecimens. It is compatible with a wide variety of matrices, including blood, urine, water, soil and animal tissue. SPE has advantages over other methods of extraction, such as low solvent consumption, efficiency and higher selectivity. This project focuses on two formats, which differ in the way samples are contained. The first format uses tubes to prepare the samples and hold SPE filters while in the second format the SPE filters and samples are held in the wells of a 96-well plate. Tubes are preferred when dealing with a smaller number of samples, however it can be time consuming and tedious, especially when preparing a large number of samples. Using a 96-well plate can be ideal as it simplifies sample preparation, requires lower volumes of reagents, and improves organization. In this study we aimed to transfer and compare a method using tubes to 96 well-plates for the extraction of opioids in human serum samples. Results will be presented on the poster.

Presenter: Ciara Featherly
Poster Number: 125
Home Institution: Macalester College
Program: UMN-Pain
Faculty Mentor: Lucy Vulchanova
Poster Title: Active Neural Populations During Alcohol Withdrawal & Chronic Pain
Abstract: Chronic pain and alcohol overuse are health conditions that often coincide in the human population. While chronic alcohol consumption is known to cause hyperalgesia in patients, the neural circuitry relationship between chronic pain and alcohol use disorder particularly during alcohol withdrawal has yet to be elucidated. In mouse models, both conditions have shown reorganization in medial prefrontal cortex (mPFC) and amygdala communication. This experiment aims to visualize the regions of overlapping neuronal activation in chronic pain and alcohol overuse in a rodent model. TRAP (targeted recombination in active populations) mice underwent a two-bottle free-choice chronic alcohol consumption paradigm and were behaviorally tested weekly to assess mechanical sensitization and recovery from a sciatic nerve crush injury. A sciatic nerve crush or sham surgery was performed during week 6 of drinking. All mice received an intraperitoneal injection of 4-OHT at week 10 of alcohol consumption. 4-OHT is a metabolite of tamoxifen, a drug that induces permanent fluorescence in active neurons of TRAP mice within a 6 hour period post-injection. The injection took place on a withdrawal day in order to visualize neuronal activity in alcohol-consuming hypersensitive mice during alcohol withdrawal. Free-floating IHC was used to enhance the fluorescence expressed during 4-OHT activity.

Presenter: Tim Follett-Dion
Poster Number: 95
Home Institution: university in minnesota
Program: MSROP
Faculty Mentor: Dingliang Yang
Poster Title: World's Fair sustainable house design
Abstract: Housing has always been one of the most important aspects to human lives and wellness. In almost all cultures, there appeared once or multiple times of housing as the most pressing social issue, which was characterized by poor supply, poor spatial provisions, poor technical amenity, or disproportionately high cost compared to the general cost of living. Expos has played continuously as a testing ground to search for solutions that have made novel achievements in urban policy and inspiring model for housing in spatial practice, in which the quantity and affordability of housing were valued beyond the pure aesthetic pursuit and eventually contributed to the improvement of living standard of citizens.

Presenter: Loren Foster
Poster Number: 15
Home Institution: Pennsylvania State University
Program: LSSURP
Faculty Mentor: Masato Yamamoto
Poster Title: Treating pancreatic cancer with “armed” oncolytic adenoviruses
Abstract: Pancreatic ductal adenocarcinoma (PDAC) is the 3rd leading cause of cancer-related mortalities in the U.S., leaving patients with a less than ten percent 5-year survival rate. Because PDAC cancer is in the duct of the pancreas, it is very hard to find, and when detected, the stage of cancer tends to be very advanced and metastatic. The goal is to develop a viro-immunotherapy against PDAC using “armed” oncolytic adenoviruses (OAds). “Armed” OAds are genetically modified to have certain transgenes that help the detection and killing of cancer cells. We first purified the “armed” OAds and the virus concentration was measured at OD 260. Then we conducted an in vitro killing assay by plating PANC-1 cells into a 24-well plate, infecting them with different viral particles per cell and results were visualized post staining with crystal violet. It’s believed that using “armed” OAds expressing various strategically picked transgenes will mitigate desmoplasia and enhance anti-tumor immune cell infiltration and help gain insight into how the PDAC immunosuppressive tumor microenvironment (TME) can be favorably altered.

Presenter: Armando Garcia
Poster Number: 114
Home Institution: University of Texas at Rio Grande Valley
Program: SOAR-REEU
Faculty Mentor: Laura Shannon
Poster Title: Differences between Expressed Plasticity Depending on Ploidy and Domestication Status
Abstract: Understanding how plants react to their environments is essential for breeding and conservation strategies in a changing climate. Many crop plants are polyploid, possessing more than two copies of each chromosome, and it has been found that polyploid crops tend to express higher levels of phenotypic plasticity than their diploid relatives. However, no such pattern has been found in natural populations. This project attempts to elucidate the interaction of domestication and ploidy and its effect on the maintenance of phenotypic plasticity. We suggest that plasticity is lost through drift during domestication as breeders act to artificially stabilize the environment. Polyploidy should work to slow the loss of plasticity by genetic buffering. Using a factorial design approach (tetraploid vs diploid, domesticated vs wild), we compare plasticity between two experimentally controlled environments (fertilized vs unfertilized). We measure phenotypes related to fitness and plant vigor. We hypothesize wild diploid and tetraploid populations will show greater plasticity for indirect contributors to fitness (e.g., plant height) while displaying greater homeostasis for direct fitness components (e.g., tuber number). This study will provide a basis for establishing strategies to maintain plasticity during breeding and conservation to create stable populations in the face of climate change.

Presenter: Rosa Gerdts
Poster Number: 67
Home Institution: Department of Family Medicine and Community Health
Program: M-ASCEND
Faculty Mentor: Sandra Japuntich
Poster Title: Sticking With It: Recruitment Strategies for Greater BIPOC Involvement In Clinical Trials
Abstract: Background: Clinical trials have inadequately sampled BIPOC participants, exacerbating health inequities. The Study for Smoking Cessation Outreach for Racial Equity (SCORE) investigates smoking cessation interventions for BIPOC populations. The current study investigates a strategy to improve recruitment.
Methods: BIPOC patients from a healthcare system received a mailed invitation followed by a phone call. Potential participants either received their invitation in an enhanced envelope or a normal envelope. Study outcomes were the proportion who agreed to screening, consented, or were randomized.
Results: 377 individuals were sent a brochure (n=183 enhanced; n=194 normal). In the enhanced envelope sample, 22.9% agreed to screening, 9.8% consented, and 8.7% were randomized. In the normal envelope sample, 20.1% agreed to screening, 7.7% consented, and 7.2% were randomized.
Discussion: The enhanced envelope improved recruitment outcomes (albeit not statistically significant– given this is an ongoing study, a greater sample size may allow for an observable difference between groups). The enhanced envelope may have increased the likelihood of opening the envelope, thereby increasing receptivity to calls. This method is promising for future studies trying to maximize BIPOC recruitment, which is integral to promoting health equity.

Presenter: Edgar Gonzales Reyes
Poster Number: 81
Home Institution: College of Education and Human Development
Program: McNair
Faculty Mentor: Stephanie Sisco
Poster Title: BIPOC ERGS as cultural knowledge: Participatory learning, development, and empowerment in organizations.
Abstract: Culture has the ability to influence organizational behavior and performance outcomes. Most studies have identified this phenomenon through the actions and vantage point of organizational leaders. To contribute a different perspective, the purpose of this study is to explore how Black, Indigenous, and People of Color (BIPOC) utilize their indigenous and cultural knowledge at work. Attention is also given to employee resource groups (ERGs) to consider how they contribute to diversity management (DM) and knowledge management (KM). We begin by explaining why the implementation of ERGs is an effective strategy to support diversity, equity, and inclusion (DEI) and anti-racism. Next, we offer a literature review of indigenous and cultural knowledge approaches that have been utilized in the workplace by racial minorities. We especially expound on research that identifies coping strategies and participatory learning practices that help BIPOC employees navigate workplace incivility (i.e., modern discrimination) and advance their careers.

Presenter: Nathan Graham
Poster Number: 16
Home Institution: University of Central Florida
Program: LSSURP
Faculty Mentor: Joan Beckman
Poster Title: Role of Histone Deacetylase 6 in Toll-like Receptor 4 Pro-inflammatory signalling in Sickle Cell Disease
Abstract: Sickle cell disease (SCD) is a blood disorder affecting the □-globin gene which alters the shape of the hemoglobin molecule. This causes the red blood cells to have a sickled shaped in the de-oxygenated state. Moreover, with this altered shape, these sickled red blood cells lack symmetry, thus causes blockage in the blood vessels, subsequently leading to tissue damages .When this blockage occurs, it is called a vaso-occulsive crisis (VO) and is painful to sickle cell patients. Sickle Cell Disease mouse models have shown that heme activates toll-like receptor 4 (TLR4) MyD88-dependent signaling and activates NOD-like receptor family pyrin domain containing (NLRP) 3 inflammasome assembly, leading to vascular endothelial activation and VO. Previous research has shown that non-specific histone deacetylase (HDAC) inhibition prevented VO in SCD. Therefore, the purpose of this experiment is to investigate whether HDAC6 inhibition will reduce VO and pain in SCD by preventing TLR4/NLRP3 activation. Mouse microglial cells were plated and were exposed to 10-20 μM hemin or 10 ng/mL lipopolysaccharide (LPS) ± HDAC6 inhibitor BML-281 (2 μM, Enzo). Pro-inflammatory proteins and genes were collected for analysis using RT-PCR, , immunoblotting, and enzyme-linked immunosorbent assay. In addition, HbSS Townes mice were given HDAC inhibitor, BML, as well as panhematin, to initiate VO, and were examined for stasis. Along with this, a Von-Frey Filament Assessment for Mechanical Hyperalgesia was done so to verify that only non-hyperalgesia mice were treated. Following these experiments, we concluded HDAC6 inhibition reduced TLR4 signalling in monocytes and microglial which reduces inflammation.

Presenter: Samuel Groves
Poster Number: 17
Home Institution: Northwest Missouri State University
Program: LSSURP
Faculty Mentor: Bruno Lima
Poster Title: The Impact of Sucrose on Oral Biofilms
Abstract: Caries, also known cavities, is the result of the demineralization and destruction of tooth structures caused by acidic byproducts of bacterial sugar metabolism. Dental plaques, also known as biofilms, are a complex community of microorganisms that adhere to surface, which are surrounded by a protective matrix that helps the community survive. One bacterium that is known to cause caries is Streptococcus mutans, a bacteria commonly found in dental plaque that contributes to tooth decay by metabolizing sugars. Based on our past research, Streptococcus has been shown to thrive in sucrose-rich environments. To verify that the growth of S. mutans's growth is optimized in a sucrose-rich environment, we performed qPCR to determine the concentration of S. mutans in the in vivo grown biofilms. The biofilms were grown in 75% SHI and 25% donor saliva media, which is used to mimic oral biofilm formation. Two separate biofilms were grown: one in 0% sucrose and the other in 1% sucrose. Results from the qPCR data demonstrate that biofilms grown in sugar have a higher concentration of S. mutans. Based on qPCR results, it suggests that in the presence of sugar, there is a higher amount of S. mutans in biofilms grown in biofilm.

Presenter: Berenice Guerra
Poster Number: 143
Home Institution: Universidad del Sagrado Corazón
Program:
Faculty Mentor: Evan Kalb
Poster Title: Investigating mutations using tRNAAsp for non-canonical Amino Acid incorporation in Native Translation
Abstract: Transfer RNAs (tRNAs) are essential for protein synthesis by delivering amino acids to the ribosome. Wild-type translation favors L-**α**-amino acids because of the specificity of aminoacyl-tRNA synthetases (AARs), EF-Tu binding, and ribosomal interactions. Tryptophanyl-tRNA synthetase has been observed to aminoacylate both D-tryptophan and *N*-**α**-methyl-tryptophan onto native $tRNA^{trp}$, but these substrates are unable to be incorporated in translation. Our hypothesis suggests that this incompatibility is due to reduced binding to EF- Tu and delivery to the ribosome. To overcome this, we introduced mutations in the T-stem of a native E. coli $tRNA^{Trp}$ and replaced it with the high affinity T- stem of $tRNA^{Asp}$. We overexpressed and purified the $tRNA^{TrpAsp}$mutant using a hybridization probe purification scheme and confirmed its purity using a combination of Urea-PAGE and MALDI-TOF mass spectrometry. We found the overexpressed tRNA was hypomodified compared to wild type $tRNA^{Trp}$. Further, MALDI-TOF suggests $tRNA^{TrpAsp}$ is charged with L-Tryptophan. Our results suggest that wild type tRNAs can be mutated for the increased incorporation of noncanonical amino acids in native translation.

Presenter: Ngawang Gyatso
Poster Number: 68
Home Institution: METROPOLITAN STATE UNIVERSITY
Program: M-ASCEND
Faculty Mentor: DOUGLAS YEE
Poster Title: Investigating APOBEC3B Expression in Breast Cancer Cell Lines: Identifying a Specific Antibody
Abstract: Breast cancer mortality remains high despite advancements in screening and treatment. APOBECs are a family of enzymes that have been linked to unique mutational signatures in human cancers, characterized by conversions from C-to-T and C-to-G. These signatures have been known to contribute up to 90% of the mutational burden in various cancers. APOBEC3B (A3B) is unique among the APOBEC family of enzymes for its nuclear localization. By acting directly on the nucleus, A3B has been implicated in driving tumor formation and drug resistance. In this study, we seek to investigate A3B protein levels in diverse immortalized cell models of breast cancer using western blot and comparing the specificity of two different antibodies. The two antibodies tested were a commercially available antibody (E9A2G- Cell Signaling, Danvers) and a privately made antibody (8713). The majority of cell lines stained for A3B expression with both antibodies. Though E9A2G seemed to display less non-specific staining. Given most cell lines demonstrated A3B, this suggests a potential shared mutagenic pathway. These results are the first steps towards testing A3B expression in breast cancer patient tumors. By identifying antibodies specific for A3B we can begin to understand the potential role of A3B in tumor formation and resistance.

Presenter: Josh Hassing
Poster Number: 103
Home Institution: University of Wisconsin-River Falls
Program: SCoPE
Faculty Mentor: Carston Wagner
Poster Title: Targeting Tumor Heterogeneity with Trispecific Chemically Self-Assembled Nanorings (CSANs)
Abstract: Emerging immunotherapies that target overexpression of a single tumor antigen face obstacles in eradicating heterogenous tumors. Limitations such as on-target off-tumor effects and antigen escape frequently plague these treatments, and tumor recurrence drives the need for new therapies with multiple targeting capabilities. This laboratory has previously developed CSANs capable of redirecting T cells for the selective targeting of tumor antigens by nongenetically modifying their surfaces. These bispecific CSAN constructs have proven to be efficacious in facilitating robust T cell responses against a variety of tumor biomarkers including EpCAM and EGFR, and their selective killing has been paired with the ability for controlled disassembly with the FDA approved trimethoprim. Additionally, our novel αEGFR-1DD-αCD3 protein incorporates a bispecific construct within a single protein monomer that allows for the development of CSANs with multiple targeting ligands providing a promising path toward targeting tumors on multiple fronts. Here we seek to utilize these advancements to investigate the development of trispecific CSANs for the targeting of tumor heterogeneity.

Presenter: Shanze Hayee
Poster Number: 96
Home Institution: University of Minnesota, Twin Cities
Program: MSROP
Faculty Mentor: Bonnie Klimes-Dougan
Poster Title: Challenges and Potential Solutions for Adapting Interpersonal Therapy (IPT) for Diverse Populations
Abstract: Interpersonal Psychotherapy (IPT) was originally developed as a treatment for adult depression and was later adapted for adolescent depression (IPT-A). Both IPT and IPT-A are widely used by clinicians and have demonstrated efficacy for treating depressive disorders in numerous studies and meta-analyses . IPT has also been successfully modified to treat other disorders including eating disorders, dysthymic disorder, and social anxiety disorder. However, IPT was developed with a predominantly white sample and IPT-A was developed with mostly hispanic youth therefore little is known about how IPT interacts with diverse populations. In recent years, due to a revolution for culturally competent psychotherapy, there have been attempts to adapt IPT for different identities and cultures. This includes low-income mothers, African Americans, and other marginalized groups within the United States as well as vulnerable populations in Asia and Africa. As a result, a variety of relevant literature is now available but there is no cohesive or standardized understanding of how IPT can be culturally adapted. This review attempts to establish such a knowledge base by summarizing the adaptation trials that have been conducted and highlighting common challenges that have been encountered in these trials as well as the techniques used to resolve them.

Presenter: Maximillian Hellrung
Poster Number: 18
Home Institution: Purdue University
Program: LSSURP
Faculty Mentor: Aaron Goldstrohm
Poster Title: CRISPR AID Tagging Human Pumilio Proteins for Inducible Depletion
Abstract: Pumillio (PUM) proteins are mRNA binding proteins that drive mRNA fate and are present in two paralogs in humans: PUM1 and PUM2. Dysregulation of PUMs has been connected to cancer development and neurological disease through alterations in growth and development pathways. While previous studies have identified mRNAs that PUMs target, these studies have been performed using KO models or RNAi knockdown, leaving room for potential genetic compensation or residual protein and, consequently, alterations in mRNA levels that may not be due to direct effects of PUM depletion. Due to these caveats, the full range of PUM targets may not have been identified. To address this gap in knowledge, we implemented an inducible protein depletion system in human colorectal cancer (HCT116) and human embryonic kidney (HEK293) cells using CRISPR integration of an Auxin Inducible Degron (AID) tag into the C-terminus of PUM. Auxin addition to cells with AID-tagged PUM will induce rapid, reversible depletion of PUM, mitigating the risk of cells compensating for the loss of a key mRNA regulator. Ultimately, use of the AID system to deplete PUMs will help to characterize PUM targets more fully and understand how PUM regulates these targets in the context of cancer cells.

Presenter: Elsa Higbie
Poster Number: 19
Home Institution: University of Minnesota
Program: LSSURP
Faculty Mentor: Louis Mansky
Poster Title: The Role of the Actin Cortex in HIV-1 and HIV-2 Replication
Abstract: Human retroviruses utilize RNA as their genetic material and can result in fatal conditions such as cancers and Acquired Immunodeficiency Syndrome. The actin cortex has been proposed as a barrier to retrovirus particle production. A more densely-structured cortex is associated with less efficient particle assembly, and vice versa. MICAL2, LIMK2, and SEMA3F are specific genes shown to induce remodeling of the actin cortex to increase this efficiency in HTLV-1. Due to the similar retroviral classification of HTLV and HIV, it was hypothesized that HIV-1 and HIV-2 would also induce the expression of these genes to increase particle assembly efficiency. Gene expression was analyzed through RNA extraction, cDNA synthesis, and qPCR analysis, and flow cytometry was conducted to quantify infectivity. Thus far, the gene expression of MICAL2 and SEMA3F has been downregulated in both HIV-1 and HIV-2. The expression of LIMK2 has shown upregulation in HIV-1 and downregulation in HIV-2. These data suggest that HIV downregulates two genes upregulated in HTLV-1, and differ in LIMK2 expression based on viral strain. These findings have clinical significance regarding potential targets for HIV treatments, as knocking them out could decrease particle assembly and infectivity within the host.

Presenter: Syrena Hilgendorf
Poster Number: 20
Home Institution: Iowa State University
Program: LSSURP
Faculty Mentor: Julie Ostrander
Poster Title: Mechanisms of Breast Cancer Cell Death by Mammalian Orthoreovirus
Abstract: Estrogen receptor positive (ER+) breast cancer is one of the most commonly diagnosed types of breast cancer in the United States and can recur and metastasize 10-20+ years after initial diagnosis. Novel therapeutic strategies are needed. A possible solution is mammalian orthoreovirus (MRV), a replication-competent natural oncolytic virus. The mechanisms of MRV-induced death are not well elucidated. Our studies aim to explore the different cell death pathways elicited by MRV, and our goal is to explore the effects of MRV in the ER+ breast cancer cell line MCF7 using inhibitors of apoptosis, necroptosis, and the NFκB pathway. We have studied the effects of different inhibitors using cell viability and western blotting. Our preliminary results indicate MRV promotes apoptotic cell death in MCF7 cells and that IKK inhibition enhances MRV-induced cell death. Our ongoing research aims towards testing different doses of inhibitors and adjusting the time course experiments in our cell viability assay. Furthermore, we are performing cell fractionation experiments to understand how MRV affects the NFκB pathway using cytoplasmic and nuclear extracts. We anticipate these results will provide insights into the pathways associated with MRV-induced death.

Presenter: Audrey Hilk
Poster Number: 21
Home Institution: University of Minnesota - Twin Cities
Program: LSSURP
Faculty Mentor: Anna Selmecki
Poster Title: A novel point mutation in CAP1 causes drug resistance in Candida albicans
Abstract: *Candida albicans* is a diploid opportunistic fungal pathogen known to exhibit high genomic plasticity. During adaptation to stressors, a variety of genomic changes can occur. To investigate these genomic changes, we serially passaged a drug-sensitive strain in the presence of fluconazole, a common antifungal drug. Whole genome sequencing of single colonies from one heterogeneous evolved population revealed a novel point mutation, Cys446*, in one allele of *CAP1*. C*AP1* is a transcription factor primarily known for its role in oxidative stress response. Interestingly, our results support an additional role in conferring drug resistance. We introduced the *CAP1*^{C446*} point mutation into one allele of a drug-sensitive background strain and found it resulted in increased drug resistance identical to that of the evolved isolates. Complementation of the *CAP1*^{C446*} mutation with a wild-type allele of *CAP1* resulted in the loss of drug resistance. These results indicate that *CAP1*^{C446*} is the driver of drug resistance in these evolved strains. Additionally, the *CAP1*^{C446*} point mutation does not lead to complete loss of function or overexpression, as deletion or overexpression of one copy of *CAP1* does not cause resistance. Next, we will investigate the function of *CAP1*^{C446*} to determine whether the truncated protein acts hyperactively.

Presenter: James Hsia
Poster Number: 22
Home Institution: Howard University
Program: LSSURP
Faculty Mentor: Jeffrey Miller
Poster Title: Exploring the Role of DUSP4 in Exhaustion in Human Natural Killer Cells
Abstract: Cancer immunotherapies leveraging Natural Killer (NK) cells have grown in potential over the last two decades, but *in vivo* studies have not shown as much efficacy as *in vitro* experiments. This may be in part due to what has been called NK cell "exhaustion," a dysfunctional state brought about by sustained activating signals. However, the exact mechanisms and profiles of exhausted NK cells are not known. Research from the Miller lab has demonstrated that phosphatase DUSP4 is overexpressed compared to non-exhausted cells, which offers a possible target for improving the efficiency and function of NK cells in the context of cancer therapies. We hypothesize that DUSP4 is restraining signaling as part of the exhaustion response in NK cells. To examine the effects of DUSP4 on NK cell function, this gene was deleted through CRISPR/Cas9 knockout in NK cells from healthy donor blood. Through quantitative PCR, DUSP4 gene expression was shown to be induced by IL-15. The knockouts were tested through functional assays, which measured the function of NK cells co-cultured with the K562 leukemia cell line. However, there was no significant effect on cell function of the knockouts, suggesting the need for further studies.

Presenter: My Linh Huynh
Poster Number: 23
Home Institution: Normandale Community College
Program: LSSURP
Faculty Mentor: Laurie Parker
Poster Title: Substrate specificity identification of CDK4/Cyclin D1 phosphopeptides
Abstract: Identifying peptide sequences preferred by CDK4/Cyclin D1 can improve biochemical assays in testing kinase-inhibiting drug efficacy. Overexpression of CDK4/Cyclin D1 causes over-phosphorylation of retinoblastomas in the G1 phase, overriding rb suppression. Cells irreversibly commit to cell division after passing G1, even when transmuted, potentially leading to cancer or other pathogenesis. This study should uncover the preferred positions of each residue after using the Serine Oriented Human Library-Kinase Library Reaction (SeriOHL-KiLR) procedure. Two plasmids inserted *in vitro* direct the peptide synthesis through E. coli; one plasmid contains information to sequence the serine-oriented peptide, while the other contains tRNA. The E. coli is grown in double antibiotic-treated media. An antibiotic-resistance gene is included in each plasmid type to cull unresistant cells, ensuring the uptakes of both plasmids. Once the peptide library is purified and phosphorylated with CDK4/Cyclin D1, the sequence and residue position is identified through mass spectrometry and its data. What is known is that the sequence will contain a serine in the middle and the 15 identified positions before and after the serine. Once sequenced, the biochemical assay can be created with the preferred synthesized peptide.

Presenter: Carla Irizarry-Delgado
Poster Number: 104
Home Institution: University of South Florida
Program: SCoPE
Faculty Mentor: Jason Varin
Poster Title: Medication Access Barriers and Pharmacy Deserts in the Greater Minnesota Area: Survey Development and Literature Review
Abstract: Medication access in Greater Minnesota is a generally unexplored area of research. There is little research regarding the barriers to medication access that patients in this area face, especially in rural communities. In order to gain a wider understanding of this, a literature search was conducted to find medication access frameworks and general barriers. The literature review resulted in descriptions of barriers and factors that play into the difficulty of medication access in the national population. Then, survey questions were generated, with an aim of electronically delivering them to healthcare professionals and community workers who have frequent communication with patients in their respective geographical areas. This research can be used to gain a closer insight into what these workers interpret to be the medication access barriers in Greater Minnesota, in order for an existing medication repository to alter its operations to better serve the community.

Presenter: Lavina Iskander
Poster Number: 24
Home Institution: University of Minnesota-Twin Cities
Program: LSSURP
Faculty Mentor: Lauren Slosky
Poster Title: Characterizing the G protein Signaling Profile of the Neurotensin Receptor 1 Allosteric Modulator SBI-810.
Abstract: Neurotensin receptor 1 (NTSR1) is a G protein-coupled receptor (GPCR) and promising anti-addiction therapeutic target. GPCRs can signal through the activation of one or more of the 16 non-visual G proteins as well as through β-arrestin proteins. NTSR1 predominantly activates the Gq protein and β-arrestins. Our research group developed a series of β-arrestin-biased allosteric modulators of the NTSR1 that counter the effects of multiple classes of reinforcers without the side effects associated with balanced receptor activation. SBI-810 is the newest clinical lead from this series. SBI-810's biochemical mechanism of action hasn't been thoroughly explored. Here, we assessed the ability of SBI-810 to modulate NTSR1 G protein signaling in the presence of the endogenous ligand, neurotensin (NT). We measured G protein activation using a bioluminescence resonance energy transfer (BRET)-based assay in cultured cells expressing the NTSR1. We found that SBI-810's effects are highly G protein-specific. SBI-810 fully antagonized NT-induced activation of Gq, partially antagonized NT-induced activation of Gi1, and was permissive of NTSR1 activation of GoA and G12. These data suggest that SBI-810 may bias NTSR1 not only toward β-arrestin recruitment, but also toward noncanonical G protein signaling. This study furthers our understanding of the mechanism of action of β-arrestin-biased modulators.

Presenter: Damaris Ispache
Poster Number: 115
Home Institution: California State University, Monterey Bay
Program: SOAR-REEU
Faculty Mentor: Julie Grossman
Poster Title: Paper circular chromatography: A qualitative tool for soil health assessments
Abstract: In recent years, agricultural systems have been encouraged to shift and focus on more sustainable practices. When farmers prepare for a new growing season, soil nutrient content and fertility are crucial for success. Until now, quantitative lab tests have obtained data corresponding to soil nutrient status. The Paper Circular Chromatography (PCC) technique is a qualitative approach that produces distinctive visual characteristics including colors, channels, spikes, and concentric rings which can be correlated to soil porosity, mineral and organic matter content, and microbial enzyme activity. The objective of this is to compare PCC visual features against quantitative tests. Samples from six soil management scenarios were taken and evaluated. All treatments were collected at Big River Farms with the collaboration of the farmers utilizing the following soil building practices, standard practices, resting land under cover crops, in addition to highly trafficked disturbed soils, grassland confers, and hardwood deciduous forests. Additionally, because this is a low-cost approach farmers of all economic standpoints can obtain on-farm timely data to achieve their sustainability goals while they improve their soil health.

Presenter: Regina Jareanpalithapon
Poster Number: 82
Home Institution: University of Minnesota - Twin Cities
Program: McNair
Faculty Mentor: Danni Li
Poster Title: Purification of Human Apolipoprotein A1 (ApoA1) from Blood Plasma Using Mixed Mode Chromatography
Abstract: This research aims to establish a method for purifying human Apolipoprotein A1 (ApoA1) from blood plasma necessary for reconstituting into synthetic high density lipoprotein (sHDL) particles. Purifying ApoA1 is crucial for developing sHDL as it makes up around 70% of HDL, which is believed to promote reverse cholesterol transport and found as a therapeutic potential for sepsis. The method to purify ApoA1 involves precipitating human blood plasma with 60% (NH4)2SO4 and then eluting the bound proteins from a HEA HyperCel- column using a discontinuous pH gradient. The purified ApoA1 is then analyzed for homogeneity and yield through 4-12% SDS-PAGE gel electrophoresis, Western blot analysis, and mass spectrometry analysis. The results from this study highlights the challenge in purifying ApoA1 and suggest that further purification strategies should be explored to improve the yield and homogeneity of purified ApoA1.

Presenter: Jimena Jimenez
Poster Number: 83
Home Institution: University of Minnesota Twin-Cities
Program: McNair
Faculty Mentor: Marc Riedel
Poster Title: Applying Stochastic Computing to Spiking Neural Networks for Ultra-Low Power Machine Learning
Abstract: Networks of spiking neurons have emerged as the third-generation neural network model, employing spiking neurons to encode data through spikes, closely resembling biological neurons. Spiking neural networks (SNNs) offering promising potential for efficient computing, leveraging event-driven, parallel processing are being explored for modeling the dynamics of the human brain and implementing compact deep learning neural networks. This research proposes a novel method for implementing ultra-low-power SNNs using stochastic computing. Stochastic computing (SC) operates on probabilities, encoded via streams of 0s and 1s. A major advantage of SC is the streamlining of multiplication with a single AND gate, simplifying the complex multiplication circuits needed for positional binary encoding. Two models for digital representation of a spiking neuron on a field-programmable gate array (FPGA) are presented. One model uses classical binary radix representation, while the other incorporates SC. The stochastic computing-based design reduces logic gates, enhancing scalability and lowers power consumption.

Presenter: Briana Jimenez
Poster Number: 121
Home Institution: Macalester College
Program: UMN Pain
Faculty Mentor: Lauren Slosky
Poster Title: Assessing the Role of GRK2 in the Ligand-Induced Phosphorylation of the Neurotensin receptor 1
Abstract: The neurotensin receptor 1 (NTSR1) is a G protein-coupled receptor (GPCR) that regulates brain dopamine signaling and mediates μ-opioid receptor-independent analgesia. It is a promising therapeutic target for both pain and addiction. The clinical development of NTSR1 agonists, however, has been impeded by their side effects. A promising candidate compound is SBI-553, a β-arrestin-biased allosteric modulator (BAM) for NTSR1. SBI-553 activates NTSR1 β-arrestin signaling while antagonizing NTSR1 Gq protein signaling, reducing side effects. The mechanism of action by which SBI-553 stimulates β-arrestin recruitment to NTSR1 remains unclear. β-arrestin recruitment is canonically preceded by receptor phosphorylation. Here, we establish a protocol to assess ligand-induced NTSR1 phosphorylation and investigate the role of the kinase GRK2. Cultured cells were treated with SBI-553 or the endogenous ligand NT, and NTSR1 phosphorylation was evaluated using immunoprecipitation and Western blotting. To assess the role of GRK2, ligand-induced phosphorylation of NTSR1 was assessed in cells lacking GRK2-family GRKs and in genetically intact control cells. Preliminary results show detectable phosphorylated NTSR1 in both cell types. Future studies will quantify the extent of NTSR1 phosphorylation following ligand treatment in control vs. GRK2 knock-out cells. These findings laying the foundation for further studies on NTSR1 phosphorylation BAM mechanism of action.

Presenter: Zoe Karwowski
Poster Number: 84
Home Institution: University of Minnesota - Twin Cities
Program: McNair
Faculty Mentor: James Forester
Poster Title: Disease Ecology of Wolves in Maiella National Park
Abstract: Infectious diseases in wildlife populations are becoming an increasing concern in conservation due to their ability to act alone or in combination with other factors. One disease of concern is Canine Distemper Virus (CDV), which has been destroying native wolf populations throughout Europe. These outbreaks are initiated by contact with infected feral and domestic dogs, and future outbreaks of CDV are expected to occur. Maiella National Park (MNP), located in South-Central Italy, is at particular risk because it is near parks that have had outbreaks and has a large feral dog population. For this project, QGIS was used to visualize home ranges and the movement of wolves in the park. Additionally, a social network and susceptible-infected-recovered (SIR) model was developed using Program R to predict the spread of CDV in the MNP wolf population. We found that neighboring packs had substantial overlap which could allow CDV strains to quickly spread, with potentially devastating outcomes. These models will provide crucial insight into the disease dynamics of the wolf population in the park and help MNP with its conservation and management efforts. Further, visualizations of our project results will be utilized by MNP to educate park visitors.

Presenter: Kevin Kereakos-Fairbanks
Poster Number: 126
Home Institution: Macalester College
Program: UMN-Pain
Faculty Mentor: George Wilcox
Poster Title: Determining the Presence of the Alpha 2C Adrenergic Receptor in Skin
Abstract: Chronic pain is a significant global burden. Conventional analgesic treatments often do not provide adequate relief or, in the case of opioids, lead to undesirable side-effects like respiratory depression and addiction. A strategy for providing effective analgesia while avoiding the undesired effects of opioids is targeting peripheral nerves with analgesic treatments. It has been shown through use of immunohistochemical methods that the mu-opioid receptor and the alpha-2A adrenergic receptor are expressed in peripheral nerve endings in keratinocytes and skin. It is not known whether or not the alpha-2C adrenergic receptor, which mediates spinal analgesia, is expressed in epidermal nerve fibers. Using immunohistochemical methods, we evaluated the expression of the alpha-2C adrenergic receptor in the peripheral nerves and keratinocytes of mouse glabrous skin. The tissue was perfusion-fixed, and also post-fixed, using 4% paraformaldehyde, and later immunolabeled for the pan-neuronal marker PGP 9.5, the neuropeptide CGRP, the alpha-2C adrenergic receptor. Those tissues were sectioned at 25µm thickness using a cryostat, and then mounted on glass microslides. We observed sparse expression of alpha-2C adrenergic receptors in epidermal and dermal fibers.

Presenter: Myana Keusch
Poster Number: 25
Home Institution: St. Lawrence University
Program: LSSURP
Faculty Mentor: Maxim Cheeran
Poster Title: Characterizing Murine Microglia, Astrocyte, and Neuronal Expression of NOX4 in Response to Mild and Moderate Traumatic Brain Injury
Abstract: Each year, about 530,000 individuals are disabled resulting from traumatic brain injury (TBI). The primary phase of TBI denotes the physical damage inflicted upon neurological tissue while the secondary phase is characterized by mitochondrial dysfunction, apoptosis, neuroinflammation, ROS accumulation, etc.–each of which have been shown to assist in the pathogenesis of cognitive diseases like Alzheimer's and Parkinson's. Inhibition of NOX4 enzymes, which function to produce ROS in microglia, neurons, and astrocytes has been linked to improved neurological outcomes. The goals of this project were to characterize the expression of NOX4 enzymes on microglia, neurons, and astrocytes of mice induced with acute and chronic mild and moderate TBI and to determine whether NOX4 expression increases with severity of TBI. To achieve this, IHC staining was used to visualize expression of NOX4 in astrocytes, neurons, and microglia of mild and moderate TBI-induced mouse sagittal sections at day 3 and day 30 post injury (n=5-6). To quantify general neurological expression of NOX4, RT-PCR was conducted and verified via Western Blot analysis for mild and moderate TBI-induced murine mRNA samples at day 3 and day 30 post injury. Fold change was measured using GraphPad Prism software and protein expression was quantified using ImageJ (n=5-6).

Presenter: Sadia Khyber
Poster Number: 69
Home Institution: University of Minnesota- Twin Cities
Program: M-ASCEND
Faculty Mentor: Anna Prizment
Poster Title: Unraveling the Impact of Biological Age on Cancer Risk Using Clinical Biomarkers
Abstract: Background: We examined an association between biological age and cancer risk. Unlike chronological age, biological age considers cellular damage, lifestyle, nutrition, and diseases, and may provide information about a person's health in addition to chronological age. Methods: In the Atherosclerosis Risk in Communities study, a population-based prospective study, researchers estimated biological age (BioAge) derived from 10 biomarkers using the Klemera-Doubal algorithm. They measured biomarkers in mid-age participants over approximately 25 years and calculated age acceleration from the residuals of BioAge regressed on chronological age. The study employed Cox proportional hazard regression to assess the associations between age acceleration and total cancer, specific cancer types, and obesity- and smoking-related cancers while adjusting for various factors like age, sex, race, education, BMI, smoking status, alcohol intake, aspirin use, hormone replacement therapy, diabetes, and eGFR. Results: Five-year increase in age acceleration for BioAge was associated with a higher risk of obesity-related cancers by 14% [95%CI:1.01-1.28], lung cancer by 49% [95%CI:1.23-1.81]; and breast cancer by 22% [95%CI:1.00-1.51]. Conclusion: These findings highlight the potential of biological age as a predictor for cancer, especially for lung cancer, and suggest its significance for identifying persons at high risk for cancer.

Presenter: Elli Kim
Poster Number: 70
Home Institution: University of Minnesota - Twin Cities
Program: M-ASCEND
Faculty Mentor: Dana Carroll
Poster Title: Exploring Attitudes Towards Smoking Cessation and Nicotine Reduction Standards: An Elicitation Survey Study
Abstract: Inadequate access to smoking cessation resources among minoritized populations underscores the need for tailored public health campaigns. Such campaigns have shown promise in improving intervention effectiveness and fostering positive attitudes towards quitting smoking. A crucial area of public health focus is evaluating the impact of a national nicotine reduction standard (NRS), which, while offering overall health benefits to the public, may not equally benefit all American groups. In this study, we examined beliefs and preferences related to smoking cessation and the NRS among rural populations. Partnering with BuildClinical, we recruited 52 participants and utilized REDCap for elicitation survey data collection. Analyzing the responses, we identified common perceptions about smoking cessation, resources, and the potential impact of a nationwide NRS.
Our findings revealed diverse shared beliefs regarding the benefits and challenges of smoking cessation, nicotine replacement therapy, and the implementation of an NRS. Understanding these beliefs is vital for crafting tailored public health campaigns that address health disparities and remove barriers for communities targeted by the tobacco industry.

Presenter: Kody Kobayashi
Poster Number: 122
Home Institution: Macalester College
Program: UMN Pain
Faculty Mentor: Lucy Vulchanova
Poster Title: The Role of VGF in Synaptic Plasticity of the Nucleus Accumbens in Opioid Withdrawal and Neuropathic Pain
Abstract: VGF is a neuropeptide precursor that is cleaved into smaller, biologically active products. One peptide, TLQP-62, is a C-terminal peptide that has been shown to promote synaptic plasticity in the central nervous system. The nucleus accumbens (NAc) is central to modulating reward and pain-related behaviors. A previous study demonstrated that, following opioid withdrawal, VGF transcription is upregulated in the NAc, and preliminary data showed that knocking out VGF in the NAc reduces the maladaptive behavioral adaptations typically associated with opioid withdrawal. This study aims to investigate how VGF functions in synaptic plasticity in the NAc in neuropathic pain and opioid withdrawal. For mice that experience either opioid withdrawal or spared nerve injury (SNI), we hypothesize VGF levels will increase in the NAc. In one cohort of mice, we induced an SNI and used Western blotting to analyze the levels of VGF protein in the NAc. In separate cohorts, mice were exposed to either oxycodone or saline via a subcutaneously implanted osmotic pump, and the effects of oxycodone were interrupted by injections of naloxone to induce withdrawal. This study will help highlight mechanisms of opioid and pain-related plasticity to ultimately identify a new therapeutic target for opioid withdrawal and addiction treatment.

Presenter: Lane Kohler
Poster Number: 26
Home Institution: Grinnell College
Program: LSSURP
Faculty Mentor: Massimo Costalonga
Poster Title: Quantifying Bone Loss Due to Periodontal Disease Modeled Within Mice
Abstract: Periodontitis is inflammation of soft tissue around teeth induced by bacterial plaque leading to destruction of the supporting alveolar bone and ultimately tooth loss. It affects over 50% of the world's population. Calprotectin, the gene of interest, is known to have proinflammatory effects. In a mouse model of periodontitis created by P. gingivalis oral colonization plus silk ligature around the 2nd molar, we compared the alveolar bone of wildtype and calprotectin null mice by microCT. A 3D box size was determined using fixed landmarks in the jaw surrounding the 2nd molar to measure bone volume. Bone loss was determined by comparison of bone volume of the non-ligated to the ligated molar. After 10 days of ligature (n=13), and after the resolution of inflammation 21 days after the removal of the silk ligature (n=10) no statistical difference was seen in bone volume between wildtype and calprotectin null mice. The resolution period led to significant bone regrowth. Additionally, a trend towards calprotectin mitigating alveolar bone loss was observed. Although further experimentation is required, calprotectin may positively impact the treatment of periodontitis.

Presenter: Nate Kreuzer
Poster Number: 27
Home Institution: Vanderbilt University
Program: LSSURP
Faculty Mentor: Stefani Thomas
Poster Title: The role of BRCA1/2 in conferring differential sensitivity to PARP inhibitors in ovarian cancer
Abstract: High-grade serous ovarian cancer (HGSOC) is the most lethal and predominant gynecologic malignancy, accounting for 75% of cases, and ranks fifth in cancer deaths among women. Over 50% of HGSOC exhibit mutations in the BRCA1 or BRCA2 genes. Poly (ADP-ribose) polymerase (PARP) inhibitors have emerged as a therapeutic strategy for these patients, exploiting the concept of synthetic lethality to target cancer cells while sparing normal cells. However, the clinical efficacy of PARPi is limited by the development of resistance, with non-responsiveness observed in over 40% of patients harboring BRCA1/2-deficient tumors. The molecular underpinnings of this resistance, particularly in the context of BRCA1 and BRCA2 mutations, remain elusive due to their integral roles in DNA repair pathways. To elucidate this, our study investigates the influence of BRCA1/2 mutations in sensitivity to FDA-approved PARPi, namely Olaparib, Rucaparib, and Niraparib. We utilized isogenic OVCAR-3 HGSOC cell lines, each representing distinct BRCA1/2 mutation status, to examine the relationship between BRCA1/2 mutations and PARPi sensitivity. The cell lines were established using a cre-lox system, with successful gene knockout verified via western blot analysis. Subsequently, the cytotoxicity of each PARPi was assessed using a Sulforhodamine B (SRB) assay.

Presenter: Samantha Krocak
Poster Number: 85
Home Institution: University of Minnesota - Twin Cities
Program: McNair
Faculty Mentor: Melissa Polonenko
Poster Title: Auditory brainstem responses to speech made with various chirp-phase profiles
Abstract: Auditory brainstem responses (ABRs) are used to objectively identify hearing loss in young children. Recently, “peaky speech” versions of audiobooks were created to facilitate faster testing by: 1) engaging toddlers who cannot sit still or complete behavioral testing; and 2) compensating for ear timing delays (chirp-phase) to promote synchronous neural activity and larger responses. However, the applied chirp-phase seemed to overcompensate the delays. Other chirps may provide better synchrony and larger ABRs. Therefore, this study aimed to determine which of four chirps evokes ABRs the quickest and clearest: CE, 60-dB, 65-dB or peaky-speech chirps. Currently, 14 adults with normal hearing listened to 30 minutes of each chirp-profile. ABRs were smallest to 60-dB chirps but similarly sized to the other three chirps. Overall, the CE-chirp provided complete ABR testing within 22 minutes for the most number of participants. Determining an optimal chirp profile will facilitate future audiobook-based ABR testing in toddlers.

Presenter: Tereza Krogseng
Poster Number: 97
Home Institution: University of Minnesota -- Twin cities
Program: MSROP
Faculty Mentor: Matthew Winn
Poster Title: The Impact of High-Pitch Stimuli on Acoustic Cue Weighting in Cochlear Implants
Abstract: Cochlear implants can restore sound perception for people with profound hearing loss. However, CIs are limited in how well they convey the pitch of a talker’s voice. This jeopardizes the ability to hear melody, emotion, who is talking, and which syllables are emphasized. A previous study examined perception of word emphasis in CIs and found that CI listeners have some sensitivity to voice pitch when hearing a talker with low fundamental frequency (F0). However, voices with higher F0 (namely, women and children) might not be easily encoded by the implant.
Therefore, the current study investigates whether the result in the study by Fleming will still hold when the speech is spoken by a woman with higher voice pitch. Stimuli included stress contrastive word pairs such as dessert and desert where we manipulated pitch, along with other cues like duration, intensity, and vowel articulation. For each combination of these cues indicating first- or second-syllable stress, participant responses are analyzed to see which cue drove the word response.
We hypothesize that use of voice pitch will be lower for the current study compared to the previous one, in line with known limitations in high-F0 pitch perception from previous studies.

Presenter: Kompal Kumar
Poster Number: 130
Home Institution: University of Minnesota-Twin Cities
Program: UROP/URS
Faculty Mentor: Rocio Gomez-Pastor
Poster Title: Cellular Localization of Dopamine and cyclicAMP-regulated Phosphoprotein-32 within the Huntington's Disease Pathology
Abstract: Huntington's disease (HD) is a neurodegenerative disorder caused by a CAG trinucleotide repeat expansion in the HTT gene. HD affects medium spiny neurons (MSN), causing motor and cognitive impairment. Although the mechanisms by which mutant HTT causes MSN dysfunction are unclear, a protein expressed in MSNs, dopamine and cyclicAMP-regulated phosphoprotein (DARPP-32), is present in lower levels in HD. DARPP32 dysregulation mechanisms are unknown. We investigated the cellular distribution of DARPP-32 using immunofluorescence. Using the heterozygous zQ175 mouse model of HD, we compared this tissue to wild type. We first observed overall lower levels of DARPP-32 in the dorsolateral region of the striatum in zQ175 samples. DARPP-32 presented different distribution patterns within the neurons in WT and HD mice. DARPP-32 also presented a higher accumulation in the nucleus of HD mice; it was predominantly cytoplasmic in WT. We used a zQ175 mouse heterozygous for CK2a', a neuronal kinase induced in HD, whose haploinsufficiency has shown improvements in various characteristics of HD. We observed that HD:CK2a'(+/-) mice DARPP-32 increased its cytoplasmic distribution compared to HD mice. Our data shows that DARPP-32 cellular localization is changing in HD and may be responsible for MSN dysfunction. Future studies will address this altered localization.

Presenter: Lauren Lee
Poster Number: 105
Home Institution: University of Minnesota Twin Cities
Program: SCoPE
Faculty Mentor: Stephanie Huang
Poster Title: NAMPT as a Potential Biomarker for Daporinad Treatment: Analyzing the Effects of Overexpression and Knockdown in Prostate Cancer Cell Lines
Abstract: Neuroendocrine prostate cancer (NEPC) is an aggressive form of prostate cancer that typically arises from androgen deprivation therapy (ADT) resistance. Computational dose-response modeling predicted that daporinad (FK866) would be an effective treatment for patients with NEPC. Our preliminary results showed increased daporinad sensitivity in the NEPC cell line NCI-H660 that displayed lower nicotinamide phosphoribosyltransferase (NAMPT) expression compared to the non-NEPC model LNCAP. To investigate the role of NAMPT expression in daporinad sensitivity, we created NAMPT knockdown and overexpression models for NEPC (NCI-H660) and non-NEPC (LNCAP) utilizing shRNA transduction and overexpression vectors. Response to daporinad was assessed following >72-hour drug exposure via WST proliferation assays and longitudinal cell growth on Cytation Live Cell Imaging System. NAMPT levels were validated by measuring NAMPT gene expression via RT-PCR. LNCAP NAMPT-KD showed 69.5% decreased NAMPT expression whereas the LNCAP NAMPT-OE displayed a 70.5% increase. In the daporinad assay, we observed an increase in drug sensitivity in the LNCAP NAMPT-KD model compared to the control (IC50 = 0.39nM vs. 3.88nM, p

Presenter: Joshua Legaspi
Poster Number: 106
Home Institution: University of West Florida
Program: SCoPE
Faculty Mentor: Natalia Tretyakova
Poster Title: Progress Toward the Synthesis of a Nucleoside Phosphoramidite and Oligodeoxynucleotide Containing a DEB–FAPy–dG Adduct
Abstract: Butadiene (BD) is a carcinogen typically found in cigarette smoke, automobile exhaust, and industrial settings. Exposure to BD can lead to various health complications including lung cancer when activated by cytochrome P450 monooxygenases to form 1,2,3,4-diepoxybutane (DEB). The genotoxic DEB can form alkylated guanine base adducts such as N7-(2-hydroxy-3,4-epoxy-1-butyl)-dG (DEB-dG). Adducts like DEB-dG are highly unstable carbocations which undergo an imidazole ring opening to form a formamidopyrimidine (FAPy). Herein, we describe an unprecedented approach that enables the synthesis and structural elucidation of chemically modified phosphoramidite containing DEB-FAPy-dG adduct in order to generate a DNA strand. A nine-step synthetic strategy was applied to get a desired compound via formation of DEB-formamidopyrimidine (DEB-FAPy-dG) adduct. The structures of newly synthesized compounds were confirmed by 1H NMR, 13C NMR, mass, and LC-MS analysis. A convenient and efficient synthetic strategy of DEB-FAPy-dG containing DNA was established, allowing for future analyses of the detailed mechanisms by which these non-canonical nucleobases impact on causing mutation and DNA replication. This acquaintance will set the foundation for understanding the consequences of FAPy lesions in cells and how those lesions can be repaired.

Presenter: Caden LeVahn
Poster Number: 28
Home Institution: North Hennepin Community College
Program: LSSURP
Faculty Mentor: Emilie Richards
Poster Title: Increased Neuromasts in Mexican Tetra Fish Correlate to Sleep Loss
Abstract: Sleep can be described as a period in time where a brain is receiving decreased sensory input. Sleep remains incompletely understood, particularly in relation to sensory organ involvement during the transition from wakefulness to sleep. Most species do not have enough natural variation in sleep and sensing abilities between populations to determine the relationship between the two traits. However, the mexican tetra is a fish species that colonized both river and cave dwellings in which cave fish have comparatively less sleep and more neuromasts than their surface counterparts. Neuromasts are sensory organs in fish responsible for detecting water disturbances.
To explore the potential connection between increased neuromast counts and sleep loss, we generated an F2 population variation in neuromast count and sleep by crossing surface-dwelling and cave-dwelling wild types. We observed a negative relationship between neuromast density in the cheek region and total sleep hours. Our findings suggest that the increased sensory input can lead to less sleep. In future studies, we will be investigating the specific sensory mechanisms connecting neuromast sensory capacity to sleep in cave fish in order to understand how conserved these interactions are across species.

Presenter: Jakeisha Lewis
Poster Number: 116
Home Institution: Berea College
Program: SOAR-REEU
Faculty Mentor: Bryan Runck
Poster Title: Penetrometers! Is the Data Quality Worth Your Money?
Abstract: Sensing has played a foundational role in precision agriculture since the field's founding. Not all devices have the same data quality, though, affecting farmer decision-making. Here, we consider penetrometers, devices for measuring soil compaction. Soil compaction is when soil particles are pressed tightly together due to traffic from animals or machines. It directly affects crop production by hindering water infiltration and root development. This study compares pressure data readings and accuracy between a low-cost penetrometer from AgraTronix and a high-cost penetrometer from the American Corps Engineer Cone Penetrometer. The two penetrometers were tested on two gridded and flagged plots, one tilled and one no-tilled. Google Earth was used to record the coordinates of each. Three compaction readings were taken at each location with each device over two days, resulting in 262 samples. A Student's t-test was performed to determine if the two penetrometers had significantly different readings. Results will be if there are statistically significant differences in the readings (p0.05). If it is below 0.05, this indicates that the higher-cost penetrometer would be a more efficient investment, and the same results are not achievable with a less expensive option.

Presenter: Alyssa Lo
Poster Number: 71
Home Institution: Department of Family Medicine and Community Health
Program: M-ASCEND
Faculty Mentor: Elizabeth Rogers
Poster Title: Examining Patient and Clinician Experiences When Using a Treatment Burden Screening Tool in Patients With Diabetes
Abstract: Patients with chronic illnesses, including type 2 diabetes (T2DM), face substantial treatment burden, including self-monitoring glucose, managing medications and diet, and attending clinic visits. Treatment burden contributes to treatment non-adherence and lower clinic engagement, leading to diabetes complications and reduced well-being. Social determinants of health and comorbidities can also increase treatment burden, contributing to disparities in diabetes-related outcomes. Our study aims to assess the acceptability and usability of a treatment burden screening (TBS) tool and examine differences in patient and clinician experiences within a pilot study of a TBS tool. Through a mixed-methods single-arm intervention study of patients with T2DM from a safety-net clinic, we are measuring acceptability and usability of the intervention using patient and clinician post-encounter surveys and patient qualitative interviews. Preliminary data from 13 patient and 11 clinician post-encounter surveys suggest that patients and clinicians, on average, have positive opinions about the acceptability and usability of the tool. However, opinions on the tool's effectiveness and utility vary between clinicians and patients, which may be due to response bias. As the study progresses, we will further assess tool effectiveness through 6-month post-encounter surveys and interviews, and by looking at changes in HbA1c levels from baseline to 6 months.

Presenter: Olivia Lopez
Poster Number: 29
Home Institution: University of South Carolina
Program: LSSURP
Faculty Mentor: Alfonso Araque
Poster Title: Sex Differences in Estrogen Receptor Expression in Nucleus Accumbens Astrocytes
Abstract: Recent studies have shown that astrocytes play an important role in the nucleus accumbens which has significant implications for drug addiction. In addition, studies show that estrogen enhances the dopamine-reward pathway in the nucleus accumbens (NAc), which provides support to the hypothesis that estrogens may cause women to be more susceptible to drug addiction. However, the underlying mechanism is still unknown with the studies primarily focusing on neurons. Astrocytes may play a role in this effect of estrogens since hypothalamic astrocytes express estrogen receptors (ERs). To determine whether estrogen receptors (ERα and ERβ) exhibit differential mRNA expression between males and females in NAc astrocytes, RNAscope with ERα and ERβ mRNA probes and immunocytochemistry with GFAP antibodies was performed on fresh frozen mouse NAc slices. Images of these fluorescent markers were obtained using confocal fluorescent microscopy and analyzed using Imaris to count astrocytes colocalized with ERα and ERβ. A trend of higher overall ER expression in females was observed, but males exhibited more ERβ than females. This preliminary data could be the basis for future studies of the potential role of astrocytes in female's higher susceptibility for drug addiction.

Presenter: Brenna Lundberg
Poster Number: 131
Home Institution: University of Minnesota-Twin Cities
Program: UROP/URS
Faculty Mentor: Kathleen Hill Gallant
Poster Title: Total Phosphorus within Recommended "Kidney Friendly" Frozen Meals
Abstract: Chronic Kidney Disease (CKD) affects more than 1 in 7 adults within the United States alone and is defined as the presence of reduced kidney function for >3 months. People with CKD are often advised to follow diets that may limit sodium, fluid, potassium, and phosphorus to manage complications of kidney function decline. These diets are difficult to follow and choosing appropriate convenience foods can be particularly challenging. In 2016, a patient educational handout was published for patients with CKD to aid in identifying frozen meals deemed "kidney friendly", defined as meals with less than 600 mg of sodium and potassium. Phosphorus information was missing as this is not required by law to be included on the Nutrition Facts label. Of the 44 meals in the 2016 handout, we found n=15 (34%) were no longer available. Of the remaining available n=29 products, n=17 (59%) had sodium and/or potassium values over 600 mg. The frozen meals were prepared by package instructions, freeze dried, dry-ashed in a muffle furnace, diluted with nitric acid, and analyzed by Microwave Plasma Atomic Emission Spectroscopy (MP-AES) to obtain total phosphorus content. This information will be able to further educate patients with CKD.

Presenter: Jessica Magalski
Poster Number: 30
Home Institution: St. Norbert College
Program: LSSURP
Faculty Mentor: Laurie Parker
Poster Title: Identification of TrkA peptide substrates using KALIP
Abstract: Oncogenic mutagenesis of the gene NTRK1 can lead to overexpression of Tyrosine Receptor Kinase A (TrkA)—a key protein in neuronal growth and survival—which has been observed to promote cancers including neuroblastoma, breast cancer, and colon cancer. Although treatment with Tyrosine Kinase Inhibitors (TKIs) initially showed promise, long-term efficacy is rarely achieved due to the development of drug resistance. This study aimed to identify target peptide substrates of TrkA by using kinase assay linked phosphoproteomics (KALIP), which can then be used as a biosensor to track oncogenic kinase activity. In this experiment, peptides isolated from K562 cells were cleared of their endogenous phosphorylation prior to undergoing a kinase reaction with TrkA. Mass spectrometry, PEAKS, and KINATESTID in R, revealed the phosphorylated peptides and the amino acid frequency at each position relative to the central tyrosine. While each position varied, the results overall suggested the substrate profile of TrkA includes primarily alanine, proline, and valine. The arrangement of amino acids preferred by a given kinase can be used to screen kinase inhibitor drugs and provide better treatment options for cancer patients. Further research may reproduce this study and build upon target peptide identification of other oncogenic kinases.

Presenter: Eunice Makori
Poster Number: 98
Home Institution: University of Minnesota - Twin Cities
Program: MSROP
Faculty Mentor: Ryan Allen
Poster Title: Refugee Parental Involvement: A Literature Review on the Intersections of Employment, Gender, and Health Status
Abstract: This research explores the relation between gender, employment, and health status within refugee parental involvement in children's education. Utilizing 2016 and 2017 data from the Annual Survey of Refugees, this study will address the following research questions: 1) How does gender and employment influence refugee parents' involvement within their children's schools? 2) What are the barriers to parental involvement in refugee communities? 3) How does parental involvement in education impact future generations within refugee communities? To provide a thorough analysis, this paper will review existing literature assessing the factors of gender, employment, and health status within the parental involvement of immigrant and refugee communities. The aim of this literature review is to enhance our understanding of the factors which influence parental involvement and identify the barriers experienced by refugee parents. The goal of these findings will provide a better awareness of the challenges that refugee families face within their integration as well as the supports that contribute to their overall success.

Presenter: Allison Makovec
Poster Number: 31
Home Institution: University of Minnesota- Twin Cities
Program: LSSURP
Faculty Mentor: David Potter
Poster Title: Role of CYP3A4 in breast cancer treatment resistance
Abstract: Metastatic breast cancer (BC) invariably develops resistance to hormonal therapies and cyclin dependent kinase inhibitors (CDKi). The mechanisms of resistance remain unknown. CYP3A4, an enzyme linked to cancer progression, is expressed in 80% of BCs. BC proliferation requires CYP3A4 through arachidonic acid epoxidation, which generates tumor promoting epoxyeicosatrienoic acids (EETs). CYP3A4's EET biosynthesis is associated with resistance to BC therapies through an unknown mechanism. We sought to determine whether selective pressure of the combination of fulvestrant hormonal therapy and palbociclib (CDKi), used to treat recurrent metastatic ER+/HER2- BC, is associated with CDK4/6 and cyclin expression alterations. MCF-7 AC1, an ER+/ HER2- BC cell line, previously selected for resistance to letrozole, was selected for fulvestrant and palbociclib resistance. We compared CDK4/6, cyclin, and CYP3A4 levels across these triple resistant (3R) cells compared to MCF-7 AC1 and unselected MCF-7 cells. We utilized western blotting to compare protein expression and qPCR to evaluate CYP3A4 gene expression. Protein and mRNA levels showed depleted cyclin D1 and increased cyclin E1. CDK4 and CDK6 were amplified in 3R cells compared to MCF-7 and MCF-7 AC1. CYP3A4 expression increased in 3R cells. CYP3A4 may play a role in treatment resistance by altering CDK4/6.

Presenter: Tanya Martinez
Poster Number: 86
Home Institution: University of Minnesota
Program: McNair
Faculty Mentor: Jennifer E. Row
Poster Title: Dice Rolls, Acting & Reenacting: Role Playing Games in the Classroom
Abstract: Role-playing games have often been reserved for musty basements and mythical gremlins, but role-playing games in the classroom can allow for the democratization of education, encouraging a deep immersion in history that wouldn't be possible in a traditional learning. The project focuses on the design and development of a game regarding the controversy surrounding Moliere's play, Tartuffe (1664) which gained notoriety for its criticism of religious hypocrisy. Students will play nobles, theater makers, and ecclesiasts who vigorously debated whether art should critique society. The play was censored and banned due to its satire of the most powerful entity in France: the Catholic Church. But does satire change society, or does theater itself (as an institution) condone trickery and illusion? Ultimately, using role-playing games in education allows for a revitalization of student interest in history, which is further accentuated by the active roles students play in their own educations.

Presenter: Melanie Martinovic
Poster Number: 32
Home Institution: University of Minnesota
Program: LSSURP
Faculty Mentor: Suhasa Kodandaramaiah
Poster Title: Cortical Activity of Different Innate Defense Responses
Abstract: A rapidly approaching shadow triggers an innate defense response in mice in the form of either robust freezing or an escape strategy. Recent studies have suggested there to be a deliberation process in choosing the best defense response to activate in the presence of an aerial predator based on differential parameters, such as: velocity of the predator, proximity to the predator, and distance to the nearest shelter. Thus, we sought to image the cortical activity of the different defense responses in mice. In this study, we used a mini-mScope mounted on Thy1-GCaMP6f mice to investigate the cortical activity created by both a small sweeping disk and a looming disk in order to replicate a predator cruising overhead and swooping down, respectively. We found an increase in activity in the anterior cingulate cortex, the retrosplenial cortex, and the visual cortex when the dark disk is most prominent in the mice's visual field. In the looming condition, the supplementary motor cortex increases in activity prior to the primary motor area, creating a rapid darting response, while both regions decrease in activity during freezing under the sweep condition. Our results demonstrate how regions of the brain activate differentially to produce different defense behaviors.

Presenter: Tyler Meeks
Poster Number: 33
Home Institution: Grinnell College
Program: LSSURP
Faculty Mentor: Gregory Vercellotti
Poster Title: Isolation of Red Blood Cell Extracellular Vesicles As Potential Base-Editing mRNA Delivery Vehicles
Abstract: Sickle Cell Disease (SCD) results from a point missense mutation in the HBB gene, leading to the formation of abnormal hemoglobin (HbS). In its deoxygenated state, HbS polymerizes and causes sickling of erythrocytes, leading to painful vaso-occlusive crises and hemolysis. Gene therapy and gene editing ex vivo of autologous hematopoietic stem cells (HSCs) have been used to increase hemoglobin A and F to treat SCD. To avoid DNA breaks, adenine and cytosine base editing of HSCs shows great promise. The ability to complete the mutation correction in vivo would mitigate transplant morbidities from chemo/radiation. Delivery of gene-editing mRNA requires a vehicle, such as a nanoparticle or other lipid membrane vesicles, to target HSCs. Recent studies have reported the usage of red blood cell membrane extracellular vesicles (RBCEVs) transport antisense oligonucleotides into targeted leukemia cells for suppression of oncogenic miRNA with great success. This project reports the successful isolation and characterization of RBCEVs from human whole blood, as well as electroporation efficacy of transfecting fluorescent-tagged polynucleotides into RBCEVs as proxy for base-editing mRNA.

Presenter: Arafah Mohamed
Poster Number: 34
Home Institution: San Diego State University
Program: LSSURP
Faculty Mentor: Katie Cullen
Poster Title: Correlation Between Creativity & Depressive Symptoms in Adolescents
Abstract: We explore the intricate link between depression symptoms, as measured by the Child CDI (Children's Depression Inventory), and creativity through two questionnaires: the Daily Creativity Questionnaire and the Creativity Domains Questionnaire. By examining the correlation between symptoms of depression and creativity at various time points, the study aims to shed light on the dynamic nature of this relationship and how it could be affected by engaging in daily creative activities. Using a sample of participants, the study analyzes the overall correlation between the two while considering all time points. We examined correlations between depression scores and creativity scores at each time point to gain a comprehensive understanding of any temporal variations in the relationship.The method is a creativity camp model where participants will join a 2 week camp participating in daily creative activities. It is anticipated that the Child CDI scores will remain relatively constant, whereas the other creativity measures are expected to exhibit more changes over time. Understanding the relationship between depression and creativity and how that relationship fluctuates over time enhances our comprehension of the dynamic relationship between depression symptoms and creativity in the context of childhood and provides valuable insights for further research and potential intervention methods.

Presenter: Miski Mohamed
Poster Number: 99
Home Institution: University of Minnesota-Twin Cities
Program: MSROP
Faculty Mentor: Matthew Winn
Poster Title: Measuring effort before listening with pupillometry
Abstract: The effort of listening to speech can interfere with quality of life for people who are deaf or hard-of-hearing. One way to measure the effort of listening to speech is by observing moment to moment changes in pupil size, with larger pupils corresponding to greater effort. Previous pupillometry studies measured effort during or after listening, but little is known about how effort is prepared in anticipation of upcoming speech that has not been heard yet. We address the issue of effort preparation and anticipation in the current study, where listeners are given a cue signaling the difficulty of upcoming speech. Listeners with normal hearing were shown three cues on screen, EASY, HARD, or a neutral XXXX, indicating the difficulty of the sentence they would repeat on the next trial, with difficulty randomized for each trial. The hard condition included speech with reduced frequency clarity. Changes in pupil size were recorded during the task. In addition to expected differences in pupil size during the harder stimuli, we hypothesized a difference in pupil dilation in the pre-listening stage simply in response to the stimulus cue on the screen, and in intermediate dilation for the neutral cue.

Presenter: Fazila Mohamed Prem Navaz
Poster Number: 132
Home Institution: University of Minnesota TC- College of Biological Sciences
Program: UROP/URS
Faculty Mentor: Carol Lange
Poster Title: Influence of AMIGO2 on CAFs/MDA231 Co-clusters and Extravasation of Cancer Cells
Abstract: Cancer-Associated Fibroblasts (CAFs) are an important component of the tumor microenvironment (TME) that growth factors to promote metastasis. Recent unpublished data from El-Ashry Lab suggests that CAF/breast cancer (BC) co-clusters extravasate faster than BC mono-clusters. Our lab did a Single Cell RNA seq of CAF/BC co-clusters versus mono-clusters which showed that CAFs can induce expression of genes, such as Amphoterin-induced gene and open reading frame 2, and aid extravasation of BC cells. AMIGO2 is an adhesion protein that is hypothesized to promote the attachment between BC cells and endothelial cells. This project aims to distinguish the expression of AMIGO2 protein in CAF/BC co-clusters compared to BC mono-clusters by staining the siRNA knockdown in MDA231 BC cells with AMIGO2 antibody and confirm the validity of the knockdown using RT-PCR with non-targeting siRNA as the control. The endothelial binding assay is also performed to determine the dependence BC cells to endothelial cells is dependent on AMIGO2, using endothelial cells, MDA231 (siAMIGO2), and MDA231 (siNT) cells. The results showed that the knockdown AMIGO2 was being compensated with a similar adhesive protein from the same family. Next, we will determine if the AMIGO family induces the downregulation of BC and endothelial attachments in co-clusters.

Presenter: Neela Nath
Poster Number: 107
Home Institution: Barnard College
Program: SCoPE
Faculty Mentor: Courtney Aldrich
Poster Title: Towards a Concise Total Synthesis of Mycobactins: Deaminative Bromination Enables Efficient Access to Mycobactic Acid
Abstract: Tuberculosis, an infectious disease caused by Mycobacterium tuberculosis (Mtb), remains a significant global health concern, causing 1.6 million deaths in 2022. There is, therefore, an urgent need for new therapeutic agents against Mtb which necessitates the exploration of diverse targets for drug development. One such target is iron acquisition, critical for Mtb growth and virulence. This requirement is complicated by the host innate immune system's restriction of free ferric iron. Mtb adopts several strategies to obtain iron, including importing hemoglobin, holotransferrin, and the biosynthesis, secretion, uptake, and recycling of siderophores known as Mycobactins. Seeking to evaluate their iron binding affinity, characterize their trafficking via photoaffinity probes, and explore their potential for drug delivery via antibiotic conjugates, we sought access to an N-Boc-Mycobactin intermediate which can be variously acylated to deliver these synthetic targets. In this study, we focused on the synthesis of N-Boc-Mycobactic acid, a crucial fragment towards the key intermediate. We describe our retrosynthetic approach, the synthesis of an anomeric amide reagent, and a key transformation through deaminative bromination and tandem N-alkylation, rather than established N-oxidative methods. Structural characterization of all intermediates and the final product was executed by Nuclear Magnetic Resonance (NMR) and Mass Spectrometry (MS).

Presenter: Sophie Naylor
Poster Number: 117
Home Institution: Colgate University
Program: SOAR-REEU
Faculty Mentor: Ya Yang
Poster Title: DNA Barcoding Hmong Medicinal Herbs
Abstract: Medicinal plants play an important role within the Hmong community, particularly for postpartum care. Though some individuals in Hmong communities can identify medicinal herbs and know them by their Hmong names, there is no accessible database of these plants and their uses. The lack of a Latin name and connection to formal scientific literature prohibits hospitals from administering them to patients, which is especially an issue in the Twin Cities, as they are home to the third largest Hmong population in the country. This project aims to identify herbs used in the Hmong postpartum chicken soup diet and review scientific literature about each plant in order to move towards more culturally-relevant medical care in Twin Cities hospitals. In this project, we used DNA barcoding to identify medicinal herbs sourced from Hmong farmers and markets located in the Twin Cities. DNA sequences were amplified, assembled using Geneious, and run through the BLAST database to identify similar sequences. Phylogenetic trees were then constructed from these matches to find the most likely candidate species. Possible species matches were then researched to find existing uses in literature and potential pharmacological properties. Through this process, we identified potential matches for 17 herbs.

Presenter: Sara Negasi
Poster Number: 35
Home Institution: Carleton College
Program: LSSURP
Faculty Mentor: Andy Harris
Poster Title: Neurobiological effects of prenatal opioid exposure
Abstract: With the opioid epidemic, there has been an increase in the number of newborns with Neonatal Opioid Withdrawal Syndrome. Children born with NOWS can be at greater risk for addiction vulnerability, anxiety, and ADHD. The goal of this project is to better understand the biological and behavioral measures of NOWS in both humans and rats. This was done by putting rat pups, whose mothers were given morphine or saline injections during gestation, through behavioral testing. The results of the locomotor test, showed that on the first test day session pups from the morphine group moved significantly more than pups from the saline group, this could be representative of the hyperactivity seen with ADHD.

Presenter: Maybelle Newcombe
Poster Number: 108
Home Institution: University of Minnesota - Twin Cities
Program: SCoPE
Faculty Mentor: Beshay Zordoky
Poster Title: Proteomic Sex Differences of Doxorubicin-Induced Cardiotoxicity
Abstract: Cancer survivors who are treated with anthracyclines such as doxorubicin (DOX) experience cardiovascular complications years after their initial treatment. Although the reason why DOX induces cardiotoxicity is unclear, sex is a known risk factor. This study focuses on the proteomic differences between male and female DOX-treated mice.
Intraperitoneal injections of 4mg/kg/week of DOX or saline were given to C57Bl/6 mice for six weeks. Five weeks following the last dose echocardiography was performed, and one week later the mice were sacrificed and their heart and liver were collected for proteomic analysis via western blotting.
DOX-treated male mice displayed physical decline with reduced heart and body weights compared to the saline-treated male mice and female mice. Echocardiography exhibited that male DOX-treated mice experienced cardiac dysfunction, while the female DOX-treated mice did not. Proteomic analysis showed acute phase proteins hemopexin, haptoglobin, and orm-1 were downregulated in male DOX-treated mice.
The results of this study reveal that male mice are more likely to experience delayed DOX-induced cardiotoxicity and that there are differentially expressed proteins between DOX-treated males and females, specifically acute phase proteins.

Presenter: D'Nico Newton-Barber
Poster Number: 72
Home Institution: Central high school
Program: M-ASCEND
Faculty Mentor: Silvia Balbo
Poster Title: How does smoke exposure contribute to carbon monoxide in lungs and DNA damage in the mouth?
Abstract: We investigated the relationship between smoke exposure on carbon monoxide in the lungs and DNA damage in the mouth, with the expectation that the greater the exposure, the more DNA damage and carbon monoxide in the lungs. To do this, we sampled 49 participants on the University of Minnesota campus. They completed a survey about their demographics and lifestyle factors, provided a 5mL saliva sample, and completed a carbon monoxide breath test. The saliva was then analyzed using an ELISA for 8-OHdG, a common DNA adduct. We found that smokers had more carbon monoxide than non-smokers but DNA damage levels showed no difference. When analyzing second-hand smoke exposure, we found a similar pattern. Therefore our hypothesis was semi-supported. Carbon monoxide is known to be associated with smoke exposure, while DNA damage was not shown to be associated with smoke exposure by our data. This likely occurred because of a small sample size and not enough smokers in the participants.

Presenter: Ryan Nguyen
Poster Number: 36
Home Institution: Rutgers University - New Brunswick
Program: LSSURP
Faculty Mentor: Masato Yamamoto
Poster Title: Generation of an EGFRvIII Targeted Oncolytic Adenovirus by High-Throughput Screening
Abstract: Adenoviruses are a novel cancer therapy alternative due to their ability to stimulate the immune system and selectively kill cancerous cells. The AB-loop in the virus's fiber-knob region attaches to CAR (coxsackie and adenovirus receptor) on cellular membranes and facilitates entry. Manipulation of the protein sequence at this site can de-target and re-target the virus to a desired receptor. EGFRvIII is a mutated membrane protein often overexpressed in glioblastomas, but selective targeting has been difficult to design because it is a deletion mutant of EGFR. We hypothesized that an oncolytic adenovirus that selectively infects cancer cells overexpressing EGFRvIII can be identified by screening a random amino acid library in the binding domain (AB-loop). In order to generate the adenovirus library, CRE-expressing cells were infected with a fiberless adenovirus and transfected with a shuttle vector library containing combinations of random amino acids in the AB-loop coding region. The library was then subjected to multiple rounds of screening (subtraction, negative, protein, and positive) that selected for viruses specifically binding to the EGFRvIII receptor. A narrowing down of sequence diversity was expected through each round and indicates successful selection. The creation of this adenovirus would generate candidates for targeted and personalized cancer therapy.

Presenter: Eleanor Nickel
Poster Number: 100
Home Institution: University of Minnesota - Twin Citites
Program: MSROP
Faculty Mentor: Benjamin Munson
Poster Title: Testing the Generalizability of Acoustic Predictors of Intelligibility with Racially Diverse Corpora
Abstract: Communication is an inherently interactive process, as messages are produced to effectively transfer information. Thus, research has examined factors that influence the ease of comprehension, often focusing on *intelligibility,* typically measured through linguistic units correctly reported by a listener. The ability to understand speech stimuli can be affected by a variety of factors, including those related to the talker, environment, and listener. *Talkers* may modify speech in ways that they believe will facilitate understanding of their message. This style, *clear speech*, is characterized by exaggerated articulation or *hyperarticulation*, wide pitch range, and slow speech rate. Subsequently, researchers often utilize acoustic measurements of rate, pitch range, and hyperarticulation to predict speech intelligibility (Bradlow et al., 1996). However, studies of acoustic predictors of talker intelligibility have largely been conducted on homogenous groups of talkers. The current research addresses this exclusion by examining acoustic predictors of intelligibility in a racially diverse corpus of talkers, first described in Smith and Munson (2023) with intelligibility measures taken from Tripp et al. (2022). The current investigation helps us determine whether previous findings generalize to a racially diverse set of talkers and provides evidence essential to reducing the ramifications of widespread bias through investigations of linguistic categorization.

Presenter: Baqir Noor
Poster Number: 133
Home Institution: University of Minnesota Twin Cities
Program: UROP/URS
Faculty Mentor: Andrew Venteicher
Poster Title: Detecting Methylation of the LYST Gene in Human Chordoma Cell Lines
Abstract: Chordomas are slow growing tumors associated with poor clinical outcomes due to their difficulty to treat. One gene that may play a role in chordoma development is the LYST gene, which is frequently affected by loss-of-function mutations. Preliminary work by the Venteicher Lab has indicated that this gene may be methylated in certain chordoma subtypes, an epigenetic change that would have a similar effect as a loss-of-function mutation. To verify this hypothesis, methylation-specific PCR (MSP) was utilized to qualitatively analyze the methylation status of the following chordoma cell lines: CH1, UM-Chor1, CH7, JCH7, CH22, U-CH2, and MUG-CC1. Discovery of a chordoma cell line containing methylation of the LYST gene would allow further testing of effect on tumor proliferation. If physicians can differentiate between more and less severe subtypes of chordoma using simple methylation analysis, then they may be able to avoid harsher treatments (e.g., radiotherapy) for relatively milder cases, improving patient outcomes. Results showed that none of the cell lines were methylated in the region of interest; future research should focus on testing more cell lines and perhaps chordoma tumors themselves to detect methylation.

Presenter: Joe Ntayagabiri
Poster Number: 123
Home Institution: Macalester College
Program: UMN Pain
Faculty Mentor: Carolyn Fairbanks
Poster Title: GluN2B and ADC Expression in Mouse Spinal Cord
Abstract: Chronic pain is a great public health burden, requiring effective long-term treatments. Previous studies demonstrated that inhibition of GluN2B subunit containing (N-methyl-D-aspartate) NMDA receptor via decarboxylated L-arginine, agmatine, can reverse the nerve-injury induced mechanical hyperalgesia. Agmatine is an endogenous neuromodulator synthesized via arginine decarboxylase (ADC). Previous studies showed that GluN2B expression increased in animals with chronic pain, and elevated ADC level attenuated spared nerve injury-induced mechanical hyperalgesia. This study aims to determine the impact of CFA-induced acute pain on the expression of GluN2B and ADC in the spinal cord. Male ICR mice were divided into Naive, Sham, CFA-injection, CFA-injection with intrathecal saline, CFA-injection with intrathecal agmatine, and CFA-injection with intrathecal strategically substituted agmatine (SSA3). The mechanical sensitivity was measured before and after CFA and drug injections using Von Frey test, and animals were perfused with paraformaldehyde. Spinal cord were extracted and sectioned on cryostat. The expression of GluN2B and ADC were assessed through immunohistochemistry and in-situ hybridization. We hypothesize that elevated expression of GluN2B and ADC in CFA treated animals compared to saline and sham. The agmatine and SSA3 group are expected to have less GluN2B and ADC expression compared to CFA-injection group, resulting from the inhibition of mechanical hyperalgesia.

Presenter: Kevin Ogbonna
Poster Number: 37
Home Institution: University of California, Santa Barbara
Program: LSSURP
Faculty Mentor: Beth Thielen
Poster Title: Assessing the role of URT microbiota in immune response to influenza infection
Abstract: Influenza viruses are a group of negative sense RNA viruses known for causing seasonal epidemics and rarely causing pandemics. They mostly infect cells in the upper respiratory tract (URT) and cause cell and tissue damage. Once a virus enters a cell, Interferons are produced which lead to expression of Interferon stimulated genes (ISGs) which help recruit immune cells and induce an antiviral state. As a form of defense, the infected epithelial cells lining the URT help stimulate upregulation of ISGs on nearby epithelial cells to help induce the whole tissue into an antiviral state. Currently, there is growing evidence that the URT microbiota plays an important role in the innate immunity against influenza. However, the molecular mechanisms by which the URT microbiota does this remains unclear. My current research project aims to explore the role the URT microbiota plays in the immune response of the URT. Our current hypothesis is that the URT microbiome itself supports a basal level of ISG expression which stimulates the nearby epithelial cells to be in an antiviral state. My experiment aims to determine if a co-culture with known healthy URT microbiota yields an increase in canonical ISGs upon infection with Influenza A.

Presenter: Sofía Oliver
Poster Number: 109
Home Institution: Universidad de Puerto Rico, Mayagüez
Program: SCoPE
Faculty Mentor: Elizabeth Hirsh
Poster Title: Activity of Fosfomycin against a Collection of Klebsiella pneumoniae (KP) Isolates and Inner Colonies (IC) Produced during Disk Diffusion (DD)
Abstract: Background: IC during fosfomycin DD have been frequently noted for KP testing. Clinical and Laboratory Standards Institute (CLSI) in the U.S., recommends including IC in zone diameters, whereas Europeans recommend excluding them. The objective was to determine the frequency of IC arising from DD and fosfomycin activity against parents and IC.
Methods: A convenience collection of 100 KP isolates underwent susceptibility testing using DD and broth microdilution (BMD) per CLSI guidelines, and were conducted in technical triplicate (for BMD), and biological duplicate on separate days. Isolates were categorized susceptible (BMD: -64µg/mL, DD: -16mm), intermediate (BMD:128µg/mL, DD:13-15mm), or resistant (BMD: -256µg/mL, DD: -12mm) by extrapolating E. coli breakpoints. Results: During DD, 54 produced -5 IC. Isolates were considered susceptible 53.7% (n/N=44/82) by DD and 40.2% (n/N=39/97) for BMD. Minimal inhibitory concentration (MIC) for IC ranged from 128 to >1024µg/mL, compared to parent isolates ranging from 8 to >256µg/mL. Using BMD, 39.2% (n=38/97) parents were considered resistant compared to 98.1% (n/N=53/54) for IC. Conclusion: IC were frequent, given 56.7% of the collection produced -5 IC. BMD testing showed greater resistance compared to DD. IC had increased resistance from their corresponding parent isolates, where most MIC were up to six 2-fold dilutions higher.

Presenter: Jose Orozco Islas
Poster Number: 38
Home Institution: augsburg university
Program: LSSURP
Faculty Mentor: colin campbell
Poster Title: investigating the role of the xpa gene in DNA protein cross link repair
Abstract: DNA-protein crosslinks (DPCs) are complex lesions that pose a significant threat to genomic stability and cell viability. The efficient repair of DPCs is crucial for maintaining genome integrity and preventing the onset of various diseases, including cancer. The XPA gene has been implicated in the repair of DNA lesions, primarily associated with nucleotide excision repair (NER) mechanisms. However, its specific role in DNA-protein crosslink repair remains poorly understood.

Presenter: Jacob Pacheco
Poster Number: 118
Home Institution: University of Minnesota Twin Cities
Program: SOAR-REEU
Faculty Mentor: Thomas Michaels
Poster Title: AgroTrack: Better phenotypic Data collection
Abstract: Due to the specialized nature of the subject, there are currently few agricultural field collection apps available in the iOS Appstore, and those that are available are frequently behind paywalls or other restrictions. This is not ideal as these apps offer several benefits over conventional data collection methods, including lower costs, quick homogenous data collection, and the ability to quickly share and store their own data. Researchers from the university, including professors and graduate students in the department of horticulture, agronomy, and plant genetics, were surveyed to find out which features they would want to see included in an app. In response to their feedback, a free and open-source app was created with an emphasis on their feedback as well as the general need to create a user-friendly app that, allows collaboration and data sharing, and prevents data loss and limits data entry errors, making this a powerful tool for researchers making their research slightly simpler while lowering the cost for their labs.

Presenter: Devin Pai
Poster Number: 145
Home Institution: University of Minnesota
Program: Independent Research
Faculty Mentor: Nicola Grissom
Poster Title: Decision Making and Dopamine Firing Rates in 16p11.2 deletion mice
Abstract: The 16p11.2 deletion genotype occurs when there is a deletion in the p11.2 coding region on the 16th chromosome. This phenotype is associated with difficulties in decision making in both males and females and is thought to account for approximately 1% of autism spectrum disorder (ASD). The goal of this project has been to quantify dopamine firing rates in the nucleus accumbens using fiber photometry during a two armed restless bandit task of both mice with the 16p11.2 deletion and wild type mice. Over the course of several weeks, mice were first trained on various task schedules to perform a probabilistic decision making task. Mice then underwent a surgery to inject a virus that causes fluorescence to quantify levels of dopamine, and place a fiber optic implant in their brain. Additionally, data was collected to see whether these mice tended to explore or exploit the two choices during their behavioral tasks. Data was collected on both male and female mice. In the future, the brains of these mice will be sliced and stained in order to perform immunohistochemistry to analyze cholinergic and parvalbumin interneurons in the various mice.

Presenter: Zetao (Tommy) Pan
Poster Number: 39
Home Institution: Emory University
Program: LSSURP
Faculty Mentor: Hai Dang Nyugen
Poster Title: Functional impact of RNase H1 phosphorylation on R-loop resolution with Replication Protein A
Abstract: Myelodysplastic syndromes (MDS) are a group of heterogeneous disorders that affect the production of red blood cells. Over half of MDS patients carry splicing factor mutations that cause an increase in R loops. While R-loops are a part of normal cellular function, an accumulation of R-loops can lead to genomic instability and promote cell death. The goal of this project is to characterize regulatory mechanisms of RNaseH1, a R-loop specific hydrolase. We hypothesize that RNase H1 phosphorylation promotes its interaction with Replication Protein A (RPA) to stimulate R-loop resolution. My research focuses on purifying human RNase H1 from *e. coli* to examine its function in biochemical assays. Fluorescence assay revealed that both RNase H1 phospho-dead and phospho-mimetic mutants have similar rates of enzymatic activity on degrading synthetic DNA:RNA hybrids in vitro. However, preliminary data remains inconclusive of the role RNaseH1 phosphorylation plays with its interaction with RPA. Future experiments will further detail the role of phosphorylation in the regulation of RNaseH1 activity. The overall goal of this project is to determine whether targeting RNaseH1 could be a potential therapeutic strategy to treat MDS patients harboring splicing factor mutations.

Presenter: Stephen Pella
Poster Number: 40
Home Institution: Florida International University
Program: LSSURP
Faculty Mentor: Michael Sheedlo
Poster Title: Progress Toward Purifying VirB2, a Putative Pilus-like Subunit of the Type 4 Secretion System
Abstract: Clostridioides difficile is a gram-positive, antibiotic-resistant bacterium and the leading cause of hospital acquired infectious diarrhea. C. difficile infections are often the result of treating an infection with antibiotics: antibiotics kill many other bacteria in the gut microbiome, leaving C. difficile to colonize. C. difficile is notable for containing seven Conjugative Transposons (CTns), which each carry a Type 4 Secretion System (T4SS) and an ABC transporter antibiotic efflux pump. T4SSs facilitate exportation of CTns into other gram-positive bacteria. T4SSs are protein nanomachines found on the membrane of almost all bacteria. T4SSs have 12 canonical components, VirB2-VirB11 and VirD4. VirB2, a putative pilin-like subunit, is of particular importance due to its potential role in selecting a target for T4SS cargo secretion. While more extensive knowledge of gram-negative T4SSs has been elucidated due to recent advances in cryogenic electron tomography, a knowledge gap exists in gram-positive T4SSs, such as C. difficile. This study details progress towards utilizing an Escherichia coli expression system to purify VirB2 utilizing affinity and size exclusion chromatography. We have determined that increasing the solubility of VirB2 is dependent on a small concentration. Future purifications of pilin-like subunits can be improved through small-scale purifications that preserve solubilization of protein.

Presenter: Christopher Peters
Poster Number: 41
Home Institution: The Johns Hopkins University
Program: LSSURP
Faculty Mentor: Hai Dang Nguyen
Poster Title: Characterizing R-loop Regulatory Function of PARP2 in Myelodysplastic Syndrome
Abstract: Every year, 15,000 individuals are diagnosed with myelodysplastic syndromes (MDS), a group of blood disorders characterized by bone marrow failure, leading to defects in hematopoiesis and cytopenia in patients. Over half of MDS patients possess somatic mutations in RNA splicing factor (SF) genes (*SRSF2*, *U2AF1*, and *SF3B1*), causing aberrant splicing events. RNA splicing mutations occur early in MDS disease, representing an attractive therapeutic opportunity. Our lab demonstrated that cells containing SF mutations accumulate R loops, three-stranded nucleic acid transcription intermediates, which cause genomic instability when not properly resolved. Recently, our lab showed that inhibiting (poly) ADP-ribose polymerases (PARPs) enzymes preferential kill SF-mutant cancers. Although PARP inhibitors inhibit both PARP1 and PARP2 enzymes, only PARP1 plays a major role in DNA damage response. Surprisingly, RNA splicing perturbation by SF-mutant expression or pharmacological modulators trigger both PARP1 and PARP2 response in an R-loop dependent manner. We hypothesize that PARP2 plays a crucial role in resolving R loops in SF-mutant cancers. My project aims to determine the domain(s) of PARP2 crucial for R-loop regulation. The future outcome of my study will provide mechanism-of-action for how PARP inhibitors sensitize SF-mutant cells and potentially identify therapeutic biomarkers to predict response in MDS patients.

Presenter: Max Pinamonti
Poster Number: 134
Home Institution: University of Minnesota- Twin Cities
Program: UROP/URS
Faculty Mentor: Michael Freeman
Poster Title: Activation of cryptic borosin biosynthetic gene clusters (BGCs) via a synthetic cumate-inducible promoter system
Abstract: The Freeman lab focuses on researching peptide natural products, specifically ribosomally synthesized and post-translationally modified peptide natural products (RiPPs), due to their antifungal, antibacterial, allelopathic, and antiviral properties as well as potential use in pharmaceuticals and commercial applications. Previous bioinformatic analysis has identified cryptic putative borosin gene clusters in Burkholderia, Achromobacter and Pseudomonas species, which are known for their metabolic versatility, pathogenicity, and resistance to antibiotics. Initial studies on activation of cryptic borosin BGCs in the Freeman lab showed that standard culture conditions did not result in robust expression. To address this issue, a cumate-inducible promoter system can be utilized. This is a cost-effective and efficient strategy allowing for tight control of gene expression over a linear range in a cumate concentration dependent manner. Implementation of this system yielded initial findings of a promoter system in our strains of interest that is able to be controlled via cumate induction. Further implementation of semi-altered promoter systems has given a library of potential promoters that can be used for cryptic borosin BGC expression.

Presenter: Morgan Pride
Poster Number: 42
Home Institution: North Carolina Agricultural and Technical State University
Program: LSSURP
Faculty Mentor: Robert Jones
Poster Title: Does OXY-NS Inhibit Oral Bacteria and Remove Dental Blood Debris?
Abstract: Imidazoline derivatives (ImDs), specifically oxymetazoline, directly target the alpha-adrenergic receptors within the sympathetic nervous system to promote hemostasis. Commonly used for congestion and to control surgical bleeding, ImD solutions exert vasoconstriction effects in the nasal passage. The dental pulp contains vital nerves and blood vessels and is crucial in maintaining tooth vitality. Traumatic exposure of pulpal tissue due to deep cavities necessitates direct pulp-capping procedures for preservation. However, the current standard hemostatic agent, 20% Ferric Sulfate (FeSO4), is associated with postoperative pain and internal resorption. In this laboratory-based study, we assess the antimicrobial activity and cleansing efficacy of a commercial nasal solution containing oxymetazoline, comparing it to FeSO4. Specifically, we investigate its effectiveness against Streptococcus mutans and Rothia dentocariosa, two gram-positive bacterial strains commonly linked to pediatric endodontic infections. Antimicrobial activity is evaluated through disk-diffusion and growth inhibition assays, while a bacteria-blood debris removal assay determines cleansing efficacy. The study holds significant implications for advancing dental care by exploring alternative hemostatic agents that may alleviate postoperative complications

Presenter: Sayumi Ranasinghe
Poster Number: 135
Home Institution: University of Minnesota TC
Program: UROP/URS
Faculty Mentor: Anna Tischler
Poster Title: Investigating Genes Responsible for Clumping Phenotype in Mycobacterium smegmatis Using Transposon Mutagenesis
Abstract: Mycobacterium tuberculosis (Mtb) is the causative agent for tuberculosis, which infects millions globally and is a public health concern. Mycobacterium smegmatis, a model organism of Mtb, was used in this experiment. According to a 2017 study done on PhoU proteins in M. smegmatis, PhoU1 and PhoU2 redundantly regulate an inorganic phosphate transport system. This study found that mutants with both PhoU genes knocked out were more sensitive to rifampicin and formed clumps in liquid culture. Understanding the role PhoU plays in the cell envelope may be integral in discovering how M. smegmatis interacts with drugs, which may be applied to Mtb. In this experiment, a PhoU double mutant strain of M. smegmatis (Phou--) was used to perform transposon mutagenesis in an attempt to yield mutants that showed a reversal in the clumping and rifampicin sensitivity phenotype. The goal was to investigate genes responsible for these phenotypes. Phage was used to randomly disrupt genes in M. smegmatis, which was cultured in rifampicin to screen for the rifampicin resistance phenotype. Multiple PhoU-- mutants that showed a reversal in the rifampicin sensitivity phenotype were isolated. In future experiments, they can be investigated to see where a transposon has been inserted.

Presenter: Mya Reeves
Poster Number: 87
Home Institution: Department of Psychology
Program: McNair
Faculty Mentor: Eugene Borgida
Poster Title: Separate Spheres Ideology and Public Perceptions of Dobbs vs. Jackson Women's Health Organization
Abstract: This 3-wave panel study examines the relationship between Separate Spheres Ideology (SSI), abortion attitudes, and attitudes toward reproductive health policies. The aim is to test the validity of SSI as a measure of gender ideology in the context of abortion attitudes. It was generally expected that respondents who endorse SSI, who are theoretically committed to preserving the gendered-status quo in society, will be more likely to endorse the SCOTUS decision in *Dobbs vs. Jackson Women's Health Organization* (*Dobbs*) and related policy attitudes when *Dobbs* is depicted as a threat to the gendered status quo. The results generally support this. Surveys were programmed in Qualtrics and administered through Bovitz/Forthright, an online research panel. The analytic focus was to test the interaction between SSI at Time 1 and the experimental factors presented at Time 2. Wave 1 included baseline measures, such as SSI and demographics, which served as control variables in the analysis. In Wave 2, participants were randomly assigned to either the control condition or one of two experimental conditions (Societal Impact or Basic Impact). Survey questions in Wave 2 measured various dependent variables, including attitudes toward abortion and *Dobbs*. Wave 3 analyses are beyond the scope of this project.

Presenter: Hanna Regassa
Poster Number: 43
Home Institution: Duke University
Program: LSSURP
Faculty Mentor: Nicola Grissom
Poster Title: How does the inhibition of NMDA receptors in the medial prefrontal cortex (mPFC) impact decision-making ability in mice?
Abstract: While schizophrenia only impacts around 1% of the US population, it is one of the leading causes of disability worldwide. The symptoms of schizophrenia are classified into positive, negative, and cognitive symptoms and limited medications to treat cognitive symptoms. Previous research suggests that the N-methyl-D-aspartate (NMDA) receptors in the medial prefrontal cortex (mPFC) are associated with the wide cognitive deficits experienced in psychosis and schizophrenia. We use genetically modified mice that are a model for psychosis and the two-armed restless bandit behavioral task, a framework used to optimize multiple choices. We then deactivate their NMDA receptors in the mPFC by injecting a virus to delete a vital subunit for the NMDA receptor, GluN1. The mice will complete the bandit tasks before and after their virus injection to observe the change in their decision-making strategy. Preliminary results show that after the NMDA receptor deletion, Grin1 mice are less likely to shift after non-rewarded trials and more likely to stay after receiving a reward when compared to the control group. These results indicate that dysfunctions in the mPFC contribute to the decline in decision-making ability, initiating the idea of targeting NMDA receptors in the mPFC to treat the cognitive symptoms of schizophrenia.

Presenter: Emma Reid
Poster Number: 136
Home Institution: University of Minnesota Department of Neuroscience
Program: UROP/URS
Faculty Mentor: Rocio Gomez-Pastor
Poster Title: The cell type-specific effect of protein kinase CK2a' reduction on behavioral phenotypes in a mouse model of Huntington's disease
Abstract: Huntington's disease (HD) is a neurodegenerative disorder derived from a trinucleotide repeat expansion in the Huntingtin (HTT) gene, which leads to the accumulation of the mutant HTT protein. Previously, we showed that CK2a', a subunit of the protein kinase CK2 involved in HTT phosphorylation, is induced in HD and reducing CK2a' can improve HD-related phenotypes. Specifically, systemic haploinsufficiency of CK2a' lowered aggregate load, improved neuronal health, and rescued motor deficits in HD mice. We sought to determine what cell types are responsible for the behavioral improvements caused by CK2a' haploinsufficiency. Therefore, we hypothesized that depletion of CK2a' in neurons would cause an improvement in motor behavior. To test our hypothesis, CK2a' floxed/+ mice underwent stereotaxic viral infusion surgeries to direct neuron-specific Cre viruses to the striatum, the most affected region in HD and strongly involved in motor behavior regulation. One month after the surgeries, we performed four behavioral tests: open field, Y-maze, pole test, and beam walk. No significant differences were observed between the groups, although a trend towards improvement was observed in beam walk. Therefore, striatal haploinsufficiency in neurons did not robustly rescue motor deficits, indicating that CK2a' contributions may be extra-striatal, non-neuronal, or necessary prior to symptom onset.

Presenter: Han Rhee
Poster Number: 44
Home Institution: North Hennepin Community College/ Bemidji State University
Program: LSSURP
Faculty Mentor: Kirsten Nielsen
Poster Title: Determining the role of a missense mutation in CNAG_07528 in Cryptococcus neoformans hypervirulence
Abstract: *Cryptococcus neoformans* is a human fungal pathogen commonly found and acquired in the environment. In healthy patients, infections are latent, meaning little to no disease manifestations. However, individuals with immunodeficiencies, such as advanced HIV disease, may experience infections with varying degrees of severity. It is currently not understood what factors directly contribute to the wide range of patient outcomes as it is suspected that this is attributed to variation between isolates in conjunction with patient specific factors. We hypothesize one of these virulence factors is a missense mutation in the coding sequence of the gene CNAG_07528, which is predicted to code for a DNA binding protein. To investigate the mutation and its potential role in hypervirulence, we used a combination of *in silico* and molecular methods to define the function of CNAG_07528 and characterize the phenotype of the mutation. We found that the hypervirulent isolates had large capsule sizes and small cell bodies. Conversely, the deletion of CNAG_07528 leads to smaller capsule size and no change in cell body size. These opposing phenotypes suggest that the mutation in CNAG_07528 causes dysregulation of CNAG_07528, leading to an altered capsule phenotype that may affect disease progression.

Presenter: Derick Rivera
Poster Number: 45
Home Institution: University of Puerto Rico in Ponce
Program: LSSURP
Faculty Mentor: Subree Subramanian
Poster Title: Targeting LAT1 for Metabolic Intervention in Colorectal Cancer
Abstract: Colorectal cancer (CRC) remains one of the most prevalent cancers worldwide and is the second leading cause of cancer-related mortality in the United States. Tumor growth heavily relies on the availability of nutrients and essential amino acids to support sustained cell proliferation. The SLC7A5 gene, encoding the LAT1 amino acid transporter, is pivotal in facilitating metabolic pathways associated with cancer by supplying tumor cells with essential amino acids. We observed elevated expression of the LAT1 in microsatellite-stable (MSS) tumors compared to the microsatellite instable-high (MSI-H) subtype. Additionally, LAT1 expression increases as tumors progress from adenoma to malignant disease. Here, we examined the impact of inhibiting LAT1 on cellular metabolism in vitro. We first confirmed LAT1 amino acid expression in cells and tissues using western blot, qPCR, and immunohistochemistry techniques. Subsequently, we assessed the influence of LAT1 inhibition on cell proliferation using the BrdU assay and investigated the metabolic changes through the Seahorse bioanalyzer when LAT1 was suppressed. Our results demonstrated that the LAT1 inhibitor significantly reduced glycolytic ATP production compared to the control group, suggesting that inhibition of LAT1 affects the cellular metabolic process. Future research will explore the effects of LAT1 inhibition in mouse models of CRC.

Presenter: Andrea Rivera
Poster Number: 46
Home Institution: Florida International University
Program: LSSURP
Faculty Mentor: Robert Tranquillo
Poster Title: Comparison of Growth in Tissue-Engineered Vascular Graft to Status Quo
Abstract: The vascular grafts that are currently used for surgical repair of congenital heart defects lack growth potential. Our lab has developed a regenerative tissue-engineered vascular graft (TEVG) and implanted it into the left pulmonary artery (LPA) of three lambs. A standard GORE-TEX graft was implanted into three other lambs. Six months following implantation, the pulmonary arteries were imaged with CT angiography, revealing substantial growth in the TEVG and a lack thereof in the GORE-TEX grafts. Materialise Mimics was used to render 3D models of the pulmonary arteries from the CT images. They were printed in a Stratasys J850 printer. The printed models revealed malformations in the LPA downstream of the GORE-TEX graft in comparison to the right pulmonary artery. The Vascular Modeling Toolkit was used to extract radius values along the length of the LPAs, and they were processed using a custom MATLAB script. The LPAs of the GORE-TEX group had a significantly steeper taper and overall smaller radius than those of the TEVG group. The lack of growth of the GORE-TEX graft resulted in stunted development of the LPA compared to the TEVG group. Future work in computational hemodynamics should be conducted to compare blood flow between the groups.

Presenter: Reese Roberts
Poster Number: 47
Home Institution: Howard University
Program: LSSURP
Faculty Mentor: Patrick Rothwell
Poster Title: The impact of MK-801 on the locomotion of schizophrenic trait mice
Abstract: Dysfunction of NMDA receptors during critical periods of brain development could contribute to the risk of developing schizophrenia later in life. NMDA receptors are crucial for the signaling of glutamate. The injection of MK-801,a drug that blocks the NMDA receptor, is commonly used to simulate NMDA receptor dysfunction. When an NMDA receptor is blocked in mice, stimulation of locomotion is a known consequence. The goal of this experiment was to see if mice carrying a genetic variant associated with schizophrenia have differential sensitivity to the effects of MK-801. This genetic variant is a duplication of a region on the 16th chromosome (16p11.2 duplication) that has strong association with schizophrenia in human patients This hypothesis was tested by injecting mice through intraperitoneal (IP) injection with MK-801 then tracking their locomotion through an open field activity chamber. Overall there was a dose-dependent increase in locomotion that was comparable in both wild type mice and the 16p11.2 duplication mice. These data points are critical for determining the range of dosage for other behavioral testing with MK-801 and shows there is no drastic difference between the 16p11.2 mice and the wild type mice.

Presenter: Raven Robinson
Poster Number: 73
Home Institution: Roosevelt High School
Program: M-ASCEND
Faculty Mentor: Silvia Balbo
Poster Title: DNA Damage Connected to Alcohol Consumption Patterns Amongst Different Races & Ethnicities
Abstract: We investigated the relationship between alcohol consumption patterns amongst different races/ethnicities and DNA damage in the mouth, expecting that minorities would suffer more from DNA damage than their white counterparts. To do this, we sampled 49 participants on the University of Minnesota campus, they completed a survey about their demographics and lifestyle factors, and provided a 5-mL saliva sample. The saliva was then analyzed using an ELISA test for 8-OHdG, a common DNA adduct. We found no correlation between race/ethnicity, alcohol consumption, and DNA damage therefore our hypothesis was not supported. This likely occurred because there was not a big enough sample size, or properly written questions to answer the research question. This could be improved with a controlled study that targeted specific participants to help answer the research question.

Presenter: Yairi Rosario
Poster Number: 48
Home Institution: UMN
Program: LSSURP
Faculty Mentor: Jocelyn Richard
Poster Title: Want some Candy?: How Hunger and Sex Influence Ventral Pallidum Activity
Abstract: The ventral pallidum (VP) plays an important role in food consumption and 'liking'. Here we tested how hunger and sex influence VP activity in response to a palatable reward. Male and female Long Evans rats were food restricted, and trained to lever press for 10% sucrose. Next, rats were perfused 30 minutes after testing under the following conditions: sucrose test while food restricted (n = 4, 2M 2F), no test while food restricted (n = 4), sucrose test while sated (n = 4), and no test while sated (n = 4). Immunohistochemistry was then conducted for c-fos protein, a proxy for neural activity, on VP slices. As expected, we found that sated rats engaged in less sucrose-seeking behavior than hungry rats. VP c-fos activity differed in sated versus hungry rats in a sex-dependent manner. Unexpectedly, sated males had more c-fos in comparison to hungry males, regardless of the final test condition. In contrast, only food-restricted female rats tested with sucrose had elevated c-fos.. These results could be due to the sample size of each cohort. Overall, the results provide insight on VP activity during reward consumption, informing how this region is implicated in sucrose consumption and other rewards like alcohol.

Presenter: Ibtehaj Shariq
Poster Number: 49
Home Institution: New College of Florida
Program: LSSURP
Faculty Mentor: Rajaram Gopalakhrishnan
Poster Title: Role of MCT1 in Metabolic Activity of Oral Dysplastic and Squamous Cell Carcinoma cell lines
Abstract: Oral squamous cell carcinoma (OSCC) is a prevalent type of head and neck cancer originating from the oral mucosa. Despite treatment, it often recurs, leading to high patient mortality. OSCC typically advances from pre-cancerous dysplasia to early invasive cancer, but the process is not fully understood, hindering effective interventions. Monocarboxylate transporter 1 (MCT1) is a membrane protein that transports L-lactate and pyruvate across the plasma membrane. Because increased MCT1 expression is linked to OSCC progression, we hypothesized that MCT1 promotes progression by supporting metabolic coupling between cancer cells and the surrounding stroma. To test this hypothesis, we knocked out (KO) MCT1 using CRISPR/Cas9 in DOK and TR146 cell lines representing oral dysplasia and OSCC, respectively. KO was confirmed by qRT-PCR and immunoblotting. Metabolic tests showed that KO of MCT1 strongly increased the glycolytic activity of TR146 cells and slightly reduced mitochondrial function. In contrast, a moderate reduction in glycolytic and mitochondrial activity was observed in DOK cells. Intriguingly, DOK cells shifted more quickly to glycolysis after mitochondrial inhibition compared to TR146 cells. These data suggest MCT1 regulates the metabolism of oral dysplasia and OSCC, and changes in the metabolism of dysplasia are required for progression to OSCC.

Presenter: Nate Silverman
Poster Number: 110
Home Institution: University of Minnesota-Twin Cities
Program: SCoPE
Faculty Mentor: Reena Kartha
Poster Title: Measuring Glucocerebrosidase Enzyme Activity in Gaucher Disease Cell Lines and Comparing to Normal Human Dermal Fibroblasts
Abstract: Gaucher disease (GD) is a lysosomal disease caused by mutations in the GBA1 gene encoding the glucocerebrosidase (GCase) enzyme. This results in defective or no GCase activity, and leads to glycosphingolipid accumulation. The GCase activity can vary depending on mutation type, handling, and storage of cells. We hypothesized that compared to normal healthy cells, GD mutant cells would have decreased enzyme activity. Furthermore, storage temperature will have a significant effect on its activity. Our objective is to develop a robust method to measure GCase activity that can show differences based on cell lines, handling, and storage. I compared two different GD cell lines against a normal fibroblasts, after attaining 80-90% confluent cell growth. I also snap-froze the lysates and stored them at -80- for up to 24 hours, before analyzing GCase activity. Preliminary results indicate that GCase activity in GD cells are significantly lower than normal cells and showed a more pronounced effect upon freezing. In the future, more work will be done to study the impact of long term cold storage on GCase activity. This data will be useful for designing future studies involving patient derived blood cells where we will examine the effect of intervention on GCase activity.

Presenter: Poorvi Singh Ghai
Poster Number: 137
Home Institution: University of Minnesota
Program: UROP/URS
Faculty Mentor: David Redish
Poster Title: Effect of clonidine on in rats performing the spatial 3-armed restless bandit task
Abstract: Making decisions depends on one's ability to make decisions quickly and effectively. Theories suggest that endogenous noradrenaline affects the balance between exploration and exploitation. Clonidine is a noradrenergic auto-receptor agonist, which has the effect of decreasing the levels of noradrenaline in vivo. It increases the decisiveness in humans through unknown mechanisms. The restless bandit puts rats in a condition where they make repeated choices between options for which the probability of receiving a reward changes over time. On this task, mice, rats, humans all show measurable bouts of exploration and exploitation. We tested the effect of clonidine in rats (2M, 2F) on a spatial 3-armed restless bandit task. Researchers were blind to condition during testing. Analyses are in progress.

Presenter: Melissa Solem
Poster Number: 138
Home Institution: University of Minnesota, Twin Cities
Program: UROP/URS
Faculty Mentor: Rocio Gomez-Pastor
Poster Title: Hippocampal pathology in zQ175 and zQ175-Neo mouse models of Huntington's disease
Abstract: Huntington's disease (HD) is a neurodegenerative disease resulting in devastating motor, cognitive, and psychiatric deficits. HD is caused by a poly-glutamine expansion of exon 1 of the *Htt* gene, leading mutant Huntingtin (mHtt) to aggregate within neurons. Brain regions significantly impacted include the striatum (involved in motor control and the focus of most HD studies) and the hippocampus (involved in memory). Despite reported hippocampal shrinkage in HD patients, this has not been reproduced in mouse models of HD, limiting the ability to study the relevance of hippocampal pathology in HD. We now report enhanced hippocampal mHtt aggregation and structural alterations by modifying a commonly used knock-in HD model zQ175. We showed that after removing the PGK-Neo cassette (a feature commonly used to generate genetically modified mice) using the recombinase Cre system, the newly generated zQ175ΔNeo mice exhibited significantly enhanced hippocampal pathology. We conclude that PGK-Neo cassette negatively affects HTT expression and that removal in zQ175ΔNeo leverages hippocampal mHtt aggregation. These findings imply that zQ175ΔNeo pathophysiology may more accurately mimic that of human HD, suggesting potential applications for the mouse model in cognitive symptoms and translational research.

Presenter: Clara Stein
Poster Number: 50
Home Institution: University of Minnesota Twin Cities
Program: LSSURP
Faculty Mentor: Kim Mansky
Poster Title: Investigating the role of LSD1 activity in inflammatory TNFα-induced osteoclast differentiation
Abstract: Conditions such as rheumatoid arthritis and periodontal disease may result in inflammation-related bone loss due to elevated osteoclast activity. It is known that the epigenetic protein lysine specific demethylase 1 (LSD1) is necessary for osteoclast differentiation under physiological conditions. Under inflammatory conditions, osteoclast differentiation is promoted by proinflammatory cytokines such as tumor necrosis factor alpha (TNFα), which works with transforming growth factor beta (TGFβ) to induce differentiation. However, it is unknown whether LSD1 is necessary for osteoclastogenesis under these conditions. Using cells cultured from the femurs and mandibles of wild type and LSD1 cKO mice, I performed qRT-PCR and imaging to determine how loss of LSD1 affects osteoclast differentiation and gene expression of inflammatory LSD1 target genes. In both the femur and mandible of knockout mice, osteoclast differentiation was decreased. However, mandible cells demonstrated higher inflammatory gene expression in the absence of LSD1 compared to femur cells. These findings suggest that inflammatory cytokines use different mechanisms to regulate osteoclasts in the femur and mandible; LSD1 may not be necessary for downregulation of inflammatory genes in the femur, whereas mandible osteoclasts cannot moderate the inflammatory response without LSD1. Understanding these differences can inform future development of targeted therapeutics for inflammatory conditions.

Presenter: Gabrielle Sutton-Vermeulen
Poster Number: 51
Home Institution: Iowa State University
Program: LSSURP
Faculty Mentor: Alonso Guedes
Poster Title: Role of Astrocytes in Spinal Pain and Opioid Signaling
Abstract: In many cases involving chronic pain, a common treatment includes the use of opioids to provide long lasting pain relief. One way for us to look at the effect of opioids on the body is to look at specific opioid receptors. In our case, we are looking at the mu opioid receptor. Mu opioid receptors (MORs) are predominantly located in the brain and spinal cord and represent a type of receptor that plays a central role in mediating the physiological and pharmacological effects of opioid drugs. When they are bound to, they result in the pain relief essential to pain management and can lead to euphoric response that is associated with their abuse. There is currently research about the neuronal activation of mu opioid receptors, but there is conflicting research on the activation of mu opioid receptors on astrocytes in the spinal cord and we are trying to prove that they play a large role. With the use of knockout animals, behavior studies and immunohistochemistry, we are attempting to learn about the mechanisms of pain relief to aid in further research for developing safer, more effective analgesics with a lower risk of addiction and abuse.

Presenter: Joel Tande
Poster Number: 124
Home Institution: University of Minnesota- Twin Cities
Program: UMN PAIN CONSORTIUM
Faculty Mentor: Malcolm Johns
Poster Title: Pain Modulation and Tumor Regression via PPARy
Abstract: Peroxisome proliferator-activated receptors (PPARs) play an important role in anti-inflammatory mechanisms in the transmission of neuropathic pain. As a member of the nuclear hormone receptor family, the PPAR isoform PPARy has long been studied for its extensive physiological roles in lipid metabolism. PPARy's extensive roles in protein transcription and cell growth between isoforms make the protein receptor functioning exceedingly complex and difficult to predict the effects of different binding ligands. PPARy and its varying changes in expression and activation during illness has provided promising developments in understanding how lipid metabolism alters cell proliferation and protein expression. Fibrosarcoma cells have quickly become a standard model for in vitro PPARy research for cancer cells and have been shown in preliminary studies to show a significant reduction in cancer cell proliferation with multiple injections of a PPARy agonist. Determining the most effective agonist and a protein of interest to monitor downstream effects of PPARy is crucial in understanding how PPARy self-regulates and what agonist results in the largest reduction of cancer cell proliferation. Preliminary quantitative polymerase chain reaction(qPCR) results have indicated that agonists LPA and Piogliterazone result in the higher PPARy activation, with a combination of orthosteric and allosteric binding.

Presenter: Sarah Tangen
Poster Number: 74
Home Institution: St. Olaf College
Program: M-ASCEND
Faculty Mentor: Subree Subramanian
Poster Title: Allogeneic Tumor Derived Extracellular Vesicles Modulate Dendritic Cell Phenotype
Abstract: Colorectal cancer (CRC) is the second leading cause of cancer related death in the United States. Most patients (~85%) present with microsatellite stable (MSS) phenotype which are immunotherapy resistant. Previously, we found that allogeneic modified TEVs, lacking functional miR-424, were capable of suppressing tumor growth and promoting T cell infiltration. Additionally, we observed that allogeneic TEVs can suppress tumor growth *in vivo* when pulsed to dendritic cells (DCs). This study sought to understand the consequences of TEV uptake and phenotypic alteration of DCs which contributed to the protective effects on tumor growth and influence on increased $CD8^+$ T cell infiltrates in tumors treated with allogeneic modified TEVs. We hypothesized that MC38-424i TEVs and CT26-424i TEVs will influence CD80 and CD86 expression on DCs due to miR-predicted binding sites on CD80/86. To test, we isolated DCs from Balb/c and C57BL/6 animals and exposed them to TEVs derived from MC38 and CT26 cells respectively. We evaluated phenotypic expression of CD80, CD86, MHCI, MHCII and, PD-L1. Here, we show that there is a marginal increase in CD80 and MHCI expression. These findings suggest that tumor suppression related to allogeneic TEV treatment could be linked to an increase in CD80 and MHCI expression.

Presenter: Aparna Thiagarajan
Poster Number: 139
Home Institution: Lillihei Heart Institute and Department of Pediatrics, University of Minnesota
Program: UROP/URS
Faculty Mentor: Sunny Chan
Poster Title: Transdifferentiating Muscle Stem Cells into Brown Fat to Treat Metabolic Disorders
Abstract: Metabolic disorders, such as obesity and diabetes, pose increasing global health challenges with limited long-term success from existing treatments, leading to high worldwide morbidity and mortality. Our project explored a novel approach to treat obesity by transdifferentiating muscle stem cells (MuSCs) into brown adipose tissue (BAT), which expends energy as heat, in contrast to white adipose tissue which stores energy as fat. The objective was to identify a specific MuSC subpopulation with an enhanced capacity to develop into BAT. The methods involved isolating MuSCs from mouse hindlimb muscles, sorting them into subpopulations based on Sca1 expression levels with fluorescence-activated cell sorting (FACS), and growing them in a pro-adipogenic medium to induce brown adipocyte differentiation. We analyzed the efficiency of BAT transdifferentiation through morphological changes, immunostaining for brown adipocyte markers, and quantification of lipid droplets. Preliminary analysis from the first two experiments revealed no significant expression of BAT derived from MuSC in either the Sca1- or Sca1+ subpopulations, suggesting the need to modify the methods of future experiments to obtain more meaningful results.

Presenter: Ren Thigpen
Poster Number: 52
Home Institution: Mercer University
Program: LSSURP
Faculty Mentor: Marija Cvetanovic
Poster Title: The Effect on Gonadal Hormones on Purkinje Cells and Bergmann Glia in the Rat Cerebellum: A Pilot Study
Abstract: The cerebellum plays a key role in many disorders such as spinocerebellar ataxia, with cerebellar dysfunction leading to a variety of motor and even cognitive effects. Purkinje cells, the principle output neurons of the cerebellum, are heavily implicated in cerebellar dysfunction along with Bergmann glia, astrocytes critical to cerebellar development and the maintenance of synaptic transmission. Gonadal hormones, including testosterone, have been shown to exhibit neuroprotective properties, and some evidence suggests a link between Purkinje cell and Bergmann glia degeneration and testosterone depletion in older rats. As such, the present study investigated the effect of circulating sex hormones on Purkinje cells and Bergmann glia in the anterior and posterior regions of the cerebellum of young rats via immunohistochemical staining. The cerebella of three-month old male rats with (n=2) and without (n=2) gonadectomies were co-stained for calbindin and GFAP, and images were quantified for comparisons.

Presenter: Bernarda Torres
Poster Number: 88
Home Institution: University of Minnesota
Program: McNair
Faculty Mentor: Angus MacDonald III
Poster Title: Socio-Economic Factors Predicting Psychiatric Symptoms in Hispanics/Latines
Abstract: It is estimated that by 2050, a quarter of the United States (US) population will be Latine (De Andrade & Viruell-Fuentes, 2011). In a study on depression and anxiety within Hispanics/Latines, 27.0% of the participants reported experiencing symptoms of depression, which positively correlated with anxiety (Wassertheil-Smoller et al., 2014). The objective of this study is to increase understanding on how psychiatric symptoms manifest in four different racial/ethnic groups; non-Hispanic Whites (n=2595), White Hispanics/Latines (n=270), non-Hispanic biracial people of color (BIPOC) (n=831), and Hispanics/Latines who identify as BIPOC (n=247). Controlling for demographic variables, we aim to examine the effects of race and ethnicity on symptoms of psychopathology (anxiety and depression). Results showed there is no effect of racial/ethnic identity on either Generalized Anxiety Disorder 7 (GAD7) and Patient Health Questionnaire 9 (PHQ9) scores. GAD7 and PHQ9 scores are affected by gender, education, income, and race regardless of ethnicity. Hispanicity accounts for higher rates of depression on the PHQ 9 than those who said no or prefer not to say.

Presenter: Lynsey Torres
Poster Number: 119
Home Institution: University of Texas Rio Grande Valley
Program: SOAR-REEU
Faculty Mentor: Jacob Jungers
Poster Title: Constructing a predictive model for soil water nitrate concentrations based on the composition of a given soil
Abstract: Heavy fertilizer usage in the Midwestern United States has led to groundwater contamination through nitrate leaching, which is especially problematic for individuals who source their water from private wells. Consumption of nitrate contaminated water can lead to infant mortality and cancer in adults. The objective of this study is to create a predictive model for soil water nitrate concentrations based on the clay and organic matter content of a given soil. Samples from two research sites in Minnesota will be taken, as well as soil water samples from lysimeters. These soil water samples will be analyzed for their nitrate concentrations. Soil texture is known to influence the percolation rate of water through the soil, which impacts the movement of nitrate in the soil. Organic matter is located at the surface of the soil, while clay content increases with soil depth. Since the lysimeters will only capture water of the first 24 inches of soil, we hypothesize that organic matter will be a better predictor for soil water nitrate concentrations than clay content. The results of this study may help farmers determine if their lands are at risk of nitrate leaching and groundwater contamination based on the composition of their soil.

Presenter: Elijah Tramm
Poster Number: 146
Home Institution: University of Minnesota
Program: Independent Research
Faculty Mentor: Nicola Grissom
Poster Title: Amphetamine induced repetitive behavior in a mouse model of 16p11.2 hemi-deletion
Abstract: In neurodevelopmental conditions such as autism spectrum disorder (ASD), repetitive behaviors are common. These repetitive behaviors can be a sign of stress or distress, and can even be harmful, as in head-banging. 16p11.2 hemi-deletion, one of the most common copy number variants (CNVs) associated with ASD, can be modeled in mice, allowing us to model repetitive behaviors. This modeling allows us to better understand why these symptoms are common in ASD and related conditions, and the mechanisms mediating these behaviors. 16p11.2 hemi-deletion has been shown to alter striatal dopamine receptor expression, where dopamine is known to regulate locomotor behavior. In this experiment, we injected 16p11.2 and wild-type mice with amphetamine to increase striatal dopamine levels to investigate whether it had an effect on repetitive behaviors. Mice were put in an open-field chamber after injection and recorder their behavior. These recordings were analyzed using the pose estimation software SLEAP, to detect fine-grained locomotor behavior. We found a significant main effect of dose and genotype on angular velocity. These results suggest that altered striatal dopamine signaling seen in 16p11.2 hemi-deletion lead to repetitive locomotor behavior. This helps to explain the prevalence of these behaviors in ASD, and what mechanisms cause them.

Presenter: Ruchik Trivedi
Poster Number: 53
Home Institution: Johns Hopkins University
Program: LSSURP
Faculty Mentor: Eric Batchelor
Poster Title: p53 and NF-kB signaling dynamics in MCF7 breast cancer epithelial cells
Abstract: As a response to various different types of cellular stress the transcription factor p53 undergoes different dynamics which are responsible for cell fates. However, different stresses have been shown to generate the same p53 dynamics but different cellular responses. Our hypothesis is that this discrepancy is caused by the integration of dynamics from other signaling pathways. We sought to determine how NF-kB pathway activation affected p53 dynamics, and vice versa. To determine the relationship, we tracked p53 expressions or NF-kB localization in cells treated with NF-kB activators, p53 activators, or both. We found that TNFa activated p53 and dual treatment of TNFa and doxorubicin lead to unique signaling dynamics in both the p53 and NF-kB pathways. These findings suggest crosstalk exists between the two pathways to alter dynamic signaling. Furthermore, the unique p53 expression dynamics generated from co-activation of the p53 and NF-kB pathways provides novel insight into how multiple signals may alter p53-dependent gene regulation to control cell fate in a complex tissue environment.

Presenter: Hiermiela Tsegai
Poster Number: 75
Home Institution: Department of Family Medicine and Community Health
Program: M-ASCEND
Faculty Mentor: Hannah Cory
Poster Title: Fruit and Vegetable Impact on Reduction of Cancer Risk in Relation to Food Deserts
Abstract: Food deserts and lack of access to nutritious food has been suggested to correlate with having a poor diet. Lack of a proper diet due to these barriers can result in unhealthy weight gain that can later lead to being overweight/obese. The prevalence between the link of being overweight/obese with cancer is increasingly growing. Certain communities are more at risk for these outcomes due to the food apartheid in their areas. We are measuring the impact of fruit and vegetables on the risk of cancer.
The EPIC study recruited 23 cohorts ranging from a variety of countries and calibrated dietary intakes through a computerized recall. Another study completed a meta-analysis also through cohort studies and doing a systematic review.
Results (Graphs and tables)
In the EPIC study, there was a reduction risk with fruit consumption in cervical cancer, but in terms of fiber intake, there was a significant reduction risk in Liver, Biliary, and Breast cancer.
In the systematic review, for every 200g/d of fruits and vegetables consumed, there seems to be a 93% reduction risk of total cancer.
Of specific types of fruits and vegetables there were significant inverse associations between cruciferous and green-yellow vegetables and total cancer risk.

Presenter: Albright Tuah
Poster Number: 54
Home Institution: Bard college
Program: LSSURP
Faculty Mentor: Peter Kang
Poster Title: Megf10 deficiency alters the expression of skeletal muscle-related Notch signaling pathway components
Abstract: MEGF10, a critical transmembrane receptor expressed in developing myoblasts and muscle stem cells (satellite cells), is associated with an inherited muscle disease generally known as MEGF10 myopathy, with the classic severe form of the disease known as early-onset myopathy, areflexia, respiratory distress, and dysphagia (EMARDD). Prior studies revealed an interaction between Megf10 and Notch1, a core receptor in the Notch signaling pathway important for skeletal muscle development. Recently, biallelic pathogenic variants in JAG2 and POGLUT1, which encode a canonical Notch ligand and a Notch glycosylation protein, respectively, were associated with muscular dystrophy. The Notch signaling pathway is crucial for maintaining satellite cells in a quiescent state. To explore these interactions further, we examined selected protein expression levels in Megf10-/- mouse gastrocnemius muscle via western blot. We found that the expression levels of the Notch pathway proteins Jag2, Poglut1, and hnRNPL decreased, while those of Notch3 increased in the setting of Megf10 deficiency compared to wild type muscle. These findings reinforce the molecular links between Megf10 and other Notch signaling pathway components, particularly two other Notch-related skeletal muscle disease genes. Future studies promise to illuminate Notch signaling pathway-related therapeutic targets that could apply to multiple Notch signaling pathway-related skeletal muscle diseases.

Presenter: Keiranin Tyson
Poster Number: 111
Home Institution: University of Minnesota- Duluth
Program: SCoPE
Faculty Mentor: David Stenehjem
Poster Title: Comparison of Clinical Outcomes of Metastatic Breast Cancer Patients Between Races in Relation to Receptor Status
Abstract: Introduction: Treatment disparities in various patient populations for diseases, particularly metastatic breast cancer (mBC), affect black patients more due to socioeconomic factors. Genetic factors also influence treatment effectiveness based on tumor biomarkers. The study's primary objective is to determine biomarker testing patterns in different racial groups with mBC. **Methods**: This is a retrospective observational study, using an extensive electronic health record database, Flatiron (FI), containing data from health centers (both academic and clinical). Patients included had a diagnosis of mBC between January 1st, 2011- December 31st, 2022 and must be ≥ 18 years of age with HER2 and HR status available. These data includes patients' demographics, biomarker testing, treatment, and survival outcomes. Race was categorized as Black, White and all other races were combined. Descriptive statistics were utilized. **Results**: Among 6942 eligible patients, 4466 (64%) were white, 744 (11%) black, and 1732 (25%) belonged to other races. Median age varied: white= 65, black=60, others=65. Additional data will be provided at time of presentation. **Conclusion**: Identifying disparities in biomarker testing and treatment outcomes can benefit patients significantly. Interventions tailored to eliminate disparities and ensure optimal treatment based on tumor characteristics, thus improving care for mBC patients.

Presenter: Sravanti Vadrevu
Poster Number: 101
Home Institution: University of Minnesota - Twin Cities
Program: MSROP
Faculty Mentor: Ji-youn Shin
Poster Title: Asset-Based Approaches to Supporting Mental Health: Community-Based Participatory Design with Students from Underserved Groups
Abstract: Existing mental health services are built from a Western perspective and support people from mainstream cultures. However, this perspective often falls short when attempting to support international students from different cultures. While there is much research on mental health and students, there is limited focus on international students, and many studies did not incorporate the perspectives of counselors and international students. In this project, we work with mental health counselors and international students at the University of Minnesota to identify design implications of technology-mediated mental health support solutions. By conducting semi-structured interviews and co-design activities, we capture the emerging issues with regard to managing international students' mental wellness. As an initial step, we conducted pilot interviews with counselors and students. Our results illustrated the strengths of international students (e.g., independence and responsibility), and their conceptions and concerns about counseling services, etc. Identified implications will be applied to the development of technology-mediated solutions for international students and counselors.

Presenter: Jenny Vang
Poster Number: 89
Home Institution: University of Minnesota: Twin Cities
Program: McNair
Faculty Mentor: Mary Butler
Poster Title: U.S Food Insecurity Interventions in Healthcare Systems - A Systematic Review
Abstract: A systematic review of literature examining patients in the United States that are food insecure, lower income, or presumed low-income status, which impacts an individual's quality of life. Food insecurity (FI) can be defined as one's lack of access to food sources and unmet nutritional needs due to social, economic, cultural, and geographic factors. Food insecurity interventions may offer access to healthy or fresh food, nutrition education, food vouchers, referrals, and direct cash while reducing food insecurity. The purpose of this systematic review is to examine the effectiveness of US-based food insecurity interventions. English-language studies published after 2018 that addressed US-based food insecurity interventions that may be used by health systems with patients described as food insecure, low-income, or presumed low-income were included in the review. The main outcomes were food insecurity status, healthcare costs, utilization of intervention(s), and health of patients with diet-related chronic disease or illnesses. Additional outcomes include changes in health behavior, patient or provider acceptability and/or satisfaction. PICO Portal was used to screen studies and extracted data will be recorded in an Excel spreadsheet. Insights of current food insecurity interventions can inform program development and reduce food insecurity in the US.

Presenter: Andrea Vargas
Poster Number: 55
Home Institution: University of Puerto Rico- Rio Piedras
Program: LSSURP
Faculty Mentor: Peter Gordon
Poster Title: Identifying Mechanisms of 6-Mercaptopurine Resistance in ALL Therapy
Abstract: Acute lymphoblastic leukemia (ALL) is the most common pediatric cancer. The anti-metabolite 6-mercaptopurine (6-MP) is a critical component of ALL therapy and forms the backbone of the 2+ years of maintenance therapy that is essential for long-term cures. Accordingly, defining and targeting mechanisms of 6-MP resistance is critical for improving ALL outcomes. Herein, we used proliferation and apoptosis assays to show that ALL cells in regular tissue culture media (RPMI) are highly sensitive to 6-MP but become almost entirely resistant when cultured in Human Plasma-like Media (HPLM), which was formulated to mimic the salt and metabolite composition and concentrations of human plasma. Moreover, based on the differences between RPMI and HPLM we hypothesized that the purine nucleotide precursor hypoxanthine, present in HPLM and absent in RPMI, mediates 6-MP resistance in HPLM. In support, we found that supplementation of RPMI media with hypoxanthine enhanced ALL resistance to 6-MP, like the
effect seen in HPLM. This work demonstrates that the ALL microenvironment, or niche, enables 6-MP resistance in ALL cells and suggests that targeting hypoxanthine metabolism may enhance 6-MP efficacy.

Presenter: Nathan Velazquez
Poster Number: 56
Home Institution: University of Connecticut
Program: LSSURP
Faculty Mentor: Hinh Ly
Poster Title: Analyzing Mouse Anti-vector Immunity using a LCMV and SARS-CoV-2 Vaccine Cocktail
Abstract: Viral vector vaccines are harmless, non-pathogenic, recombinant viruses which have the ability to deliver foreign antigens to the immune system and are immunogenic without an adjuvant. Arenaviruses are single stranded, bi-segmented RNA viruses that directly target antigen presenting cells (APCs) such as macrophages and dendritic cells. Pichinde virus (PICV) is an arenavirus that doesn't cause disease in humans or elicit strong anti-vector immunity. Our lab has utilized PICV (strain P18) and a reverse genetics system to create a recombinant, tri-segmented PICV vaccine (rP18tri) which allows for two genes of interest (GOI) to be cloned into the genome and expressed as nonessential genes. It has also been shown to elicit strong cellular and humoral immune responses. In the present study, mice were immunized with an rP18tri vaccine cocktail containing the GOIs LCMV NP and SARS-CoV-2 spike protein receptor-binding domain (RBD) and N protein. Peripheral blood from immunized mice were used to analyze T cell responses by tetramer staining and evaluate antibody specificity by enzyme-linked immunosorbent assay (ELISA), respectively. Gene expression and localization of the inserted GOIs were assessed via in vitro infection and visualized by indirect fluorescent antibody assay (IFA).

Presenter: Connor Wayne
Poster Number: 57
Home Institution: North Hennepin Community College
Program: LSSURP
Faculty Mentor: Jay Bundy
Poster Title: The Cost of Cooperation
Abstract: Kluyveromyces Lactis is a strain of yeast that has been evolved to exhibit unicellular and multicellular phenotypes. This makes it a favorable model organism for studying the origins of multicellular life. To identify possible environmental factors that make multicellularity a benefit, we looked at the cost of cleaving a disaccharide into its monosaccharide components. Since K. Lactis in unable to uptake disaccharides, it must excrete an enzyme into its environment to break them down into monosaccharides. This process has a cost for the producing cell and is vulnerable to exploitation. To test our hypothesis that multicellular K. Lactis will experience more rapid population growth then the single cell strains because of their structure, we created six environments with either the disaccharide maltose, lactose, or sucrose or an equal amount of their monosaccharide components. The unicellular and multicellular variants were incubated for six days with daily transfers to new media and population size was measured every three days. We found that contrary to our hypothesis, the unicellular variants experienced rapid population growth while the multicellular variants experienced slower or negative population growth. Single day growth rates measured in a TECAN produced similar results. Future work includes investigating cells per multicellular colony.

Presenter: Michael White
Poster Number: 90
Home Institution: University of Minnesota-Twin Cities
Program: McNair
Faculty Mentor: Steven Harris
Poster Title: Transracial Adoption and The Polarity of Racial Identity
Abstract: Transracial adoption in the United States can create barriers to developing a solid racial identity, and cultural development among transracial adoptees (TRA). These barriers are especially present in Black TRAs raised by White parents due to conflicting racial lenses and a lack of exposure to a TRA's own racial and cultural background. This book review on *Transracial Adoption, Identity, and Racism in the United States* by Kyrai E. Antares aims to highlight the importance of supporting the development of racial and cultural identity among Black TRAs. Antares is a licensed psychologist, professor, anti-racism consultant, and White adoptive mother of two with a mixed-race child. The book features interviews with nine Black emerging adults and their experiences of being raised by White parents, supported by Antares' research on the subject. This book review will also have a personal and individual component as I am a Black TRA myself. I will call upon my own experiences to drive home the book's potential real-world applications. The completed book review will be submitted for publication in the Journal of Marital and Family Therapy.

Presenter: Mia Wilcox
Poster Number: 127
Home Institution: Tulane University
Program: UMN-Pain
Faculty Mentor: Carolyn Fairbanks
Poster Title: Agmatine Acting Through Microglia in Mitigating Chronic Pain
Abstract: Chronic Pain holds a global burden in today's world and is estimated that over 51.6 million US adults suffer from chronic pain. Left uncured, harmful, and addictive drugs such as opioids have been used to lessen this burden of chronic pain but it poses psychological and addictive side effects in addition to hyperalgesia unsuitable for long-term treatments. Researchers aim to develop a drug that can relieve chronic pain without the harmful risks of addiction and hypersensitivity. Agmatine has emerged in studies as a treatment for a myriad of complex diseases; however, it is still unknown if agmatine works through microglia to prevent development of chronic pain. We will use Immunohistochemistry to stain for IBA1 as well as synapse markers such as PSD-95 and synaptophysin in mice pre-treated with agmatine or saline, and a naive group for control. These mice will then be injured on their hind left paw utilizing the CFA-injected inflammatory pain model. We will explore the effects of agmatine using IHC and microscopy to observe microglia in the spinal cord. We believe our research will show that agmatine promotes anti-inflammation via microglia in the dorsal horn of the spinal cord and in return aid in mitigating chronic pain.

Presenter: Tabitha Williams
Poster Number: 120
Home Institution: Clemson University
Program: SOAR-REEU
Faculty Mentor: Brandon Miller
Poster Title: Growth and Resilience of Forestiera pubescens in Water-Stressed Minnesota Environments
Abstract: Stretchberry (*Forestiera pubescens),* a deciduous shrub native to the southwestern region of the US, demonstrates ornamental value, cold hardiness in Minnesota, and tolerance of droughts and periodic flooding. We aim to introduce this plant to Minnesota to increase plant biodiversity and landscape resiliency. It could be a candidate if this species tolerates extreme soil moisture conditions. To test *F. pubescens* capabilities, we evaluated its soil moisture tolerances.
The greenhouse experiment of 44 container-grown *F. pubescens* subjected plants to either complete inundation (flood), drought (5% moisture), extreme drought (undetectable soil moisture), or consistent watering (control). Soil moisture was recorded every other day using an HH2 Moisture Meter. Non-treated controls were watered every other day. Drought and extreme drought treatments were watered when soil moisture by volume reached 5% or was undetectable (0%). Flood-treated plants were inundated up to the surface of the potting substrate. After 14 days, growth was recorded by measuring leaf surface area with a surface area meter, leaf greenness with a SPAD Meter, shoot extension in cm, and leaf osmotic potential with vapor pressure osmometry.
Results indicate that *F. pubescens* preferred the controlled watering but tolerated each soil-moisture treatment suggesting its suitability to grow in water-stressed Minnesota landscapes.

Presenter: Jocelyne Yataco
Poster Number: 58
Home Institution: Florida International University
Program: LSSURP
Faculty Mentor: Alik Widge
Poster Title: Optogenetic Deep Brain Stimulation and its effect on Cognitive Flexibility
Abstract: Deep Brain Stimulation (DBS) can improve the symptoms of treatment resistant mental illness. A rat model used to study electrical DBS is already in existence, but there is no understanding of what circuits should be stimulated. A previous study in rats using electrical DBS showed that there was a reduction in reaction time with no increase in errors during a behavioral decision making task. This study attempts to develop a rat model of optogenetic DBS, to precisely target circuits that are involved in cognitive flexibility. We implant bilateral fibers to the dorsomedial or mid striatal targets that drive cognitive flexibility. These fibers will deliver 130 Hz pulses of 465 nm light for 5 ms. Rats will be injected with the ChETA opsin in either the cingulate, prelimbic, infralimbic, or medial orbitofrontal cortex. After the implantation and injection, the rats undergo set shift and probabilistic reward learning with reversal task (two arm Bandit). We hypothesize that optogenetic DBS stimulation in rats provides specificity to brain circuits involved in cognitive flexibility and decision making. This study will pave the way for precision targeting of circuits involved in OCD.

Presenter: Saathvika Yeruva
Poster Number: 140
Home Institution: University of Minnesota-Twin Cities
Program: UROP/URS
Faculty Mentor: Aaron Goldstrohm
Poster Title: Determining the regulation of Vacuolar ATPases (V-ATPases) by the RNA-binding protein Brat via CRISPR tagging.
Abstract: The *D. melanogaster* protein Brat is essential for development and regulates other genes that control differentiation in stem cells. Brat is an RNA-binding protein that recognizes unique sequences in messenger RNAs (mRNA) to regulate protein expression. Brat is reported to both repress translation and degrade of mRNAs. RNA-seq was utilized to identify RNAs that increase in abundance when Brat is reduced. Out of the ~200 genes that are up-regulated, we identified high-confidence Brat targets. One surprising subset was the V-ATPase genes, which regulate cell pH. Specifically, *Vha100-2* mRNA is down-regulated by Brat and contains Brat motifs in the 3' untranslated region (3'UTR). We aim to use CRISPR to add epitope tags to V-ATPase genes in cultured *D. melanogaster* cells. This allows us to easily track their protein levels via Western Blot. Once we generate these cell lines, we expect to see V-ATPase protein levels change the same way their RNA levels do. We have determined the genomic sequence for the V-ATPase genes and predicted how the insertion of these epitope tags could affect the structure of the V-ATPase complex. Finally, we cloned the necessary plasmids to begin the process of CRISPR.

Presenter: Salma Yusuf
Poster Number: 76
Home Institution: South high school
Program: M-ASCEND
Faculty Mentor: Silvia Balbo
Poster Title: Investigating DNA Damage in the Mouth in Relation to Oral Hygiene
Abstract: We investigated the relationship between oral hygiene and DNA damage in the mouth; we expected that people who brush, floss, and go to the dentist less would have more DNA damage than people who brush, floss, and go to the dentist more. To do this, we sampled 49 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 using an ELISA for 8-OHdG, a common DNA adduct. We found that people who brush, floss, and go to the dentist less do not have higher concentration of 8-OHdG than people who do. Therefore our hypothesis was not supported. This likely occurred because other factors affect DNA damage more than oral hygiene.

Presenter: Christopher Zajac
Poster Number: 141
Home Institution: University of Minnesota
Program: UROP/URS
Faculty Mentor: Anna Selmecki
Poster Title: Chimeric FKS121 Gene in Drug Resistant Candida glabrata Clinical Isolates
Abstract: *Candida glabrata* is an opportunistic human fungal pathogen that is an important health concern due to its intrinsic and acquired ability to resist antifungal drugs. Six clinical isolates of *C. glabrata* from a single patient over the course of three weeks were compared computationally and phenotypically. All six isolates were sent for whole genome sequencing by Illumina, mapped to the reference genome CBS138, from which genotypic variances were determined. Ten single nucleotide polymorphisms separated the six strains from each other, with two apparent isolate groups sharing different variances. A deletion in a well-documented gene associated with echinocandin drug resistance, *FKS1*, was observed in only one of the two genotypic groups of isolates. Through long read sequencing by PacBio and *de novo* assembly with Flye, it appears that a homologous region of a functionally redundant gene, *FKS2*, was inserted into the *FKS1* deletion. This translocation likely resulted in a chimeric *pFKS121* gene, which may impact phenotype. The four isolates with the *FKS121* chimera genotype had higher values of resistance for micafungin, an echinocandin, and fluconazole, which may indicate pan-drug resistance, compared to the other genotypic group of two isolates, which had a separate predicted genotypic mechanism for drug resistance.

Presenter: Elizabeth Zewdu
Poster Number: 59
Home Institution: Macalester College
Program: LSSURP
Faculty Mentor: Li-Na Wei
Poster Title: P19 Embryonal Carcinoma Cell Differentiation into Motor Neuron-Like
Abstract: Cellular retinoic acid binding protein 1 (CRABP1) has been identified as being highly expressed in motor neurons (MN), and its significance in MN diseases such as amyotrophic lateral sclerosis (ALS) has been highlighted. However, the exact role of CRABP1 in maintaining MN health and function remains incompletely understood. This study aims to investigate the relationship between CRABP1 and MNs using an in-vitro model with CRABP1 Knock-out (CKO) and Wild Type (WT) P19 embryonal carcinoma cells. The P19 cells were exposed to Sonic hedgehog protein (SHH) and retinoic acid (RA) to differentiate into MNs over a 10-day period. The morphological characteristics were monitored, and MN specific gene expression of the differentiated cells were assessed by using RT-qPCR. It was noticed the CKO cells and WT cells exhibited similar morphological characteristics upon differentiation into MN. However, the RT-qPCR analysis revealed significantly different expression levels of CRABP1 between the two groups, suggesting that CRABP1 plays a crucial role in regulating gene expression in MNs. This finding emphasizes the potential of using this in-vitro model to investigate the impact of CRABP1 on MN function and disease progression, making it a promising tool for testing motor neuronal therapeutics.

Presenter: Zachary Zhou
Poster Number: 142
Home Institution: Department of Political Science - College of Liberal Arts - UMN
Program: UROP/URS
Faculty Mentor: James Hollyer
Poster Title: Manipulation of COVID-19 Statistics and Career Incentives of Local Leaders: Information Problems in Chinese Bureaucracy
Abstract: This study empirically examined the hypothesized correlation between Chinese local officials' manipulation of COVID-19 death reports and their career advancement. Using province-level COVID-19 data from the National Health Commission of China and officials' promotion data, we investigated whether officials under-reported COVID-19 statistics as a mechanism for securing career progression. Our research employed regression analyses and fraud detection techniques to analyze COVID-19 data and officials' promotional prospects. We did not find a significant association between lower reported COVID-19 statistics and the probability of officials' promotions. In addition, we found a general pattern of manipulation in the reported COVID-19 data. These findings suggest that bureaucratic incentives might distort local officials' data-reporting behavior. However, there was no evidence that officers who reported a lower number of COVID-19 statistics were more likely to get promoted.

Presenter: Abby Zumbrunnen
Poster Number: 77
Home Institution: University of Minnesota
Program: M-ASCEND
Faculty Mentor: Helen Parsons
Poster Title: Legal Challenges faced by Cancer Patients: Financial Implications
Abstract: Cancer is an extremely costly disease, by 2030 cancer costs are projected to reach $246 billion. Millions of Americans face this financial burden, often due to issues that could be improved with help from lawyers and legal services. For example, struggles arise related to income, food, disability benefits, health insurance, and legal status issues. Cancer Legal Care (CLC) is a nonprofit located in the Twin Cities area which provides free legal services to people with cancer and their families. In this study, A 34 question survey was developed with questions that covered the following topics: CLC experience, cancer and finances, Social Security Disability Benefits, and demographics. In partnership with CLC, 400 surveys were sent out to CLC clients. A total of 95 surveys were completed and analysis was conducted on the categories of financial experience with cancer demographics. The present study uses that analysis to investigate the financial implications of a cancer diagnosis across varying demographics.