

CURC

2023



**Celebrate Undergraduate
Research and Creativity**

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ABOUT CURC

Celebrate Undergraduate Research and Creativity is an annual event held in April that showcases the creativity and scholarship of undergraduate students across various disciplines. The showcase culminates in a closing ceremony that recognizes all participants and honors award winners from events throughout the year.

History of CURC

CSU's Department of Biochemistry and Molecular Biology was responsible for the first formal research symposium on campus. Over time, that event grew into a college-wide event for students in the College of Natural Sciences (CNS).

Around 1989-1990, the Office of the Provost began working with CNS to facilitate the expansion of their annual research poster session into the university-wide event that we know today as the Celebrate Undergraduate Research and Creativity Showcase. With the inclusion of all disciplines represented at CSU, CURC showcases much more than traditional research. Audiences attend CURC as much for the writing, artwork, music, and design projects as they do to observe the research presentations.

From a handful of students presenting their research from a single department decades ago, to over 500 students presenting their research from across the university today, CURC continues to be an evolving event that captures the spirit, creativity and scholarship of undergraduate students at CSU.

ACKNOWLEDGEMENTS

We express our gratitude to the following people and departments:

CURC Steering Committee 2023

College of Liberal Arts: Ellie Light

Warner College of Natural Resources: Chris Myrick

Walter Scott College of Engineering: Christie Peebles

College of Natural Sciences: Nancy Levinger

College of Health and Human Sciences: Matt Hickey

College of Business: Ken Manning

College of Veterinary Medicine and Biomedical Sciences: Alan Schenkel

College of Agricultural Sciences: Thomas Borch

Office for Undergraduate Research and Artistry: Louise Allen, Courtney Ngai, Michelle Matter

CURC is generously supported by the **Office for Undergraduate Research and Artistry, The Institute for Learning and Teaching** and **CSU's School of Music Theater and Dance**.

Each year various CSU units, institutes, and colleges sponsor student awards to recognize creative and scholarly excellence presented at CURC. The sponsors in 2023 include:

- [The Energy Institute](#)
- [The Graduate School](#)
- [The College of Liberal Arts](#)
- [The Colorado School of Public Health at Colorado State University](#)
- [The Data Science Research Institute](#)

JOURNAL OF UNDERGRADUATE RESEARCH

The Journal of Undergraduate Research (JUR) is a peer-reviewed, undergraduate journal registered with the Library of Congress that accepts submissions of any subject, from any undergraduate institution. We receive hundreds of sub missions for publication every year, from institutions ranging from small liberal arts colleges to international institutions. The review process for publication includes peer, graduate, and faculty referees, ensuring that the Journal publishes competitive material that follows the Journal's standards for academic, creative, and passionate work.

JUR accepts any work created by an undergraduate including, but not limited to:

- Research
- Review
- Journalism Article
- Creative Writing (including fiction, non-fiction, poetry, and prose)
- Photography and Visual Art (must be accompanied by a brief description)

If you are interested in publishing with JUR, go to jurpress.org for a full list of guidelines.

The logo for JUR PRESS features the letters 'JUR' in a large, bold, dark red serif font. Below 'JUR', the word 'PRESS' is written in a smaller, gold-colored serif font. The 'J' in 'JUR' is particularly large and stylized, extending downwards.

A LETTER FROM THE OURA DIRECTOR

Dear CSU Community,

The Celebrate Undergraduate Research and Creativity (CURC) 2023 Showcase has arrived. This is an exciting event with a long history. More than 3 decades ago, the Office of the Provost began working with College of Natural Sciences to facilitate the expansion of their annual research poster session into the university-wide event that we know today as the Celebrate Undergraduate Research and Creativity Showcase. With the inclusion of all disciplines represented at CSU, CURC showcases much more than traditional research. This year CURC will feature over 240 research and service-learning posters, dozens of oral presentations, visual and performing arts, and written submissions.

To all of the students who are participating, let me just say how impressed I am by the level of dedication, skill, and creativity that you've demonstrated. You spent many hours researching and creating your projects—and crafted posters, presentations, art and performances of exceptional quality while doing so. Each and every one of you should be proud of this accomplishment!

To our volunteers, thank you for helping the day of CURC run smoothly. To the editors of the Journal for Undergraduate Research, especially Alex Silverhart, Abi Somers, and Theresa Farley thank you for putting this abstract booklet together and for making CSU proud to be home of JUR.

We are exceedingly grateful to the judges who dedicate their time to thoughtfully review posters and other works and provide feedback for students. We cannot pull off this event without your extensive help, as well as your support and encouragement. Thank you, thank you, thank you!

Thank you to The Institute for Learning and Teaching (TILT) for helping to support a campus-wide event of this scale. Thank you to the School of Music, Theater, and Dance for hosting us at the University Center for the Arts and for being amazing collaborators to make CURC feel welcome. We thank the Energy Institute, the Graduate School, the College of Liberal Arts, the Data Science Research Institute, and the Colorado School of Public Health at Colorado State University for sponsoring student awards. Many cheers to everyone who helped make CURC 2023 a success!

Have a great CURC and remember that Research and Creativity are for everyone!



Louise Allen, Ph.D. (she/her/hers)
Director of Student Engagement
Program Director, Office for Undergraduate Research and Artistry ([OURA](#))
The Institute for Learning and Teaching ([TILT](#))
Colorado State University

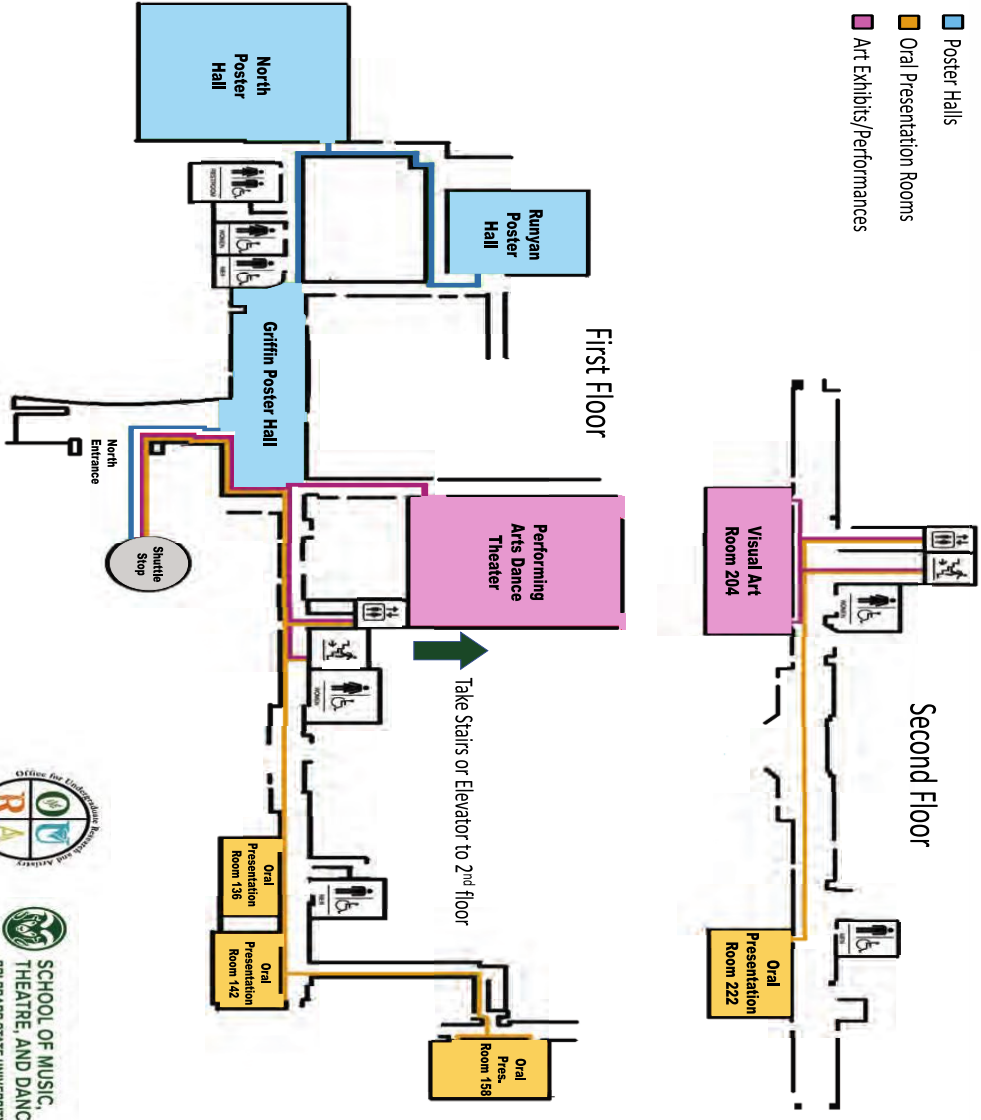
LAYOUT OF PRESENTATIONS



COLORADO STATE UNIVERSITY

C **U** **2** **0** **2** **3**
R **C** **3**
 CELEBRATE UNDERGRADUATE RESEARCH AND CREATIVITY

- Poster Halls
- Oral Presentation Rooms
- Art Exhibits/Performances



SCHOOL OF MUSIC, THEATRE, AND DANCE
 COLORADO STATE UNIVERSITY

SCHEDULE OF EVENTS



Celebrate Undergraduate Research and Creativity



Colorado State University

2023 Schedule of Events

What?	When?	Where?
1 st Shuttle	7:50am	Between LSC to UCA
Check-in opens	8:00am	UCA/Griffin Lobby
Morning snacks	8:00 - 9:30am	UCA/Griffin Lobby
CURC 2023 begins	9:00am	-
Posters I	9:00 – 10:15am	Poster Halls
Performing Arts	9:30 – 10:45am	Dance Theater
Posters II	10:15 – 11:30am	Poster Halls
Lunch	11:30am -1:00 pm	UCA/Griffin Lobby
Visual Arts	12:30pm – 1:45pm	Room 204
Talks 1	2:00pm – 3:15pm	Rooms 136, 142 & 222
Talks 2	3:30 – 4:45pm	Rooms 136 & 142
Last shuttle	4:45pm	Departs UCA
CURC 2023 ends	5:00pm	-

10 Dogs undergoing chemotherapy treatment experience changes in gut dysbiosis.

Juan Aragon

Dr. Elizabeth Ryan

Type: Research Poster

Chemotherapy can cause adverse gastrointestinal side effects in dogs and people. The overall objective of this study is to assess the impact of chemotherapy treatment with CHOP (cyclophosphamide, hydroxydaunorubicin, oncovin, and prednisone) on gastrointestinal (GI) dysbiosis in dogs with lymphoma. We hypothesized that CHOP treatment would result in increased gut dysbiosis in compared stool samples from canine patients pre and post-chemotherapy. Dogs undergoing chemotherapy for lymphoma (n= 26) were consented to provide stool and blood samples for targeted metabolite and microbiota analysis including, but not limited to phytosterols, bile acids, and commensal bacterial populations. A dysbiosis index was calculated for each dog that takes account of 7 bacterial taxa, primarily described at the genus level. A dysbiosis value greater than 2 indicates severe dysbiosis, a value of 0-2 indicates moderate dysbiosis and a value less than 0 indicates normal function. The pre-chemotherapy dysbiosis index analysis measurements showed (n=8) with severe dysbiosis, moderate dysbiosis (n=3), and normal function (n=12). There was an increase in the number of dogs with gut dysbiosis after CHOP treatment (n=14). There were 4 dogs with decreases in dysbiosis, and 5 without any change. A fold change of -0.07 was observed between the start and end of chemotherapy treatment. While preliminary, the findings in this pilot study suggest that canine dietary intervention may be beneficial to dogs undergoing chemotherapy treatment to reduce risk for dysbiosis, and merit continued attention for nutrient-rich feeds to maintain gut health during chemotherapy and to restore gut health after chemotherapy.

<https://symposium.foragerone.com/csu-curc2023/presentations/54827>

5 Nutrient Challenge During Gestation on Lamb Growth and Development

Sarah Gabel

Dr. Caitlin Cadaret, Ellen Roberts, Rachael Stucke, Alison Kuderka, Terry Engle

Type: Research Poster

During the winter months when pregnant ewes are typically in peak gestation, nutrient dense feed can be hard to come by. It is well studied that reducing feed intake has an impact on lamb growth and development; however, this is typically done by reducing the overall quantity of feed rather than the quality as would be seen on winter range. Thus, the objective of this study was to investigate how the growth and development of newborn lambs was impacted based on whether their mother consumed a diet that met their nutritional needs or one that was restricted in protein and energy. Time bred ewes were individually housed and fed one of two diets during gestation. Control ewes were fed a diet meeting 100% of NRC requirements for the entirety of gestation. Nutrient restricted ewes were pair to a control for quantity but received a diet that contained approximately 70% of their energy requirements and 50% of their protein requirements from 30-125 days of gestation (dGA), after which they were re-alimented to the same feed as the control ewes. After birth we took weights daily for the first 30 days of life and morphometrics weekly to observe how lambs grow and develop. By the end of the study, we predict that the lambs who were on a nutrient restricted diet during gestation will not grow and develop as well as those who were on a normal nutritional diet. This would be a logical conclusion as the lambs on a nutrient restricted diet would not meet all their nutritional needs to compete with nutritionally met peers and will be smaller and not grow as fast. The results of this study will be beneficial to shepherds when deciding what to feed their flocks during pregnancy and how that decision will impact their lamb crop.

<https://symposium.foragerone.com/csu-curc2023/presentations/54817>

11 Greenhouse-based method for studying disease development in rice for an emerging pathogen, *Pantoea ananatis*

Mitchell Giebler

Dr. Jan Leach, Emily Luna, Yulin Jia

Type: Research Poster

New and emerging pathogens constantly threaten the security of important crops globally. A recently characterized pathogen of rice that was first observed in the United States in 2021, *Pantoea ananatis*, causes leaf lesions, panicle sterility, and reduced yields to susceptible varieties. To date,

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repeatable methods to characterize and study symptomology and development of the disease caused by *P. ananatis* in rice plants are unreliable. This lack of repeatable methodology has hindered the identification of resistant cultivars of rice. Here we report a robust method for inoculating plants with *P. ananatis* and monitoring symptom development in several rice cultivars commonly grown in the United States. The knowledge gained from this method will provide important information for growers to mitigate the economic impact of this emerging pathogen.

<https://symposium.foragerone.com/csu-curc2023/presentations/54888>

11 Testing relevant rice DNA-regulatory elements involved in plant adaptation to combined biotic and abiotic stresses.

Mitchell Giebler

Dr. Jan Leach, Dr. Federico Martin, Kamal Neupane

Type: Research Poster

As global temperatures increase, more intense climate cycles are expected to affect crop production worldwide. One strategy to mitigate the detrimental effects of these cycles is to breed for more resistant cultivars against biotic and abiotic stresses (climate smart breeding). Plant adaptation to stressful environments requires changing the activity of thousands of genes involved in different molecular pathways. This modulation is mostly dictated by cis-regulatory DNA elements, known as CREs, or combinations of multiple CREs in modules (CRMs). CRE/CRMs are found in promoter regions of genes, and many of them are shared by genes involved in response to either single or combined stresses. For example, we have shown that many genes involved in broad-spectrum disease resistance (BSDR) share a set of CRMs in rice. Moreover, genetic polymorphisms modifying CRE/CRMs can significantly impact gene activity and plant responses to stresses. The goal of our project is to experimentally test CRE/CRMs involved in plant adaptation to combined biotic and abiotic stresses. Using an expression assay known as STARR-seq (self-transcribing active regulatory region and sequencing), we are currently cloning promoter regions of known BSDR genes showing polymorphisms in key CRE/CRM elements. Vectors containing these promoter regions driving the expression of a reporter gene will be transiently infiltrated in *Nicotiana benthamiana* as well as barley and their activity will be measured via qPCR. Our goal is to identify relevant CRE/CRMs

affecting gene expression and analyze the possibility to develop molecular markers based on their polymorphisms that could be used in breeding programs.

<https://symposium.foragerone.com/csu-curc2023/presentations/54885>

12 FTIR Analysis of Smoke Tainted Hops

Amy Gola

Dr. Jessica Prenni, Brandon Sandoval

Type: Research Poster

The Pacific Northwest (PNW) is the center of hop (*Humulus lupulus*) production in the United States, with effectively 100% of commercial hops being grown in this region. The PNW is also facing increasing wildfire activity, presenting challenges to growers and brewers over potentially smoke-tainted hops. While the effects of wildfire smoke on exposed grapes have been well studied by the wine industry, the effects on hops and beer have only just started to be investigated. Current studies have shown that compounds that are characteristic of wildfire smoke can be detected in smoke-exposed hops through gas chromatography – mass spectrometry (GC-MS). However, this technology is expensive and time consuming, rendering it inaccessible and/or impractical for hop growers. Thus, it is worth exploring less expensive high-throughput analytical methods. Fourier-Transform Infrared (FTIR) spectroscopy requires minimal sample preparation and requires less time per sample than GC-MS. Our goal is to develop and validate an FTIR method for detection of compounds that are characteristic of wildfire smoke in hops. To achieve this goal, hops will be treated with smoke from various fuel sources to reach high levels of smoke contamination to aid in method development. The method will then be validated with “real-world” hops that were exposed to wildfire smoke during the 2020 growing season. Results from this study could aid growers and brewers in identifying smoke-tainted hops by providing an inexpensive, high-throughput alternative to GC-MS.

<https://symposium.foragerone.com/csu-curc2023/presentations/54939>

2b 7 Generations

Keanu Kaibetoney

Dr. Dominique David-Chavez, Ariana Gloria-Martinez, Megan Shiotani, Paula Huddleston, TR Heydman, Ty Smith

Type: Oral Presentation

The 7 Generations project works to engage Indigenous and climate-resilient design principles to develop a 70-acre field site that will support experiential learning and research opportunities for future generations of Indigenous students, faculty, staff, and community members. Research, outreach, and activities at this generational space will broadly focus on ecological restoration and cultural reconciliation efforts. This project's significance is preparing a field site and programming to address a longstanding need for community-based Indigenous science education while serving CSU's commitments as a land grant institution and needs identified by our local Native community.

The first step was identifying and compiling a portfolio of existing Indigenous and climate-resilient program models to inform architecture and design. The next step was to develop a stakeholder assessment plan for identifying needs and functionality the site could serve (e.g., Indigenous garden, phenology walk, climate-monitoring station, greenhouse for plant propagation, etc.) Which led to applying climate-resilient landscape architecture principles to designs after assessing the site's natural elements, including the climate, soil, slope, drainage, and vegetation. The designed master plan is for the structures and outdoor areas working towards community-informed environmental, social, and cultural outcomes. What is next for this project is drafting a complete budget and proposal for site development.

To be able to give back to our local native community and impact future generations of Indigenous people is the true significance behind this work. Being able to present research findings and design proposals to investors would help turn this 7 Generations dream into a reality.

<https://symposium.foragerone.com/csu-curc2023/presentations/54918>

13 In Search of Ants in the Pryor Mountains of Montana

Heide Keeble

Dr. Marek Borowiec

Type: Research Poster

The Pryor Mountains of Montana are an understudied area for Formicidae (ants). Similar to the Sky Islands of Arizona,

the Pryor Mountains are isolated mountains, rising 5000' above the surrounding plains. There are endemic species of plants known from the area, and in summer 2022, Honey-pot Ants (*Myrmecocystus testaceus*) were incidentally discovered by the Montana Moth Project in that area, which was a new state record of that genus for Montana. The plan for summer 2023 is to make multiple trips throughout the season to the Pryor Mountains in southern Montana to collect ant specimens. The specimens will be brought back to the C.P. Gillette Museum of Arthropod Diversity at Colorado State University and identified. I have been studying and identifying ant specimens in the museum since January, and have learned a whole new set of terminology to describe ant characteristics and morphology. I learned how to properly mount ants using the point-pinning method. I will utilize all of my newly acquired skills during or after the summer collection season. We hypothesize that there may be additional species of ants living within the Pryor Mountains area that are unknown to the state of Montana. Based on data pulled from multiple sources, there are a total of 136 species of ants known from, or expected to reside within, the state of Montana. We aim to find out how many are living within the Pryor Mountains area, and if any more should be added to the known species list for the state.

<https://symposium.foragerone.com/csu-curc2023/presentations/54693>

A Comparison of Two Water Soluble Fertilizers for Increased Indoor Strawberry Runner Production

Clinton Lacy

Samantha Rosado and Joshua K. Craver, PhD

Strawberry plants are stoloniferous, which refers to the propagation strategy in which a mother plant forms stolon's (runners). Runners eventually develop adventitious roots which results in clone plants. Most varieties of strawberries produce runners, making it a commonly utilized method in the industry to reproduce plants for both indoor and outdoor strawberry crops. Since controlled environment strawberry production is an up-and-coming production system, there are few recommendations for optimal environmental conditions. Specifically, research regarding how water-soluble fertilizer influences the production of strawberry runners in a controlled indoor environment is limited. This research seeks to quantify the effects of two water soluble fertilizers on strawberry runner growth. Six, 18-liter

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Beekankamp fragola strawberry troughs with seven strawberry plants (*Fragaria ananassa* 'Ozark Beauty,' 'Fort Laramie,' or 'Quinault') each were grown in a greenhouse at uniform light, temperature, and relative humidity conditions for eight weeks. Two different fertilizer formulations were tested: Nutriculture 21-5-20 Plus General Purpose and Jack's Professional LX 15-5-15 with CaMg, both providing 100 mgL⁻¹ nitrogen. After the soil in each trough was saturated with water, 150 mL of fertilizer was measured and applied twice per week according to treatment. Observations include counting the number of new runners daily and a final quality assessment by counting the number of nodes per runner. Results will help inform best practices for the successful development of strawberry runners for indoor production.

<https://symposium.foragerone.com/csu-curc2023/presentations/54890>

8 Breeding for Fungal Disease Resistance in Sugar Beet Crops (*Beta vulgaris* subsp. *vulgaris*) with the USDA

Sam McNeill

Dr. Olivia Todd, Dr. Kevin Dorn

Type: Research Poster

Sugar beets (*Beta vulgaris* subsp. *vulgaris*) are an agronomically important crop grown for their high sucrose content. Around 55% of sugar production in the United States comes from sugar beets. Fusarium yellows is a fungal infection on sugar beets caused by the pathogen *Fusarium oxysporum*. This pathogen causes significant decreases in root yield and sugar content. Fusarium resistant lines are commercially available; however the underlying mechanisms of resistance are still largely unknown. The goal of this study is to show the performance of a new USDA developed resistant line to *Fusarium*. This study consists of a greenhouse experiment followed by data collection and statistical analysis through an ANOVA and Tukey Test.

<https://symposium.foragerone.com/csu-curc2023/presentations/54816>

4 Effects of Sterilization and Fertilization on Phosphorus Cycling in Tomato

Skylar Monette

Dr. Jorge Vivanco, Jane Godfrey, Mary Dixon, Carley Rohrbaugh

Type: Research Poster

Phosphorus (P) is a required nutrient for plant growth. Fertilizers are often applied in excess of crop demand because of P-immobilizing processes in the soil. However, P is a nonrenewable resource, and if more sustainable approaches are not implemented, current reserves will be depleted. To assess methods for enhancing P cycling in the soil, we investigated how P content in two P-efficient tomato varieties, *Solanum lycopersicum*

'Rutgers' and *S. lycopersicum* var. *cerasiforme* 'LA1519,' were affected by fertilization and soil sterility. The treatments were fertilization (unfertilized and fertilized) and soil sterilization (sterile and nonsterile). We collected both root and shoot biomass and determined shoot percent phosphorus. There was an increase in root and shoot biomass grown in the sterile soil compared to the biomass for the nonsterile soil. <https://symposium.foragerone.com/csu-curc2023/presentations/54869>

7 Thermoregulation in Newborn Lambs After Gestational Nutrient Challenge

Ellen Roberts

Caitlin Cadaret, Sarah Gabel, Rachael Stucke, Alison Kuderka, Terry Engle

Type: Research Poster

Due to common production practices for grazing livestock through the winter, animals often go through nutrient challenges during gestation. Severe insults during gestation are known to impact fetal development and produce lambs with a lack of vigor, but less is known about the impacts of moderate sustained challenges in gestation on neonatal lamb success. Therefore, the objective of this project was to understand how early postnatal lambs thermoregulate after their dams undergo moderate nutrient challenges, by quality rather than quantity during gestation. Time bred ewes were individually fed a diet that met 100% of their nutrient requirements for the entirety of gestation or a restricted diet (70% energy and 50% protein requirements) from 30-125 days of gestation. The incidence of hypothermia is most common in the first week of life, and thus, rectal temperatures were collected for the first seven days on all lambs from both fully nourished (CON) and nutrient challenged (NR) dams. A treatment by day interaction was observed as NR (n=10) lambs had an average lower (P

<https://symposium.foragerone.com/csu-curc2023/presentations/54894>

6 Evaluation of Photoperiod Treatment on Ornamental Herbaceous Taxa

Yamilex Romero

Dr. James Klett, Ronda Koski, James Klett

Type: Research Poster

One experiment was repeated to see if four different light treatments would delay reproductive growth with various plant taxa. Experiments one and two both maintained *Salvia greggii* 'Wild Thing' and *Salvia greggii* 'Furman's Red'. Experiment two added *Phlox bifida*. Experiment one had 15 replications and experiment two had 8 replications in each of the four light treatments. The light treatments were: ambient light where the taxa were set on the bench to receive natural

daylight, 12 hours darkness and 12 hours of light (12D:12L), 14 hours darkness and 10 hours of light (14D:10L), and 16 hours darkness and 8 hours of light (16D:08L). These last three-night treatments were conducted in grow tents with LED lighting. Each replication was grown in Berger BM6 substrate. Soil moisture percentage was measured periodically, and all taxa was watered with fertilizer water solution when under ten percent moisture. Signs of reproductive growth were observed weekly light treatments were initiated. When most of the replications of a plant taxa within a light treatment had signs of reproductive growth, they were harvested. From the harvested plants, 24 cuttings were taken and stuck into trays to be observed for root growth. The light treatments resulted that the quickest reproductive growth was in 12D:12L and 14D:10L treatments and reproductive growth was delayed or suppressed the greatest for all plant taxa in the 16D:08L treatment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54870>

1 Factors Affecting Algorithmic Aversion

Sam Abadie

Dr. Hamed Qahri-Saremi, Dr. Adela Chen

Type: Research Poster

Algorithm-based technologies, such as artificial intelligence (AI), are becoming more and more important in business environments. These technologies can reinforce decision-making rules, help employees make decisions in routine jobs, and automate corporate operations so that staff can focus on more important duties. However, opinions among employees about these technologies might differ greatly, with some having positive opinions (i.e., appreciation) and others having negative opinions (i.e., aversion). To create successful strategies for adopting algorithmic technologies in a corporate context, it is essential to comprehend the interactions between algorithmic technologies and human actors. This study seeks to undertake a systematic literature review to shed light on the predictors and implications of people's favorable and negative attitudes of algorithmic technology. This study will analyze the various factors that can influence algorithmic aversion and algorithmic appreciation by synthesizing the prior studies on the subject. This research is expected to produce insights into the predictors and consequences of individual's positive and negative views towards algorithmic technologies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54868>

3 Who Chose For You?

Matthew Cash

Dr. Nick Roberts, Dr. Hamed Qahri-Saremi

Type: Research Poster

The rise of social media has brought about an increase in concern about misinformation, particularly in relation to the 2016 election and the term "Fake News". This has led to an increase in incidents of injury and harm caused by misinformation and the echo chamber effect. This

research project aims to investigate whether Nudges, and changes in the design of choice architecture, can influence the thinking process and steer individuals towards reputable sources and smart decisions.

The research project involves gathering information from hundreds of peer-reviewed articles using keywords such as "Nudge", "Choice Architecture", "Dark Patterns" and "Boost". The use of "Boost" was removed as it involved teaching individuals, which was determined to be outside the scope of this research. "Nudge" and "Choice Architecture" were used to identify specific methods, purposes and results of the nudge. "Dark Patterns" was used to find papers on countering the negative influence of those patterns.

Currently, the research team is working on obtaining IRB approval for 14 nudges and measures to identify potential changes through data analysis. Once approved, digital surveys will be conducted on both the student population of CSU and MTurk freelancers to collect data on a larger population. The potential impact of this research is the development of a method or methods of nudging that can be implemented en masse on websites to decrease the spread of misinformation and prevent harm while allowing individuals freedom of expression and free will.

<https://symposium.foragerone.com/csu-curc2023/presentations/55032>

2 Moving Formal Wear to a More Sustainable Future: Understanding Potential Obstacles and Biases

Cristin Ensor

Ruoh-Nan (Terry) Yan

Type: Research Poster

In the 1890s the French took off with the trend of haute couture and it progressed throughout the 19th century with brands such as Dior. Designer formal wear is still in high demand today for events such as proms, weddings, and more. The average

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designer formal gowns range from \$100-\$1,200 yet many formal-wear gowns such as prom dresses and wedding dresses are only worn once, for such a high ticket item this is not very sustainable. This research project was created in an effort to examine and understand how we could transition this one-time wear market into a more socially conscious and continuous lifecycle. The purpose of the study is to evaluate the potential of the resale market for designer formal wear and the possible profitability for small businesses. The study aims to understand small business owners' perspectives regarding sustainability, how their customers would respond to the efforts, and the feasibility of implementing the resale of designer formal wear. This study will be able to dive into the designer formal wear markets of varying price points at different stores and also from the business owner's point of view. Interviews will be conducted with a minimum of three business owners and cross-examine the results of different businesses and their clientele. With the collection of data, we hope to understand implementation techniques for resale in the designer formal wear market from a small business perspective as well as the amount of success businesses foresee with the efforts.

<https://symposium.foragerone.com/csu-curc2023/presentations/54803>

W4 Rebooted: A Journey of Justice, Equity, Diversity, and Inclusion

Jacqueline Natrasevski

Type: Written Work

The poem "Rebooted: A Journey of Justice, Equity, Diversity and Inclusion" is a powerful testament to of resilience and determination in overcoming numerous obstacles in life, including learning disabilities, vision loss, health problems, and mobility issues. Despite these challenges, the speaker now thrives at CSU and has found a renewed sense of purpose in promoting justice, equity, diversity, and inclusion. The poem also reflects on the speaker's past, the sacrifices made, and their journey of unlearning and growth. The

speaker's dream of becoming a teacher is driven by a desire to connect with others, honor differences, and create a more just and inclusive world. The poem concludes with a call to action for amplifying every voice and building a better future for all.

<https://symposium.foragerone.com/csu-curc2023/presentations/52347>

65 Analyzing Trends in Groundwater Storage and Water Quality in the United States from 1920-2020

*Cavin Alderfer
Dr. Ryan Bailey
Type: Research Poster*

A general knowledge of the availability and quality of water resources must be possessed before they can be properly used. However, quantifying fluctuations in groundwater storage over time is difficult, and few datasets exist of temporal changes in salt and nutrient concentrations for water bodies across the United States. To resolve this issue, our study combines ArcGIS geoprocessing routines, groundwater data from the United States Geological Survey, and water quality data from the National Water Monitoring Council's Water Quality Portal, to outline trends in groundwater storage for unconfined aquifers and to analyze patterns in salt and nutrient concentrations for water bodies across the United States. All USGS monitoring wells are tested for completion in unconfined aquifers, with water table depth measurements retrieved for selected wells. Annual averages for groundwater head, aquifer saturated thickness, and water table depth are calculated for each well, and wells are subsequently grouped according to their 8-digit hydrologic unit code for spatial analysis. Water quality data for three site types (groundwater wells, lakes and reservoirs, and springs) is filtered for measurements pertaining to eight salts (calcium, chloride, magnesium, potassium, sulfate, sodium, carbonate, and bicarbonate) and two nutrients (nitrate and phosphorus). Temporal averages for each salt and nutrient are calculated, and ArcGIS shapefiles are generated for each salt and nutrient according to the water source type. The results of our trend analysis depict spatiotemporal trends in water quality and groundwater storage that can be used to guide water remediation efforts and to improve sustainable water management practices.

<https://symposium.foragerone.com/csu-curc2023/presentations/54764>

69 Metakaryotic Cancer Stem Cells in Canine Tumors

*Isabel Brandtjen
Dr. Elena Gostjeva, Prof. William Thilly, Dr. Doug Thamm
Type: Research Poster*

Metakaryote cancer stem cells (MCSC) are large cell nuclei with hollow bell-shaped morphologies consisting of approximately 10-15 microns in height and 8-10 microns in bell diameter. MCSCs are hypothesized to be responsible for differentiation and net growth in human tumors and make up roughly 5% of human colonic adenocarcinoma-derived HT-29 cells in vitro.

MCSC have been identified in previous human, mouse, rat, and plant models. This study sought to identify, analyze, and compare the phenotype of MCSC in canine soft tissue sarcomas, osteosarcomas, and anal gland adenocarcinomas.

To identify MCSC, fresh tumors were retrieved from canine patients undergoing surgery and immediately fixed in an ethanol solution. The sample was spread in a single cell layer over a microscopy slide and stained with Schiffs reagent and 1% Giemsa Stain to identify double-stranded DNA. Whole-slide images were obtained using a slide-scanning microscope, then analyzed using NDP View 2 software to identify bell-shaped nuclei, which indicate the presence of MCSC.

Preparations were made from four fresh tumor samples from canine patients with grade 2 soft tissue sarcomas, a chondroblastic osteosarcoma, and an anal gland adenocarcinoma. MCSC were identified in all samples.

In conclusion, MCSC appear to be present in canine tumors. Dogs with spontaneous cancer may therefore be a useful translational model for the study of MCSC biology and MCSC-directed therapy in the future. Future directions include growing MCSC in culture to run survival assays against different

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drug regimens to inspect possible new drug therapeutics to eliminate MCSC in canine tumors.

<https://symposium.foragerone.com/csu-curc2023/presentations/54728>

54 Generation of hairy roots from *Catharanthus roseus*

Zachary Cohn

Dr. Christie Peebles

Type: Research Poster

Catharanthus roseus (*C. roseus*) produces several important terpenoid indole alkaloids (TIAs) that are valuable in the pharmaceutical industry. Four of these TIAs were analyzed in this project: serpentine, catharanthine, ajmalicine, and tabersonine. Currently it is difficult to harvest the TIAs from the plants as they are produced in low quantities and are stored inside various parts of the plant. Hairy root generation provide a method of creating a quick growing line of roots that are homologous. *C. roseus* seeds were sterilized and grown until seedling at which point they had a root inducing plasmid inserted into their genome. The hairy roots were then removed from the plant and propagated. Several lines were isolated and had their TIA levels measured via HPLC. The best performing lines can now be used in future experiments to try and maximize their TIA production.

<https://symposium.foragerone.com/csu-curc2023/presentations/54791>

56 Using Fluorescent Proteins to Understand Gene Expression in Recalcitrant Plants

Alexandre David

Dr. Christie Peebles

Type: Research Poster

Sorghum is a species of grass primarily cultivated for its grain, making it the world fifth most important cereal crop. It is mainly cultivated in areas with limited and erratic rainfall, high temperatures,

salinity, and nutrient deficiency. These factors make sorghum an extremely drought-tolerant plant which is significant in many biological applications. However, the plant has proven challenging to manipulate genetically. This project aims to create a recombinant plasmid that can be inserted into sorghum and induce transient gene expression. Successful gene expression in sorghum can aid in our understanding of what genes lead to specific phenotypes, along with how we could remove or upregulate those phenotypes.

<https://symposium.foragerone.com/csu-curc2023/presentations/54859>

52 Upgrading and Analysis of Red Oak Pyrolysis Oil to Develop Sustainable Aviation Fuels

Alayna Gilbert

Dan Cornett, Jason Quinn, and Dr. Bret Windom

Type: Research Poster

The aviation sector is a large contributor to international carbon dioxide emissions. The global jet fuel market produces over 81 billion gallons of fuel per year and demand is continually increasing with the 3.8 billion air travelers in 2016 expected to double by 2035. [The expected increase in air travel provides great concern about the corresponding increase in emissions and demands for fossil fuels. This has led to extensive interest in sustainable aviation fuels (SAF(s)), sourced from renewable resources such as biomass.

In the last several years Bridgestone Corporation, the world's largest tire producer, has developed a process to create rubber from the bagasse of the guayule plant. This process has a high yield of plant waste resulting in opportunities for development of byproducts. Several university research groups have partnered to explore some of these opportunities including bug repellent, adhesives, and jet fuel.

This research explores the potential of creating SAFs from guayule waste through high-pressure/high-temperature hydrotreatment. Due to the novelty of the rubber process, there is limited supply of

guayule waste, thus red oak bio-oil has been used as a surrogate to develop the hydrotreatment and analytical methods that will be applied to guayule waste. This research discusses the experimental and analytical methods as well as the chemical processes discovered through the upgrading process of the red oak bio-oil.

<https://symposium.foragerone.com/csu-curc2023/presentations/54996>

64 Immunoreactive Histamine in Mast Cells Increases in Mice Under Stress

Nicholai Hagemann

Brielle Patlin, Julietta Sheng, Hayley Templeton, and Stuart Tobet

Type: Research Poster

Mast cells are a type of white blood cell with a protective role in the immune system. They release histamine, among other chemicals, in response to physiological stressors. Studying the relationship between stress and histamine—a mediator of allergic reactions and inflammation—and understanding the effects of stress on the immune system is vital because stress increases susceptibility to illness. In the current study, stress was operationally defined by physical restraint. Mice were placed in small tubes that restricted their movements for 20 minutes. This was followed by a one-hour recovery period; then, the lungs were processed for immunohistochemical localization of histamine in mast cells with or without prior stress. Cells containing immunoreactive histamine were counted in 50 μ m thick lung sections. There were 1.2 times more histamine-positive mast cells in stressed mice's lungs than in control mice. Because the stress preceded lung dissection and fixation by only an hour, the sum of immunoreactive cells likely indicates histamine release. If the histamine is not replenished, a lack of histamine could make the body more susceptible to infection and disease. Future experiments will need to determine whether the difference between tagged mast cells is the

secretion of histamine, and if so, whether the histamine in mast cells is replenished and over what duration. Changes in histamine availability may be significant for understanding the effects of stress on the immune system, particularly in the context of respiratory health.

<https://symposium.foragerone.com/csu-curc2023/presentations/54855>

58 Heating Stove Use Patterns in Rural China with Applications to Air Pollution Impacts

Kennedy Hirst

Dr. Ellison Carter, Kennedy Hirst, Collin Brehmer, Talia Sternbach, Enkhuun Byambadorj

Type: Research Poster

Air pollutant emissions from solid fuel use have contributed as much as 25% of global anthropogenic black carbon emissions (Bond, 2013) and have accounted for 1.6 million annual premature deaths, as estimated in 2017 (Stanaway, 2017). Most studies that have previously aimed at evaluating domestic solid fuel use and interventions to reduce it, have primarily focused on cooking activities. However, in some settings, like northern China, use of solid fuel stoves for heating is also a major source of indoor air pollution exposure. Quantifying when and how much heating stoves are used is critical for modeling indoor air quality and resulting exposures. Yet, studies that evaluate home energy use, and home heating behavior in particular, are scarce. To address this gap in scientific literature, a study was conducted that purposefully investigated home heating activities that involve solid fuel use in the context of a larger intervention transitioning homes from coal-to-electricity-based heating. Temperature sensors were used to collect short- (24-hour) and long-term (several month) measurements of stove use. Also, there was implementation of in-depth questionnaires to collect information on household characteristics, heating stoves usage, and energy

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consumption patterns. The analysis of stove temperature data is still ongoing. Further evaluations of associations between indicators of home heating behaviors and relevant indicators of socioeconomic, demographic, and treatment status in our study population will be discussed. Results from this study are expected to contribute to improved modeling for indoor air quality in order to ultimately prevent premature deaths and decrease indoor air pollution.

<https://symposium.foragerone.com/csu-curc2023/presentations/54838>

60 Compliant Bistable Prestressed Spring Steel Grippers for Aerial Perching and Grasping

Bryce Jones
Dr. Jianguo Zhao
Type: Research Poster

Quadcopter drones are popular in many markets, with a wide range of uses and applications. Aerial perching can extend the useful flight time of a drone by allowing for passive perching in a location for a desired amount of time, conserving the battery when compared to flight uses. Current research into aerial perching and grasping with drones is limited by relatively heavy, complex control systems to actuate the gripper. This research aims to build on current work to develop a more functional and lightweight compliant bistable prestressed spring steel (PSS) gripper for passive perching and grasping in a wide variety of environments. Multiple gripper configurations utilizing PSS bands have been developed for this research including a single PSS band, and two double PSS band grippers in a parallel and cross-shaped design. The grippers are activated when an external force pushes a central sliding mechanism down, bending the PSS band up between two inner support beams. Two springs are used to add pretension to the sliding mechanism to reduce the triggering force by manually adjusting the spring displacement until the desired force is reached. To flatten the PSS band for rapid reuse two thin cables are utilized, one to flatten the band, and one to extend the sliding mechanism back upward.

Future work will be focused on integrating the parallel and cross-shaped grippers into a dynamic multi-configuration gripper, as well as adding a secondary nested bistable mechanism for dynamic pretension and triggering force tuning.

<https://symposium.foragerone.com/csu-curc2023/presentations/54951>

61 Mobile Additive Manufacturing of Carbon Fiber Composites

Walter Jordan
Dr. Mostafa Yourdkhani, Jianguo Zhao
Type: Research Poster

Current manufacturing and repair of fiber-reinforced thermoset composites has proven to be energy-intensive and time-consuming due to extensive processing required to achieve complete cure. As a result, 3D printing of these fiber-reinforced thermoset composites is desirable due to the ability to produce complex parts quickly, with little required tooling. 3D printing of thermoset composites has proven to be difficult in the past due to low resin cure rates and poor mechanical properties. The Multifunctional Polymers and Composites lab at CSU has developed a novel method to address this issue by simultaneously printing and curing the fiber-reinforced thermoset composite as it is extruded. This method has been proven to be effective at creating freeform, unsupported structures with high mechanical properties. A limitation of this work is print volume associated with traditional gantry style additive manufacturing systems. My research aims to address this issue by combining the highly desirable properties of additive manufacturing using frontal polymerization with the mobility of a mobile additive manufacturing system. This combination allows for the ability to print large, mechanically sound structures with virtually no limitations on print volume. Using this novel manufacturing approach, high-strength, in-situ repair, and construction in remote, potentially planetary, areas can be explored.

<https://symposium.foragerone.com/csu-curc2023/presentations/54920>

66 Evaluation of Gastrointestinal Toxicity associated with Abdominal Radiation Therapy and Concurrent Administration of the Oral Tyrosine Kinase Inhibitor Sunitinib

Bailey Latka

Dr. Mary-Keara Boss, Bailey Latka, Amber Prebble, Braden Burdekin, Daniel Regan

Type: Research Poster

Tyrosine Kinase Inhibitors (TKI) and radiation therapy (RT) treat cancer; however, the combination of TKI and abdominal RT may exacerbate gastrointestinal (GI) toxicity. We hypothesize abdominal RT and the TKI sunitinib will increase GI toxicity due to compromised tissue vascularity and cell proliferation. CD-1 mice were treated as control, sunitinib alone, RT alone, and sunitinib + RT. ceDaily oral gavage (vehicle control or sunitinib) was initiated on Day 0. Abdominal RT or sham irradiation was performed on Day 7, and mice were euthanized, and GI harvested on Day 14. Immunohistochemical staining of CD31 (vasculature) and Ki67 (cell proliferation) was performed and quantified using Visiopharm software. The mean percent positive tissue area was compared using one-way ANOVA followed by Tukey's multiple comparisons test. The difference in mean CD31+ tissue area was statistically different across the treatment groups ($p = 0.0235$) with a significant difference between sunitinib alone vs RT alone groups ($p = 0.0252$). The difference in mean Ki67+ tissue area was not statistically different across the treatment groups ($p = 0.1937$). RT alone increased GI vascularity but did not when RT + sunitinib. The vascular response associated with tissue injury following RT may be hindered due to the anti-angiogenic properties of sunitinib. While not statistically significant, the mean percent of Ki67+ cells was highest in the control GI tissue samples and lower in the other treatment groups, which could indicate a reduction

in GI cell proliferation with treatment with sunitinib, RT, or sunitinib + RT.

<https://symposium.foragerone.com/csu-curc2023/presentations/54891>

62 Variable Stiffness Robotic Fish Enabled by Artificial Muscles

Clint Middlemist

Dr. Jianguo Zhao

Type: Research Poster

Traditional robotic fish have been used in a wide array of applications, from surveying fish populations to inspecting underwater structures. These complex environments yield a desire for a robotic fish with high maneuverability and high speed. Real fish accomplish this tradeoff of speed and maneuverability by changing the stiffness of their tail during swimming. However, for different tail frequencies, the optimal tail stiffness for desired performance may vary. Thus, having a robotic fish with the ability to tune tail stiffness on the fly allows for this adaptability. Other robotic fish have tried to solve this problem, but the main issue is either the mechanism required to tune the tail stiffness is large, complicated, or limited in capacity. In this project, we will investigate how to address the limitations of existing research to tune a fish's tail stiffness on the fly by using a novel artificial muscle called Twisted and Coiled Actuators (TCAs) which have the ability to serve as a sensor and actuator simultaneously (self-sensing). To stiffen the robotic fish tail on the fly, TCAs will be used to induce curvature into two thin plates on the tail. In literature, it has been found that applying transverse curvature to a thin plate has a dramatic increase in stiffness through the development of internal strains, increasing the elastic energy of the thin plate. Depending on the distance of contraction of the TCAs, which can be controlled through self-sensing, a range of stiffnesses can be obtained for the tail. Using this concept, the objective of the proposed work is to develop a robotic fish capable

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of tuning tail stiffness to adapt to a wide variety of environments and situations.

<https://symposium.foragerone.com/csu-curc2023/presentations/54904>

57 Optimizing Protein Crystal Stability Using a Network of Disulfide Bonds

Anika O'Brian

Dr. Christopher Snow, Alec Jones

Type: Research Poster

A periplasmic polyisoprenoid binding protein from *Campylobacter jejuni*(CJ) forms highly porous protein crystals under the right conditions. The resulting array of 13-nm diameter solvent nanopores allows these crystals to act as a scaffold material, with a multitude of downstream applications. However, protein crystals are typically fragile and vulnerable to slight changes in their environment, such as variations in pH, ionic strength, or temperature. Disulfide bonds can stabilize protein structures by linking distant regions of the protein. Similarly, we aim to stabilize a specific protein crystal assembly by introducing cysteines at key locations across protein-protein interfaces. Subsequent covalent bonds formed between two interfacial cysteine residues have the potential to stabilize the crystal matrix and successful disulfide bond formation will lead to the formation of protein polymers, templated by the crystal lattice. In fact, due to the P622 symmetry of the CJ crystals composed of domain swapped dimers, our intended polymers would form a 6-fold braid along the z-axis of the CJ crystals. Using this strategy, we have grown variant crystals dubbed "CJ-Braid," which showed increased thermal and chemical stability compared to the wild-type protein, without the need for third-party crosslinking agents. This strategy has the potential to eliminate the time-consuming crosslinking process, with potential benefits to the repeatable product crystal production as well as eliminating potential carry-over of reactive reagents in the final product. Thus, full validation of the new CJ-Braid variant crystals via x-ray diffraction will improve the

practical prospects for deploying CJ crystals for applications in biotechnology and structural biology.

<https://symposium.foragerone.com/csu-curc2023/presentations/54788>

53 Do You Really Want to Smell That?

Rachel Potter, Cailey Risenhoover

Dr. Christopher Snow, Rachel Potter, Cailey Risenhoover, Michael Burns, Kyle Curtis, Caroline Loewecke, Kileigh Palmer, Makele Reed, Marcus Garcia, Josie Reinhardt, Katey Fix

Type: Research Poster

Can you discern an odor too faint to detect? Dogs can smell cancer on their owners, what if your doctor could smell cancer on you? Let's snap together puzzle pieces. A trap and a target. The trap is an engineered bacteria dripped into your nose. The target is a faint odor. Start sniffing around. When the odor reaches the trap they bind together. The snapping puzzle pieces create a reaction. The reaction creates a really strong odor. This internal reaction makes invisible odors detectable. Our experiments are conducted on rodents. Before injection we train rats using positive reward. Rats learn to press a specific lever when they detect wintergreen. After the bacteria is dripped into their noses the rats sniff an odorless chemical. The odorless chemical binds to the bacteria to create wintergreen sent in their nasal passages prompting them to press the lever. Today, we talk about the training before inoculation. Do rats understand directions to press different levers for odor detection? We found it depends on duration of training and consistency.

<https://symposium.foragerone.com/csu-curc2023/presentations/54923>

51 Hydrogen: A Sustainable Energy Carrier for a Clean Energy Future

Samantha Preuss

Dr. Bret Windom, Andrew Zdanowicz

Type: Research Poster

A significant hurdle we face in shifting from fossil fuels to renewable energy lies in our ability to store and distribute generated energy. Hydrogen solves this problem by allowing us to store excess renewable energy in a form that can be easily transported and utilized. Hydrogen can be produced from renewable energy sources through electrolysis, which splits water molecules into hydrogen and oxygen using electricity. Continued research and development efforts are needed to improve the efficiency and reduce the cost of hydrogen production. These goals are central to our hydrogen research at the Chemical Energy Conversion Laboratory. We aim to investigate hydrogen production, storage, and infrastructure by installing our own indoor electrolysis facility at the CSU Energy Institute at the Powerhouse Energy Campus. We are in the process of commissioning a former hydrogen fueling station for FCEVs (Fuel Cell Electric Vehicles) and adapting the equipment to serve our indoor system. We expect to be producing hydrogen with this equipment by August 2023. This facility represents a major advancement in the effort to decarbonize large-scale power systems and other sectors such as transportation and deploy hydrogen-fueled vehicles and hydrogen energy systems.

<https://symposium.foragerone.com/csu-curc2023/presentations/54938>

68 Contribution Of Microtubule Structure in the Viscoelasticity Iscoelasticity of Healthy Right Ventricles

Olivia Pyke, Brandyn Garcia

Kristen LeBar, Dr. Zhijie Wang

Type: Research Poster

The right ventricle (RV) is viscoelastic, which means it displays both viscous and elastic properties. The cardiomyocytes, the contractile cells of the heart, are known to play a key role in the viscoelasticity of the RV. Structural modifications of the cardiomyocytes during disease progression can significantly impact RV function. The microtubule (MT) is a cytoskeleton that forms a network within the cardiomyocytes and significantly contributes to the cell's mechanical behavior. The strengthening and weakening of the MT network have been shown to increase and decrease cardiomyocyte viscoelasticity, respectively. However, in a complex microstructure tissue like the RV, how the MT structure affects the tissue level mechanical properties has not been investigated. Therefore, we aim to measure the viscoelastic properties of healthy rat RVs before and after MT network alterations by sinusoidal biaxial mechanical tests. After tissue isolation and mounting, we treated the RV acutely with colchicine to weaken the MT structure and deuterium oxide (D₂O) to strengthen it. Viscosity and elasticity were calculated as the dissipated energy (loop area) and the stored energy from the hysteresis loops, respectively.

All tissues remained anisotropic before or after drug treatments. After colchicine treatment, we observed an increase in the viscosity of the RV tissue, and the change was stronger in the longitudinal (outflow tract) than circumferential direction (p20 only reduced RV longitudinal elasticity).

<https://symposium.foragerone.com/csu-curc2023/presentations/54850>

63 Integration of remote heating system for 3d printing of composite materials

*Samuel Radosevich
Dr. Mostafa Yourdkhani
Type: Research Poster*

Fiber-reinforced polymer composites (FRPCs) are widely used in many applications due to their excellent strength- and modulus-to-weight ratios. Boeing 747 fuselage and wind turbine blades are only a few examples of the applications of FRPCs. Current manufacturing of these high-performance thermoset composites, however, requires energy-intensive and time-consuming processing conditions for complete curing of a product. Another challenge with manufacture of FRPCs is the design of expensive tooling or molds for every new design. At CSU, we are addressing these manufacturing issues by 3D printing composite structures. The goal of my research project is to investigate remote heating of printed materials via radiation, as opposed to conductive heating, using an infrared heating element mounted on the print head of a 3-axis robotic platform. Direct heating of each printed layer via radiation allows for obtaining consistent temperature and cure distributions during the printing process, irrespective of the height and size of the printed part. The current approach for printing such composites relies on heating the deposited material using a heated bed to assist the polymerization of the thermoset matrix. However, this approach is limited to only a few layers of printing, as after printing a certain height, the conductive heat transfer mechanism results in a temperature gradient across the thickness of the part, leading to nonuniform and incomplete curing of the material on top layers with inferior mechanical properties compared to bottom layers. Therefore, my novel approach enables scalable, uniform printing and curing of high-quality composite materials.

<https://symposium.foragerone.com/csu-curc2023/presentations/54746>

67 Predicting the impact of Non-Photochemical Quenching (NPQ) on light-driven models of metabolism in a marine diatom

*Mary Skillicorn
Dr. Joshua Chan, Dr. Ashok Prasad, Dr. Graham Peers
Type: Research Poster*

When light is absorbed by the antenna or photosystems, it can either be utilized by the PSII complex (Y(II)), dissipated as heat (Y(NPQ)), or quenched by other processes within the reaction center (Y(NO)). We previously developed a whole genome-scale model of metabolism that integrates realistic measurements of photosynthetic physiology with other catabolic/anabolic reactions. We will present *in silico* studies that look into the relationship between light absorbance and Y(NPQ) in driving the flow of carbon and energy in the modeled marine diatom *Phaeodactylum tricornutum*. Parsimonious Flux Balance Analysis (pFBA) was used to optimize the reaction fluxes with biomass formation as the objective function. We will show that NPQ has a major influence on the modeled growth rate and the fluxes between biochemically significant reactions including metabolites that are precursors to the formation of economically important bioproducts.

<https://symposium.foragerone.com/csu-curc2023/presentations/54458>

55 Metabolic Engineering of the Shikimate Pathway in *Synechocystis* for Production of Trans-Cinnamic Acid

*Hayley Stern
Dr. Christie Peebles
Type: Research Poster*

Trans-Cinnamic acid is a chemical traditionally produced from fossil fuels that is used in many industries, including the pharmaceutical and cosmetic industries, and has the potential to make biofuels behave like diesel or jet fuel. It is also produced in bacteria like *Synechocystis* using the Shikimate Pathway with the addition of a

phenylalanine ammonia lyase gene. However, these amounts are low due to the feedback inhibition of the precursor to Trans-Cinnamic acid, phenylalanine. This feedback inhibition can be overcome utilizing metabolic engineering of this pathway. To begin this process, wild type *aroG* DNA, the gene responsible for inhibition of phenylalanine production, is extracted from *Escherichia Coli*, amplified using a polymerase chain reaction, and purified. Mutations of *aroG* are then identified and implemented in the gene through mutagenesis. These feedback resistant *aroG* plasmids are then transformed into *Synechocystis*. Following cell growth, the Trans-Cinnamic acid is collected and measured with High Pressure Liquid Chromatography to determine which gene is best at maximizing the Trans-Cinnamic Acid production. These feedback resistant strains of *Synechocystis* will then undergo random chemical mutagenesis and screening, followed by growth to determine new gene mutations that increase Trans-Cinnamic acid production.

<https://symposium.foragerone.com/csu-curc2023/presentations/54682>

Crystallizing Synthetic DNA: Tensegrity Triangles

Grace Thompson, Jaellyn Erickson, Sam Stroup

Dr. Chris Snow

Type: Research Poster

Our team has bioengineered DNA tensegrity triangles capable of holding guest molecules, such as new drugs or proteins with currently unknown structures. We have optimized the growth conditions for these crystals and crosslinked the DNA within them using 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC), which has made them much more stable and robust. We believe that these crosslinked crystals will allow for higher resolution X-ray diffraction and enable us to determine the structure of the guest molecules with greater accuracy. We are excited to conduct upcoming experiments to test our hypothesis and see if the crosslinked DNA tensegrity triangles can serve as a general-purpose scaffold for determining the structure of unknown guest molecules. Additionally, we plan to test the utility of crosslinked DNA tensegrity triangles as a novel material for drug delivery by using them as a reservoir for small molecule drugs.

<https://symposium.foragerone.com/csu-curc2023/presentations/54930>

22 Testing of Unproven Microbiology Techniques

*Riley Brooke, Madeline Judson, Genova Mumford
Jessica Liddicoat, Dr. Claudia Gentry-Weeks, Dr.
Doreene Hyatt
Type: Research Poster*

'The zone of sterility' is something that has recently appeared repeatedly in modern-day microbiology lab texts. However, the validity of the 'zone of sterility' needs to be re-evaluated as there are no peer-reviewed publications proving the belief. This study aims to test whether Bunsen burners create a "zone of sterility" around themselves when lit. Our first test was to examine the contamination on agar media exposed to ambient air, with a lit or unlit Bunsen burner in the center of the plate. The ambient air supplied the environmental microorganisms that would be sterilized in the 'zone of sterility.'

<https://symposium.foragerone.com/csu-curc2023/presentations/54884>

170 The Impact of Prophylactic PEG Tubes as Opposed to Reactive Nutrition Support on Treatment Delays in Head and Neck Cancer Patients

*Sydney Coons, Corrin Coons, Bridget Eades-Kasinger
Michael Diehl, Colleen Burke
Type: Research Paper*

Head and neck cancer (HNC) patients often experience nutrition impact symptoms (NIS) including mucositis, dysphagia, dysgeusia, and anorexia that impact their ability to consume a regular diet and can lead to poor nutrition status and weight loss. This can contribute to delays in treatment which worsen tumor control and overall survival outcomes. With the use of prophylactic percutaneous endoscopic gastrostomy (pPEG) tubes as opposed to reactive nutrition measures showing promising impacts on nutrition status, our

poster aims to investigate whether the use of pPEG tubes leads to reduced treatment delays in adult HNC patients. Our results show mixed findings with some studies indicating reduced treatment delays with the use of a pPEG tube, and other studies finding reduced treatment delays in only some treatment modalities or no difference at all, suggesting this is an area in need of further research. However, after evaluating aspects of both sides of the research, we believe the use of pPEG tubes show promise in reducing treatment delays. Standards for who should receive a pPEG tube, such as those set by the National Comprehensive Cancer Network, should be followed. Adult HNC patients should be supported by multiple members of the healthcare team to maintain their nutrition status and path of treatment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54338>

163 Associations Between Balance and Psychomotor Performance in Type 1 Diabetes

*Ariana Crary
Dr. Brett Fling, Bayley Wade
Type: Research Paper*

Type 1 diabetes (T1D), which affects 37.3 million Americans, is a chronic autoimmune disease where the pancreas doesn't produce insulin, causing dysregulation of blood glucose. This can lead to balance impairments, which increases fall risk. Cortical volume loss in sensorimotor areas could contribute to balance deficits seen in T1D. Since psychomotor skills rely heavily on these cortical areas and they have been correlated to balance abilities in neurotypical people, we are interested in the relationship between psychomotor skills and balance performance in T1D. We had 7 participants with T1D complete the Purdue Pegboard test, Grooved Pegboard test and Sensory Organization Test (SOT). We compared participant scores to normative data and assessed correlations between psychomotor and balance performance by running

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regression analysis. We found that individuals with T1D performed slightly worse on the balance test and performed much worse on the psychomotor tests compared to normative data. Additionally, we saw a moderate correlation between performance on the SOT and Purdue Pegboard ($r = 0.54$) and a moderate correlation between performance on the SOT and Grooved Pegboard ($r = -0.58$). The large decrease in psychomotor abilities could be indicative of deficits in cortical regions responsible for the planning and execution of fine movement. The moderate correlations between deficits in balance performance and deficits in psychomotor performance support the idea that balance and psychomotor skills are related in T1D. If T1D balance deficits are due to central nervous system degeneration, this could help tailor therapeutic interventions to improve balance and prevent fall risk.

<https://symposium.foragerone.com/csu-curc2023/presentations/54742>

1C Equity-Focused Teaching Practices

Parker Davis

Dr. Aimee Klesiner Walker

Type: Oral Presentation

I wanted to understand the impact systematic inequities had on students learning within the classroom. I partnered with Dr. Aimee Klesiner Walker (HDFS teaching faculty), and we explored the extant literature about how to mitigate systemic barriers in higher education. In this collaboration, we examined if implementing equity-based practices would be meaningful toward equity of opportunity for success in a higher education course. According to the University of Michigan (2021), equity-focused teaching practices can be classified into five domains of criteria; critical engagement of difference, structured interactions, academic belonging, transparency, and flexibility (University of Michigan, 2021). Using a cycle of inquiry model from the Department of Education (2019), we began with Dr. Walker and I completing an audit of these practices in one of her courses.

Additionally, we worked to create a survey to elicit feedback from her current students on their perception of the equity-based teaching strategies identified in her class and their potential impact on student outcomes (Department of Education, 2019). Ideally, this information will inform how undergraduate students and faculty can collaborate to enhance our equity-focused teaching practices and in supporting campus equity.

<https://symposium.foragerone.com/csu-curc2023/presentations/54526>

157 The Effects of Weekly Intermittent Fasting on SARS-CoV-2 Severity in Mice

Phoenix Espinoza

Elliot Graham, Dr. Christopher Gentile, Dr. Tiffany Weir

Type: Research Poster

Intermittent fasting (IF) is a popular dietary strategy and purported to ameliorate cardiometabolic disease. Our preliminary data show that IF reduces vascular stiffness in obese mice while altering their immune system. Due to the continued presence of COVID-19, we aim to clarify whether changes to the immune system from IF leads to altered protection against SARS-CoV-2 (SC2) infection. Lean (WT) and obese (Ob) mice were randomized to a control diet (Ad-Lib) or once weekly 24 hr fast (IF). Following the protocol, Ad-Lib and IF mice were infected with SC2 (MA10) or sham, yielding 6 groups: WT+Ad-Lib; WT+Ad-Lib+MA10, WT+IF+MA10, Ob+Ad-Lib; Ob+Ad-Lib+MA10, Ob+IF+MA10. Temperature, body weight, and food intake were measured prior to infection (baseline) and 3- and 7-days post infection (3 DPI and 7DPI, respectively). At 3 or 7 DPI, mice were euthanized, and tissues were collected for flow cytometry, histopathology, and/or viral titers. **RESULTS:** Compared to baseline, food intake decreased in all groups following infection, which validated infection in mice. Changes in food intake compared to baseline were similar for all groups (range of -12.9 ± 4.1 g. to -22.8 ± 8.2 g). 7 DPI temperature in Ob+IF+MA10 mice was increased compared to baseline ($p=0.0097$) and 3 DPI. IF might alter SC2 infection in Ob mice, yet our forthcoming

flow cytometry, histopathology, and viral titer data will clarify whether this rise in temperature is due to an improved immune response or exacerbated infection severity.

<https://symposium.foragerone.com/csu-curc2023/presentations/54967>

15 Feeding the starving heart in Barth Syndrome: The efficacy of dietary supplements in bypassing the metabolic defects in a mitochondrial metabolic disorder

Jacob Geiger

Dr. Adam Chicco, Luke Whitcomb, Katie Sikes

Type: Research Poster

Barth syndrome (BTHS) is a rare genetic disorder associated with debilitating cardio-skeletal myopathy and exercise intolerance. While there is no cure, early diagnosis, physical therapy, and disease management may improve quality of life and increase survival into adulthood. BTHS results from loss-of-function mutations in the *TAFSAZIN (TAZ)* gene, which encodes an enzyme that catalyzes the remodeling of cardiolipin, a mitochondrial phospholipid that supports normal mitochondrial function. Studies in BTHS patients and *TAZ*-deficient (*TazKD*) mice have identified substrate specific defects in oxidative metabolism, which may contribute to reduced functional capacity and disease progression. To test this hypothesis, we pre-fed *TAZ^{KD}* mice dietary supplements that will elucidate and functional pathways of energy production. Animals are provided a source of short-chain fatty acids (triheptanoin; TH), the amino acid L-glutamine (Gln), or the ketone beta-hydroxybutyrate (BHB) for 12 hours prior to a graded exercise test (GXT) to fatigue on a motorized treadmill. Results of these ongoing studies may identify translatable interventions for improving functional capacity in BTHS patients, and perhaps longer-term strategies for slowing disease progression.

<https://symposium.foragerone.com/csu-curc2023/presentations/54909>

164 MSWS-12 as a Predictive Tool for Gait Asymmetry Reduction in People with Multiple Sclerosis (PwMS).

Chaia Geltser

Andrew Hagen, Dr. Brett Fling

Type: Research Poster

Multiple sclerosis (MS) is a neurodegenerative disease affecting two million people worldwide. This disease is characterized by degradation of the myelin sheath resulting in impaired neural communication throughout the body. People with MS (PwMS) often have one side of their body which has more severe motor and sensory impairments. This leads to gait asymmetries which can cause imbalance, falls, and a decreased quality of life. In this study, PwMS were recruited to take part in a split-belt treadmill training program which has shown in previous studies to improve gait asymmetries. Phase Coordination Index (PCI), which measures temporal symmetry, and Limb Excursion Asymmetry (LEA), which measures spatial symmetry, are measured before and after the training to assess changes in gait asymmetry. Participants also completed the Twelve Item Multiple Sclerosis Walking Scale (MSWS-12) which is a self-evaluated report of disability in PwMS, with a higher score being indicative of more severe walking impairment. In this study, MSWS-12 scores were compared to changes in PCI and LEA scores in order to understand whether MSWS-12 scores are good predictors of gait asymmetry reduction following split-belt treadmill training. Our analysis demonstrated no correlation between MSWS-12 scores and change in PCI ($= -0.07$, $p = 0.68$) but did show a weak correlation between MSWS-12 scores and change in LEA with near significance ($= -0.33$, $p = 0.054$). This indicates that self-reported disability may be a predictor for spatial, but not temporal, gait asymmetry improvements following split-belt treadmill training.

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<https://symposium.foragerone.com/csu-curc2023/presentations/54722>

176 Neuroimaging of Vestibular and Oculomotor Function in Healthy Athletes & Athletes with Concussion

Sydney Lacy

Dr. Jaclyn Stephens, Madison Propp, and Dr. Brett Fling

Type: Research Poster

An estimated 1.6 to 3.6 million sports-related concussions (SRC) occur annually in the United States, with approximately 60% experiencing vestibular and/or oculomotor symptoms. Athletes with SRC often experience a myriad of symptoms, and the two most notable areas of symptomatology involve vestibular and oculomotor systems. Independently and collaboratively, these systems support our ability to use information from the environment efficiently and make decisions automatically. Therefore, damage to and dysfunction within the vestibular and oculomotor systems negatively affect athletic performance. To assess athletes with SRC, the vestibular oculomotor screening (VOMS), is often employed and uses triggering stimuli to provoke and quantify symptoms. The reliability and validity of the VOMS tool have been established, however, its combination with neuroimaging techniques such as functional near-infrared spectroscopy (fNIRS) has been unexplored. We hope to answer two questions: 1) what regions of interest are active during VOMS tasks and 2) does symptomatology influence regional activation? In this study, we have developed a paradigm to combine fNIRS and VOMS to explore the neural underpinnings of vestibular and oculomotor dysfunction following an SRC. A 34-channel fNIRS cap was created to measure oxygenated hemoglobin during VOMS tasks in four regions of cortex: the visio-motor cortex, front eye fields, primary visual cortex, and the supramarginal gyrus. Given previous research indicating that symptomatic individuals have increased cerebral blood flow, we hypothesize that athletes who are

symptomatic will elicit greater levels of neural activation in our proposed regions of interest compared to asymptomatic individuals and controls. If the data supports our anticipated results, we will then have a way to describe the neural underpinnings of the vestibular and oculomotor systems following an SRC and most importantly we will have an objective neuronal signature of symptomatology.

<https://symposium.foragerone.com/csu-curc2023/presentations/54536>

19 Architectural Virtual Library: Development of Educational K–12 Resources

Katey Lam

Dr. Maria Delgado

Type: Service-Learning Poster

With the outbreak of COVID-19, students and tourists are deterred from visiting historical sites in person. As a response, the Colorado State University-Architectural Virtual Library (CSU-AVL) website provides virtual tours of these historic buildings to promote architectural education to students in K–12 programs. Embedded in these tours are stories, historical references, architectural details, newspaper articles, and videos to add to the experience and keep these incredible buildings alive. These resources are gathered from historical documentation and also from the stories and resources of local community members including historians, property managers, and lifelong residents. CSU-AVL encourages community members to engage with the content through multifaceted approaches such as (a) teachers developing assignments on historic architecture, (b) older adult organizations interested in virtual educational content experiences, and (c) people of all physical abilities to access historical buildings that are not ADA-compliant or easily accessible. The aim is to provide learners – of all ages and abilities – with increased access to the interiors and histories of these incredible buildings.

<https://symposium.foragerone.com/csu-curc2023/presentations/54761>

28 Relationship between Dietary Fiber and Endothelial Function in Postmenopausal Women with Above Normal Blood Pressure

Truc Le

Emily K. Woolf, Sylvia Y. Lee, Nancy Ghanem, Sarah A. Johnson

Type: Research Poster

Heart disease is a leading cause of mortality worldwide, and several modifiable risk factors contribute to its development. A significant body of research has consistently shown that people who consume high amounts of dietary fiber are less likely to develop heart disease. Despite the well-established benefits of fiber, 9 out of every 10 US adults do not meet the recommended daily intake of fiber, or fruits and vegetables which are major sources of dietary fiber. We performed a cross-sectional analysis in postmenopausal women with above-normal blood pressure to evaluate the relationship between dietary fiber, daily fruit, vegetable, and whole grain intake with flow-mediated dilation (FMD), a measure of endothelial function. FMD measures the ability of blood vessels to dilate in response to increased blood flow or shear stress. Estrogen-deficient postmenopausal women (n=43) reported food intake on 3 separate days (2 weekdays and 1 weekend day) prior to each study visit through the Automated Self-Administered 24-hour dietary recall. FMD was measured at the baseline, and the data was stratified by participants who did and did not meet dietary guidelines. Interestingly, there is no significant relationship between FMD and baseline dietary fiber, fruit, or whole grain intake ($p>0.05$). These findings suggest that meeting the dietary guidelines for these specific dietary components may not protect endothelial function in this population.

<https://symposium.foragerone.com/csu-curc2023/presentations/54863>

17 Neural Control of Balance: Smartphone-instrumented measures of sensory contributions to postural stability in older adults.

Dana Lervick

Chasmine Malabanan, Madeline Stanger, Jinqiu Yang, Angela Bryan, and Brian L. Tracy

Type: Research Poster

The neural control of postural stability is very important for functional mobility, independence, and fall risk in older adults. The effects of aging on postural control have been extensively described using expensive, lab-based research equipment. A clinical test prescribed to assess the role of different sensory systems in postural control is the Clinical Test for Sensory Integration and Balance (CTSIB). The test is traditionally scored in the clinical setting using subjective observation and relatively crude outcome measures. The purpose here is to assess the feasibility of the smartphone as an instrument to acquire quantitative measures of the CTSIB test in a remote setting. With a smartphone device attached to the lateral hip, 90 older adults performed the four conditions of the CTSIB test for 30 seconds; (1) balancing on a hard surface with eyes open, (2) a hard surface with eyes closed, (3) a compliant foam surface with eyes open, and (4) a compliant foam surface with eyes closed. A smartphone app was used to digitize the signals from the triaxial accelerometer sensors. The standard deviation of the acceleration was measured for both the anterior-posterior and medial-lateral directions. When visual feedback was removed, postural sway increased by 41% on the hard surface and 151% on the soft surface. The Romberg ratios (EC/EO) were 1.45 and 2.60 for the hard and soft surfaces, respectively. When the quality of proprioceptive feedback was altered on the foam pad, postural fluctuations increased by 94% with the eyes open and 246% with the eyes closed. These findings are similar to previous research in older adults using

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expensive lab-based equipment. These findings demonstrate the feasibility and sensitivity of portable smartphone technology as a measurement tool to assess the contribution of different sensory systems in postural control of older adults in remote settings.

<https://symposium.foragerone.com/csu-curc2023/presentations/54427>

V2 Shanghai Concorde Culture Center: Conservation and Promotion of Historical Architecture and Local Culture through Designing a Cultural Complex

Chenyi Luo

Jain Kwon

Type: Art

This research-based design project intends to create a cultural center as a commercial model that demonstrates sensitivity to culture and consideration for locals in the preservation and revitalization of old districts. Shanghai's early modern history of colonization has resulted in the mixed-style architectural fabric of the city. The design of each historical dwelling incorporates the traditional style with wooden frames and brick walls in the original structure with Western neoclassical features, including pediments on the building facades. Concorde Culture Center used a modular prototype based on the history and an industrial concept of contemporary culture. The culturally oriented design was informed through user research, material analysis, and precedent study. The cultural center comprises two sectors: the West building, with a museum and a theater, and the East building, housing a commercial complex with retail and dining spaces. The museum contains a historical exhibition structure, and the theater accommodates a variety of performances and serves as a location for cultural festivals and community gatherings. The commercial complex provides a diverse range of local to premium products and cuisine to meet the needs of a variety of visitors, as well as a unique perspective of the real historical site. The space emphasizes local materials

and colors to symbolize the culture and provide an appropriate amount of instructional content. The Concorde Culture Center can also serve as a tourist hub that contributes to enriching the local culture and to the economic growth of the local community.

<https://symposium.foragerone.com/csu-curc2023/presentations/54670>

71 Reduced Processing Speed But Not Force Accuracy Predicts Bimanual Dexterity in Older Adults

Brianna Moran

Neha Lodha, Prakruti Patel

Type: Research Poster

Bimanual dexterity is important for manipulating objects in activities of daily living. Recent evidence supports that increased time to perform manual tasks is linked to increased risk of cognitive decline. Thus, in the current study, we aimed to determine the relative contribution of motor and cognitive abilities to bimanual dexterity in older adults. Nineteen older adults and nineteen young adults participated in the study. All participants performed two bimanual tasks – 1) Purdue pegboard assembly task and 2) force tracking task that required simultaneous coordination of isometric pinch forces generated with each hand in an anti-phase manner. All participants participated in a motor task that tested their maximum grip strength of each hand. We also measured 1) selective attention with a visual search task and 2) cognitive flexibility and inhibition with the Stroop word-color task. Processing speed was quantified as response time from appearance of target stimulus to pressing of space bar. We performed multiple regression analysis to predict the pegboard score with predictor variables – response time, Stroop interference score, RMSE to measure bilateral force accuracy, and relative grip strength. Results showed that only response time was a significant predictor of pegboard score ($R^2 = 0.29$; $p = 0.01$) among older adults. This study shows significant contribution of cognitive abilities rather than motor abilities in bimanual dexterity among older adults. Interestingly, reduced processing

speed during selective attention is associated with poor bimanual dexterity in older adults.

<https://symposium.foragerone.com/csu-curc2023/presentations/54848>

30 Relationship between Dietary Components and Endothelial Function in Postmenopausal Women with Above-Normal Blood Pressure

Aaron Nacey

Emily K. Woolf, Sylvia Y. Lee, Nancy Ghanem, Sarah A. Johnson

Type: Research Poster

Cardiovascular disease (CVD) is the leading cause of death in the United States, with coronary artery disease caused by atherosclerosis being the most common type of CVD, killing 382,820 people annually. Coronary artery disease is closely related to a decrease in endothelial function. Endothelial cells make up the inner lining of blood vessels and regulate exchanges in and out the bloodstream and are responsible for vasodilation and vasoconstriction. Endothelial dysfunction is associated with a narrowing of the blood vessels and arteries and is implicated in atherosclerosis. Many studies have taken place to study different avenues of combatting this narrowing and stiffening of the arteries by improving endothelial cell function, and thus, improving cardiovascular health. Recent research has pointed to certain dietary nutrients as protective for cardiovascular health. We assessed the dietary intakes collected from participants in a randomized, double-blind, placebo-controlled clinical trial where daily blueberry consumption for 12 weeks improved endothelial function in postmenopausal women with above-normal blood pressure. The purpose of this cross-sectional assessment of baseline data was to identify dietary intakes of sodium, potassium, magnesium, vitamin C, and vitamin E as these nutrients have been shown to impact cardiovascular health. Additionally, we sought to determine the relationship between these dietary nutrients and endothelial function. The data

showed there were no significant correlations between dietary intakes of these nutrients and improvements in endothelial function, suggesting dietary intake of these nutrients is not implicated in endothelial function in this population.

<https://symposium.foragerone.com/csu-curc2023/presentations/54845>

106 Neural Correlates of Balance Deficits in Type One Diabetes

Lauren Neugeboren

Bayley Wade, Andrew Hagen, Brett Fling

Type: Research Poster

Type 1 diabetes (T1D) is a chronic condition where the pancreas produces little or no insulin. T1D is associated with cognitive decline and diabetic peripheral neuropathy (DPN). Peripheral deficits can cause gait asymmetry which has historically been associated with falls, injuries, and poorer quality of life in T1D. Previous research on T1D-related cortical deficits has largely targeted cognitive decline while sensorimotor research has focused on DPN. However, sensorimotor deficits in diabetics without DPN suggest a central nervous system mediator. Therefore, this study aims to identify potential underlying neural mechanisms of sensorimotor dysfunction in type 1 diabetics without DPN to address the elevated fall risk that can impair quality of life. Adults with T1D (n=6) ages 21-58 underwent MRI data collection on a 3T Siemens Skyra scanner using a MPRAGE scan sequence at the C. Wayne McIlwraith Translational Medicine Institute. Error correction and segmentation were performed in the FreeSurfer software, and cortical parcellation was completed using the Desikan-Killiany atlas. Cortical regions of T1D participants were compared to age and sex matched neurotypical controls using a public database (Potvin et al., 2018). Results showed significant deficits in the superior frontal lobe and the left post-central gyrus in T1D participants compared to normative data. These findings provide evidence of a cortical deficit in T1D without DPN.

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This data can be used for future interventions to improve quality of life in T1D, and future investigations are warranted to explore associations with cortical deficits and psychomotor and balance outcomes.

<https://symposium.foragerone.com/csu-curc2023/presentations/54847>

24 Invisible Identities in CSU Undergraduate Students

*Emma Oredson, Elise Golyer, Madison Guzman
Naomi Banuelos, Julie Jones, and Neomi Vin-Raviv
Type: Research Paper*

There are many identities that are not inherently visible but create additional obstacles to self-disclosing. An inventory and understanding of these identities allow for insight into aspects of how individuals interact with learning environments, relationships, and self-efficacy. The present study investigated undergraduate students' personal experiences on CSU campus relating to invisible identities and learning environments. We conducted a cross-sectional study using an online survey between 10/18/2022-11/10/2022. Participants were recruited using QR code flyers hung around CSU's Student Diversity Program and Services offices and from social work classes. The survey included four demographic questions and seven questions to measure invisible identities. In total 57 surveys were completed. Of those, 46% reported race/ethnicity as their invisible identities, 46% LGBT+ community, 33% disability, and 30% first-generation. Most respondents stated feeling comfortable disclosing their invisible identities to instructors (53%) and to peers (43%). However, 40% of participants also stated that they have at some point felt pressure to conceal part of their identity while on campus. Through the open question, five themes were identified related to how invisible identities influence learning environment and decisions to disclose: feelings of loneliness, being a parent, conversations relating to LGBTQ+ issues, fear of judgment, and not fitting the expectations of others. Results suggest that the participants are generally

comfortable disclosing hidden identities with their peers and instructors. This research can be used for further investigation into how invisible identities affect the daily lives of CSU students.

<https://symposium.foragerone.com/csu-curc2023/presentations/54143>

165 Directionality analysis of transcallosal communication utilizing the ipsilateral silent period in people with multiple sclerosis

*Sydney Petersen
Dr. Brett Fling, PhD, Jordan S. Acosta, Andrew C. Hagen
Type: Research Poster*

Multiple sclerosis is a neurodegenerative disease characterized by damage to the central nervous system (CNS). The CNS includes structures such as the corpus callosum: the largest white matter tract connecting the cerebral hemispheres. In persons with multiple sclerosis (PwMS), degradation of the corpus callosum can result in asymmetric gait due to the lack of coordination of bilateral movement. The ipsilateral silent period (iSP) is a measure of interhemispheric inhibition. iSP metrics were utilized to relate differences in directionality from the two cerebral hemispheres, as most PwMS have hemispheres that are more and less affected by the disease. Twenty-nine participants completed the study and iSP metrics of duration, average depth, and maximum depth were analyzed for interhemispheric inhibition. Muscle activity of the first dorsal interosseus muscle was monitored while single pulse transcranial magnetic stimulation (TMS) was delivered to the ipsilateral primary motor cortex. We hypothesized that reduced transcallosal inhibition may be an underlying neuropathological mechanism driving gait asymmetry in PwMS due to directionality differences between more and less affected hemispheres. While there were no significant differences in the directionality of iSP metrics from the less to more affected hemispheres, these findings suggest interhemispheric inhibition may be preserved in people with MS, and other factors may be driving gait asymmetry. More

investigation regarding underlying neural mechanisms is necessary, and research investigating the neurophysiology and gait metrics are pivotal to individualize potential rehabilitation protocol for people with MS.

<https://symposium.foragerone.com/csu-curc2023/presentations/54770>

18 Tibialis Anterior Maximal Force Capacity and Balance Assessment Scores in People with Multiple Sclerosis.

*Matthew Scarsbrook
Chris Patrick, and Brett Fling
Type: Research Poster*

Multiple sclerosis (MS) is a chronic neurodegenerative disease that results in damage to the central nervous system and hinders communication between neurons. Impaired neuronal communication reduces the amount and quality of sensory input from the periphery and decreases force capacity, which may lead to gait and balance impairments. These manifestations put people with multiple sclerosis (PwMS) at an increased risk of falls and other adverse events. Clinical evaluations such as the Mini Balance Evaluation Systems Test (Mini-BEST) can be used to evaluate the degree of balance and mobility deficits that PwMS experience. Components of the Mini-BEST include 14 assessments that target 4 balance systems: anticipatory postural adjustments, reactive postural responses, sensory orientation, and dynamic gait. The capacity for quick and powerful force output from the muscles of the lower body is critical for the function of all these balance systems and for reducing the likelihood of falls. Understanding how force capacity influences performance on each Mini-BEST subcomponent can inform rehabilitative efforts. My project compares maximum force output of the tibialis anterior muscle of the lower leg with participants scores for all 4 subcategories of the Mini-BEST. Results from this study will emphasize the need for future studies

to look at more specific areas of force generation in PwMS so novel rehabilitation methods aimed at reducing falls and other injuries can be created.

<https://symposium.foragerone.com/csu-curc2023/presentations/54946>

16 Phytochemical compound, PB125, improved mechanisms of proteostasis in a guinea pig model of musculoskeletal decline

*Josh Survis
Maureen A. Walsh, Robert V. Musci, Kendra M. Andrie,
Maryam F. Afzali, Wenceslao Martinez, Areli Sanchez,
Qian Zhang, Thomas J. LaRocca, Julie A. Moreno,
Kelly S. Santangelo, Karyn L. Hamilton
Type: Research Poster*

Protein homeostasis (proteostasis) is the collective processes to synthesize, breakdown, and chaperone proteins. Loss of proteostasis is a hallmark of aging and drives the development of age-related chronic diseases. Specifically, loss of proteostasis drives musculoskeletal aging which includes declines in skeletal muscle, joints, and bones. Currently, there is a lack of effective treatments to slow musculoskeletal declines in older adults. One reason is the absence of effective preclinical models that recapitulate human aging. However, our lab has identified the Hartley guinea pig (HGP) as a model of musculoskeletal decline. Our lab previously demonstrated that age-related decline in skeletal muscle mitochondrial of HGPs was attenuated with the phytochemical compound, PB125, which is a nuclear factor erythroid factor 2-related factor 2 (Nrf2) activator. Nrf2 is a transcription factor at the nexus of redox homeostasis and proteostasis. The purpose of this study is to examine if PB125 treatment improves mechanisms of proteostasis in the tibialis anterior (TA) muscle. We assessed mechanisms of proteostasis with the stable-isotope deuterium to quantify rates of protein and DNA synthesis. Rates of protein synthesis were maintained in the TA in 10 mo treated HGPs. However, there was a significant decrease in DNA

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synthesis in PB125 treated HGP. When examining protein synthesis in the content of cellular proliferation (DNA synthesis) we observed a greater ratio of protein synthesis to DNA synthesis in 10 mo treated HGPs indicating improved mechanisms to maintain proteostasis. These results provide a foundation for human trials with PB125 to slow the progression of musculoskeletal decline.

<https://symposium.foragerone.com/csu-curc2023/presentations/54368>

14 Examination of Relationships Among Environmentalism & Young Adults' Consumption Choices.

*Makayla Trapp
Dr. Ruoh-Nan Yan
Type: Research Poster*

In the apparel industry, the fast fashion business model has become one of the main drivers of overconsumption, resulting in an excess of cheaply made products, exploited workers, and environmental concerns. Additionally, the multiple retail channels available to consumers make it easier than ever to buy products, which has negative implications for the environment and sustainable apparel consumption. Currently, a gap in the literature surrounding this topic exists that relates consumers' environmentalism to variables such as transportation when shopping, retail channel choice, and shopping values. The purpose of this study is to examine how young adults' environmental behaviors influence their apparel consumption-related choices. This study will answer the following questions: **Q1:** How do young adult consumers' environmental behaviors relate to their preferred mode of transportation when shopping in person? **Q2:** How are their environmental behaviors related to their retail channel choice (e.g., physical stores vs. online websites)? **Q3:** How are their environmental behaviors related to their shopping values (i.e., utilitarian vs. hedonic)? To collect data, an online survey was administered to undergraduate college students that gauged their environmental behaviors. The survey also asked

students about their preferences in modes of transportation when shopping, retail channel choice, and shopping values. Correlation analysis through SPSS was used to analyze the data. Data from a sample of 182 US college students showed significant correlation among environmentalism and the three variables. Implications of these correlations will be discussed further.

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26 Effects of covid-19 on The Colorado roofing industry

*Trevor Wahl
Rodolfo Vasquez-Valdes, Erin Arneson, Michael Gebhardt
Type: Research Poster*

The roofing industry is one of the largest construction sectors, with a market share of almost \$20 billion in 2021. Roofing plays a critical role in all commercial and residential construction projects. In March 2020, the roofing sector was heavily impacted by the COVID-19 Pandemic and was brought to a virtual standstill. This study examines the effects COVID has had on the residential and commercial roofing industries in Colorado. Previous research was compiled to help understand how technology, labor, and safety has evolved in roofing over time and to help identify the current state of the industry. In addition, U.S. Census data was also organized to investigate the number of establishments, number of employees, and quarterly wages for commercial and residential roofing in each Colorado county. Data from 2019 to early 2021 was used to show the potential effects of COVID and the differences in how residential and commercial roofing were impacted. The contrast in rural vs urban counties were also examined using the Census data. Using the software Tableau, the data collected was used to create a visual representation of the findings in the form of an interactive map. The map will showcase any differences in the effects of COVID on both roofing sectors. Preliminary results indicated a noticeable decline in employees and wages during the

pandemic and a larger decline in wages and employment for residential roofing.

<https://symposium.foragerone.com/csu-curc2023/presentations/54655>

31 Filling a Disparity: Dental Hygiene Items for Those in Need

Lexi Walker

Traci Kinkel, Sam Desta, Riley Anderson

Type: Service-Learning Poster

When my dad was diagnosed with a rare autoimmune disease, it sparked my interest in the dental field due to the disease having a large effect on his oral health. After researching, I have come to learn that much of our overall health is affected by what is going on inside of our mouths and how many diseases can be prevented. As a local volunteer for homeless shelters in Fort Collins, I noticed disparities with access to dental hygiene items as donations often consist of food and clothing but not dental items. My project aimed to educate the public on why oral health is so important, what disease can be prevented from proper oral hygiene, and bring access to oral hygiene products to those in need.

Over the last year, I have been able to network with local dentists and compile donations of toothbrushes, toothpastes, floss, and non-alcoholic mouthwash. I packaged and distributed these items in November and December to the local homeless shelters while performing a voluntary survey to learn more from each person's own experience. I distributed one bag to every person when they were receiving their meal with an informational pamphlet regarding the importance of dental health & overall health. I also supplied over 1250+ dental hygiene items men, women, and children's shelter in Fort Collins. My overarching goal was to help fill a void by supplying resources and educating others to help improve dental hygiene in hopes that their overall health will improve as a result.

<https://symposium.foragerone.com/csu-curc2023/presentations/54494>

20 Fluoride in Human Health and Nutrition

Lexi Walker, Alex Madachy

Colleen Burke, Rachel Kastanek

Type: Service-Learning Poster

Fluoride is a trace mineral known for aiding bone health. This chemical is found in some foods, fluoridated water, and oral health products. Fluoride is absorbed in the stomach and small intestines and travels through plasma to be deposited in bones and teeth. About 50% of ingested fluoride is retained, and 99% of fluoride in the body is stored in bone and teeth. It supports oral health by promoting osteoblasts, a cell that synthesizes and maintains bone. Poor oral health and hygiene can lead to increased amounts of acid produced by bacteria. Prolonged exposure to high amounts of acid can degrade protective layers of enamel and dentin on teeth. Dental caries occur when degradation of tooth surface and plaque buildup. This increases risk of infections, inflammation, oral pain, premature tooth loss, and impaired quality of life. Fluoridation of community water sources became popular in the 1960's as a public health intervention to improve oral health. Communities that introduced fluoride into their water supply had a 25% reduced risk of dental caries. Although the safety and efficacy of water fluoridation has been supported by research, many communities still do not have access to fluoridated water or refuse to implement this intervention.

<https://symposium.foragerone.com/csu-curc2023/presentations/54450>

38 Public Achievement Through Deliberation

John Argenio

Isabel Henry, Jonathan Cable, Clay Kimberling,
Alexandria Hansen, Sabrina Slagowski Tipton, and
Katie Knobloch

Type: Serving Learning Poster

I joined the Public Achievement team within the Center for Public Deliberation (CPD) to work with the younger generation. We provide them with the resources and training associated with the CPD while teaching them valuable deliberation skills. This project falls within the study of deliberative analysis, as the resources we provide to these high schools mostly revolve around this form of communication. The mission of Public Achievement is to empower those of a younger generation to challenge the issues they see within their environments. We are able to empower these students through the skills and training we have accumulated through the CPD. Specifically, this project worked to help the students create whatever change they wanted in their neighborhood, school, or larger community. The process begins with a general conversation allowing the students to decide the direction they would like to take this process. At Rocky Mountain high school and Ft. Collins high school, the students independently chose to focus on equity issues at their schools. Surveys compiling their fellow students' feelings about said equity in the school are the beginnings of a process to amend the problems the students face. We assisted in developing a student-led teacher workshop where they could communicate the issues in the school environment. This empowerment and education process allows a younger generation to enact the change they desire. The Public Achievement team continues to grow this process as more schools and students are needed to refine the potential of empowerment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54777>

34 Capturing the Essence of America with the Music of Charles Ives

Enzo Barrett

Dr. Dawn Grapes

Type: Research Poster

Charles Ives is often considered the leading composer of American art music in the twentieth century. The medium of his works is varied and included symphonies, marches, chamber music, vernacular music, and works for organ. *Variations on America* is one of Ives's earliest pieces, composed circa 1891 for organ when he was just seventeen. Recently, *Variations on America* has taken on a second life in the form of a band arrangement done by William Rhoads. Despite the many decades it took to rise to prominence, Charles Ives's *Variations on America* has an important pedagogical place in the band literature because of its ability to teach students the connection between patriotic music and band, the depth of consideration that is required when interpreting the piece due to its rich history, and the many technical passages that students will not only learn from but are essential band excerpts to be familiar with. Previous research has been done on this piece's place in the band literature and its excerpts, but most of it lacks context of its history and original form. In the classroom, *America* provides a meaningful introduction to the musical voice of Ives, and his specialized musical techniques including polytonality and patriotism. It is important to not only know how to play pieces, but also to have knowledge of why they are important and should be played in the future.

<https://symposium.foragerone.com/csu-curc2023/presentations/54767>

37 “Does Anyone Else Have Thoughts on That?”: Norms and Strategies for Deliberative Facilitation

Liam Bureau

Katie Knobloch

Type: Research Poster

Currently, a gap exists between the theoretical norms and ideals of deliberation and our understanding of what they look like in practice. This disconnect is especially relevant when attempting to understand the role of the deliberative facilitator. It is understood that a facilitator should strive to remain impartial, ensure inclusion, build consensus and common ground, and manage time. How these norms are defined and carried out, however, remains unclear. Investigating how they appear in practice can provide important insights where theory alone cannot. Through the thematic coding and analysis of 150 peer observation sheets from facilitator practice forums at Colorado State University’s Center for Public Deliberation, I investigated how graduate and undergraduate student facilitators are defining the roles and practical tools of deliberative facilitation. I have found that these student facilitators rely on complex understandings of norms such as impartiality, participant agency, and structure management in order to uphold them in deliberative discussions. Students strove to meet these ideals with clear, well timed, and genuine interventions using questions, warnings, transitions, and more. This suggests that existing literature understates, for example, the importance of facilitator interventions being genuine and authentic, delivered clearly and concisely, as well as the importance of concluding a deliberation with sufficient time and space for reflections. The insights into deliberation in practice that these findings provide are relevant to educators, deliberative practitioners, and future researchers.

<https://symposium.foragerone.com/csu-curc2023/presentations/54858>

2b Homelessness

Kailer Chance

Professor Matter

Type: Oral Presentation

There are many social issues affecting Americans that need to be addressed. Homelessness is a major issue sweeping the nation and many consider it to be an epidemic. By addressing homelessness at the core, we can solve this issue. By making housing more affordable, making health care more accessible, and creating more jobs, we can solve homelessness head on. By doing these three things we address some of the problems being brought on such as drug abuse, mental health, and overall well-being. Critical review of scholarly articles is the type of method that was used in this research study. The findings gathered were that affordable housing has the biggest direct impact on homelessness by addressing a ton of the symptoms that come with having no home. The significance of this study was to show that homelessness is a difficult problem to address, but it is still a problem we can overcome by making housing more affordable, making a greater access to health care, and creating more access to employment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54432>

39 Inferring the feeding ecology of a newly documented owl from the lower Eocene (56-52 Ma), Willwood Formation, WY

Janie Christensen

Kimberly Nichols, Dr. Tom Bown

Type: Research Poster

Owls (Order Strigiformes) are the oldest known birds of prey, appearing in the fossil record before hawks, eagles, and falcons. However, Cenozoic birds are understudied, and very little is known about them in part due to a paucity of specimens and a field-wide bias towards mammals. A specimen collected by CSU’s paleontology field school from the Willwood Formation is the unguis digit 3 phalanx of a fossil

owl. Based on measurements of modern owl within-species size variation, it is unlikely to belong to the same species as the recently discovered fossil owl *Primoptynx poliotauros* from the same formation, and therefore the two species coexisted, occupying different ecological niches. In predatory birds, claw morphology correlates to the size of the prey relative to the bird's body, and whether it has a generalist, small mammal specialist, or piscivore diet. We also reconstructed what the soft tissue keratin sheath over the claw may have looked like in life, to better compare to museum specimens. By comparing the fossil to modern owl, hawk, and falcon museum specimens, we reconstructed the diet and hunting strategy of this prehistoric owl. Then, this inferred diet can be compared to the locality where the fossil was found, which is richer in small mammals than other localities and uniquely concentrated into a small area. This site includes primates and plesiadapiforms, and possibly represents a predator accumulation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54862>

W4 Yellow Planet

Cayden Clark-Johnson
Type: Written Work

Yellow Planet is a poetry collection that I have been working on for a couple of months in my free time. In 19 poems, I explore what the color yellow has come to represent for me as an artist since October of 2022. Yellow is often used to symbolize happiness and energy, but also decay and danger. The poems vary greatly in topic, but many of them were written after a brief moment of clarity I experienced in my day-to-day life that caused me to freeze and notice the lurking, almost malicious presence of the color yellow in my life. Many of them are reenactments of those experiences, although not all of them. Regardless, each poem in this collection utilizes the color yellow in an effort to connect the poems and make them parts of a whole. Much of my writing is also inspired by Sylvia Plath and confessional poetry in general. In summation, it is a deeply personal, if

fragmented account of the past few months of my life, all connected by this color that has strangely and intimately become my muse.

<https://symposium.foragerone.com/csu-curc2023/presentations/53169>

32 Addressing Homelessness in America

Jake DeLuca
Type: Research Poster

This study was a deliberative analysis that examined the effects of homelessness in the United States and considered why it is a wicked problem. Homelessness has been a wicked problem for decades. Homelessness is one of the largest issues in the United States currently, but it is also an issue all over the world. Because wicked problems inherently cannot be solved, the only way to help improve them is to use adaptive changes along with creative and innovative ideas to try and minimize the extent of the problem. There were four approaches used to examine the problem; the use of government aid and promotion to create more awareness, the use of nonprofit organizations to be the leading fund creators, the utilization of education, enforcement, and engineering to create new ideas for solutions, and increasing the number of outreach programs including case management and housing programs. The analysis confirmed that the four approaches used supported the hypothesis that homelessness in the United States is a wicked problem. Overall, the wicked problem of homelessness can be effectively addressed through the use of a comprehensive approach that utilizes education, enforcement, and engineering. This approach should include the coalition of local, state, for-profit, and non-profit organizations, all of whom should provide funding and support for outreach programs, case management, and housing programs.

<https://symposium.foragerone.com/csu-curc2023/presentations/54751>

1C Singing through Change: Classical Vocal Pedagogy for Testosterone HRT

*Mykayla Fitzpatrick
Dr. Nicole Asel
Type: Research Poster*

Trans voices are unique and often overlooked in Western classical vocal pedagogy as they can be difficult to teach and may not follow a traditional journey of vocal development. Although there is a wide and wonderful array of trans voices in music, this article guides music professionals through methods to approach, teach, and choose repertoire for a young adult voice developing through testosterone hormone replacement therapy. Testosterone hormone therapy is used to induce the physical body changes caused by male hormones during puberty in order to better promote gender identity and body congruence. Specifically regarding the voice, testosterone therapy will produce the same physical phenotypes as male puberty over a shortened window of time, including: increased vocal fold thickness, cartilage growth, cartilage tilt (the Adam's apple), and early cartilage ossification. These physical changes will result in a variety of phonation changes, including: general deepening of the voice over time, consistent hoarseness, weakness, cracking, a decrease in range or two separate ranges with missing pitches between, and even difficulty matching pitch. These changes are unique to testosterone hormone therapy and deserve a place in literature to be explored, developed, and understood, allowing us to expand Western pedagogy to a more diverse world of classical voice.

<https://symposium.foragerone.com/csu-curc2023/presentations/54745>

50 Combat on Communication

*Dylan Formento
Dr Aoki, Dr Matter, Laraine Winter
Type: Research Poster*

Veterans are a very protected group from any sort of bad talk about them but the more you research, the more you realize that this is not the case for interpersonal communication. This includes the effects of PTSD on the veterans themselves as well as how they communicate with loved ones. This is what my research topic covers, how communication for veterans changed before and after they have been in action. The biggest problem that was found was that these veterans' experiences have disconnected them from the real world causing their communication to fail leading to broken friendships and relationships with loved ones. I conducted multiple interviews with veterans that would volunteer to speak with me as well as conducted in depth research on the scientific side of this topic. After gathering the information from both sources combining them led to some very interesting findings which pushed for more questions to be asked. After combining the information it came out to show that the hypothesis has been supported and even skyrocketed beyond my belief with the inclusion of PTSD within these veterans. This increased the number of friendships that have been broken or relationships as a whole for these people as it decreased their effective communication leaving them alone to live by themselves.

<https://symposium.foragerone.com/csu-curc2023/presentations/54485>

1C Exploring Latino-Male Retention Through Testimonio and Interdisciplinarity

*Oscar Godinez-Avila
Dr. Cindy Murillo and Dr. Heidi Hausermann
Type: Oral Presentation*

The lower attainment of college degrees by Hispanic folk compared to White folk has been widely recorded and acknowledged. This disparity exists

further for Latino-males, however, who also have lower rates of success in higher education than their female counterparts. This demonstrates an enduring need to support Latino-males in collegiate environments. A typical, disciplinary perspective of education identifies a sense of belonging as a prominent factor in Latino-male retention and seeks to promote this by connecting them with relatable role models and mentors. However, a more interdisciplinary approach reveals additional factors to consider. As a former college dropout myself, I explore this interdisciplinary perspective using the personal ethnography method of *testimonio*. I connect my experiences surrounding housing instability, food insecurity, and low self-compassion with academic literature, which shows my story is an example of the kinds of adversity the broader Latino-male collegiate population faces. As a result, this exploration identifies socioeconomic and psychological perspectives as relevant supplements to the education perspective on Latino-male retention. Ultimately, I encourage colleges to continue doing what they can to connect Latino-male students with relatable mentors and role models, but I also encourage them to take more active roles in supporting the financial and psychological needs of these students. In the process, I also seek to affirm students struggling with issues related to those discussed in this project and encourage them to practice self-compassion.

<https://symposium.foragerone.com/csu-curc2023/presentations/54800>

47 The Youth Mental Health Crisis is Affected by Social Media Usage

Bryant Gross

Michelle Matter

Type: Research Poster

Social Media platforms are often used by our youth for entertainment or communication. The affects that these platforms have on our youth are questionable, as it has caused social media addiction and other harm such as; increasing the rate of suicide within school aged children. Do social

media platforms have a correlation with the rising mental health crisis? The analysis exposed platforms such as Facebook, which knows that their website is harmful to their users. In addition, many social media companies make their platforms purposefully addictive to sell the users data. The ethics of this is questionable. In our modern-day society, studies like these are important for future studies that link mental health and social media usage.

<https://symposium.foragerone.com/csu-curc2023/presentations/54789>

1C Family Communication Patterns Theory: Influence on Listening Skills and Communication Competence in Adulthood

Isabel Henry, Olivia Birg

Dr. Meara Faw

Type: Oral Presentation

This study considers Family Communication Patterns Theory family styles and their correlations to listening skills and communication competence through three different scales: the Active Empathetic Listening Scale (AELS; Bodie, 2011), the Family Communication Patterns Theory scale (FCPTS; Ritchie & Fitzpatrick, 1990), and Interpersonal Communication Competence Scale (ICCS; Cupach & Spitzberg, 1983). Using an online survey, we examined the ways that these scales correlate with each other. Our results demonstrate a statistically significant relationship between the laissez-faire FCPT family style and low communication competence. However, there were no statistically significant correlations found between other FCPT family styles, listening skills, and communication competence. These results carry interesting implications for future research due to the lack of correlation and the opposing literature findings.

<https://symposium.foragerone.com/csu-curc2023/presentations/54561>

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44 Social Media Impact on Mental Health

Davis Hubble

Michelle Matter

Type: Research Poster

Social media has become an essential part of our daily lives, revolutionizing the way we communicate, share information, and interact with each other. Since the emergence of platforms like Facebook, Twitter, and Instagram, social media has continued to evolve, and its impact on various aspects of society has become increasingly significant. The topic of this research project is the impact of social media on mental health, specifically exploring the relationship between social media use and anxiety and depression. What are the underlying factors that mediate the relationship between social media use and anxiety/depression? How can social media be used positively to promote mental health and well-being? The study will use a qualitative research methods approach. The research aims to identify the impact of social media use on mental health and the factors that mediate this relationship. The research findings will provide insights into the extent to which social media use affects anxiety and depression levels and how this impact differs among different age groups. The research project is significant because it sheds light on an important public health issue and provides insights into the relationship between social media use and mental health. The study's findings could inform the development of interventions to promote healthy social media use and reduce the risk of anxiety and depression.

<https://symposium.foragerone.com/csu-curc2023/presentations/54837>

33 Digital Mental Health on College Campuses

Olivia Levy

Type: Research Poster

Mental health is an ongoing issue all over the world and digital mental health resources have become more prevalent since the pandemic but still are not

as widely used and promoted as other resources specifically on a college campus. This study in psychology examined how college students found or interacted in digital mental health resources through their university. It can be difficult for students to reach out or find services from their university when they are struggling with their mental health. Understanding how to better promote and display digital mental health resources on campus may increase the number of students who are working to benefit their mental health. This study in psychology examined a number of sources in digital mental health on college campuses. Through surveys and interviews, there are many students who feel that they would be more inclined to utilize mental health resources if they were provided digitally. With this found information, colleges around the world will be aware of the resources and services that students interact with.

<https://symposium.foragerone.com/csu-curc2023/presentations/54818>

48 Importance of Color in Wes Anderson's *The Grand Budapest Hotel*

Annabel Lockett

Michelle Matter, Katie Moylan

Type: Research Poster

Color holds a deep creative meaning and creators use it as a tool to further pervy meanings and unknowingly guide the viewers thoughts and depiction of the story. Wes Anderson uses color in a powerful way. By studying creative processes and color usage, one can gain cultural knowledge and gain a deeper creative understanding.

<https://symposium.foragerone.com/csu-curc2023/presentations/54460>

49 Water Conservation

Cynthia Macias

Paul Oldham, Will Given, Cahil Bealmer

Type: Research Poster

The Colorado Basin River supplies water to about 7 states, both domestic and agricultural. As of August 2021 the federal government declared a water shortage on the river. This has caused a lot of issues because this river supplies water to major cities. Finding a solution to water conservation could potentially help prevent issues in the future regarding water and who owns these water rights. There have been issues where farmers think they should hold the water rights, but something needs to be done in order for there to be peace.

<https://symposium.foragerone.com/csu-curc2023/presentations/54846>

40 Fantastic Box Office Numbers and Where to Find Them

Holly Middleton

Type: Research Poster

Messages and success of pop culture products are indicative of the values our society holds; therefore, understanding why pop culture media find success – and equally important, failure – is imperative towards the understanding of the current state of our society’s values within the context of capitalism. This critical media analysis and criticism investigates the three *Fantastic Beasts* sequel movies in the *Harry Potter* franchise.

Utilizing a three-pronged analytic structure of these movies’ production, textual content, and reception allows for an understanding of capitalism’s influence on each major aspect of the media we consume, and how that affects future investment on behalf of studios’ resources and consumers’ time. This analysis revealed that, rather than allowing the lessons learned from the *text* of a franchise installment to shape culture, instead the production and the reception of the project are now what shape

culture; at least, in the context of big-budget blockbusters. If media shapes culture, and that culture in turn shapes media further, then this echo chamber will eventually settle on producing inconsequential stories like *Fantastic Beasts*: devoted to revenue, void of meaning.

Since movie studios cater their content towards the largest audiences possible in an effort to increase capitalistic gains, movies therefore tend to highlight what matters to the society they are made for. Understanding how a large piece of our society – the blockbuster – falls apart can offer insight into the inner machinations of select societal conditions and offers an opportunity to investigate the goings-on in our world from a new perspective.

<https://symposium.foragerone.com/csu-curc2023/presentations/546869>

35 Voting Rights of the Recently Incarcerated: If You Can't Vote, Are You Really Free?

Dawn Paepke

Sarah Wernsing

Type: Research Poster

The history of slavery and the exception in the 13th Amendment where “neither slavery nor involuntary servitude shall exist...except as punishment for a crime,” is the genesis of the criminal justice system in the United States. Value is placed on creating wealth for those in power over the civil rights of incarcerated individuals. Often, the recently incarcerated are not allowed to vote, rent a home, secure gainful employment, or access social services. American institutions prop up the practice of disenfranchisement for ex-felons in this country, stripping them of uniquely American civil liberties. Studying the intersection of America’s institutions through interdisciplinarity exposes long-held beliefs, fears, and resistance to change. This research focuses on how recently incarcerated individuals, through the power of the vote, can become fully engaged in their communities.

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<https://symposium.foragerone.com/csu-curc2023/presentations/54537>

46 My Health, My Choice: Politicization and Polarization During The COVID-19 Pandemic

Drew Peterson

Type: Research Poster

Health is important to everyone and being able to stay healthy during a global health crisis can be hard without proper communication. This research paper in the field of communication took a look into how the US dealt with the COVID-19 pandemic and whether the response was effective or not. The purpose of this research was to better understand how politicization and polarization affected the US response to Covid-19, and how the world can be better prepared for another global health crisis. To complete this analysis the ideas of politicization and polarization in the US were researched, as well as responses to COVID, and how to better deal with a new health emergency. This research found that the US was at the bottom of the list when it came to COVID response because of high degrees of polarization and the need to make everything political. The way to fix this is to rebuild our trust in one another as well as in science and the government. This research is important because it shows that political division has become a problem and that it is now affecting healthcare and how the US and other countries deal with emergencies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54741>

V4 The Little Bird, Exploring Big Emotions Through A Little Bird

Meg Robinson

Type: Visual Art

The Little Bird Mini Artist's Book is an investigation of themes interpreted from the Annie Lennox song, Little Bird. The familiarity of the lyrics immediately

struck me. We were exhausted. The world was and still is overheating, a global pandemic held us still, and it seemed as if the door to childhood had been slammed shut. Her lyrics described comparison, burdens, and resilience all at once. I was just as hopeless as the little bird in her song, but I still felt the guttural call found in, "Mamma, we reap what we sow". Thus the visual story of The Little Bird began. To unearth the hope that Lennox slyly convinces you is still there, I knew I needed to play. I needed to get wild, get sad, and release all of the past few years' experiences. Jumbled yet justified collage and interactive type work to visualize overlapping layers of sorrow and joy. This piece consists of magazine cutouts, scrap fabric, and to-do lists from my own weekly planners. These parts were compiled into physical page layouts that were then scanned and reprinted for digital and hard-back copies. While creating this piece the world changed, as it should. It will always change, burdens will come and burdens will go. Yet, through this Little Bird, I induced that our ability to play is what remains. We can confront complex emotions by playing. If you need to play to feel a little better go right ahead and just see what you might grow.

<https://symposium.foragerone.com/csu-curc2023/presentations/54900>

43 Spider-Man 3: The Bastard Child of a Trilogy, Or a Misunderstood Reflection of Our Lives?

Coehen Sperry

Michelle Matter

Type: Research Poster

Just because a film is objectively bad does not mean that film can't contain strong messages and symbolism that provide catharsis and points of reflection for an audience. This study in critical media analysis examines why Sam Raimi's Spider-Man 3 is an excellent example of the superhero genre. The allegory of the venom suit representing substance abuse allows the viewer to gain clarity of the bigger picture in the film. One that tells the story of a man who succumbs to his deepest and most selfish desire to avoid feeling powerless like the

people he tries to save every day. I found a scholarly definition of genre and superhero movies. I used this knowledge to view Spider-Man 3 through a critical lens and overlook the negative connotations of the film to understand why this movie is an excellent example of the genre through its allegory of the venom suit representing substance abuse. The rushed nature of the project and heavy studio interference made for a conglomerate of clashing ideas for a movie that was already jam-packed from the beginning. However, when we step back and look at the more minute aspects of the film, it is easy to argue that the film has more going for it than was originally perceived. This essay shows why genre in films is more than just a category. It can help an audience appreciate more than just the story and promotes people to look deeper into a film for greater significance and meaning to themselves.

<https://symposium.foragerone.com/csu-curc2023/presentations/54796>

36 INGO Recognition of De Facto States: A Constructivist View

Samuel Stoltz

Dr. Eric Fattor

Type: Research Poster

De facto states are stuck in limbo, frequently exerting *de facto* territorial control while lacking *de jure* international recognition. While intergovernmental organization (IGO) membership is a commonly used metric for assessing *de jure* recognition, some de facto states seek membership in international nongovernmental organizations (INGO) as well, raising the question: why do de facto states seek to achieve INGO membership? I argue that membership in INGOs provides many similar benefits as IGO membership, and that de facto states seek material and normative benefits from INGOs due to the lower bar of entry into these organizations. By constructing a dataset of 113 INGOs and analyzing which de facto states these organizations recognize, I am able to demonstrate that there is a clear divide between de facto states that receive a significant amount of recognition and

those that don't. Using a constructivist lens, I argue that de facto states that are more successful at achieving INGO recognition do so through ideological alignment and the construction of a strong national identity. In turn, this recognition provides a number of normative and material benefits to these de facto states making these efforts worthwhile.

<https://symposium.foragerone.com/csu-curc2023/presentations/54795>

V3 The Mexican Flag (Acrylic on Canvas)

Christian Suarez

Type: Visual Art

Artistic interpretation of the Mexican Flag, done with acrylic paint. The emblem represents an eagle attacking a snake, perched on a cactus.

One of the Aztec Gods "Huitzilopochtli", commanded them to build their new city wherever they saw this sign, which they found on an island in the middle of the Lake Texcoco; building their capital city of Tenochtitlan where modern day México City stands. The Spanish as well saw a higher meaning in this symbol. They saw it as a triumph of God over Satan, where the Eagle represents an animal sent from the sky, the heavens, to conquer an animal of the underworld, the snake. The snake which also tempted Eve in the Garden of Eden, and began the fall of man.

This important symbol represents the soul of the Mexican people, who were created by the unification of the Indigenous Aztecs, surrounding Indigenous groups, and the Foreign Spanish. This is now commonly referred to as *mestizaje*, the mixing of the two races, and the mixing of Pagan and Catholic traditions.

This interpretation depicts the eagle as the Aztec God "Quetzalcoatl", the God of time, eating himself. His earthly form is depicted as a feathered serpent, a mix of both a bird and a snake. He is absorbing his own tail, to represent the Aztec perception of time as

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circular, as opposed to the Western perception of time as linear.

<https://symposium.foragerone.com/csu-curc2023/presentations/54922>

41 Dangers of Texting and Driving

Robert Swerer

Michelle Matter

Type: Research Poster

I am going to do my research project on texting and driving. I think everyone can agree that texting and driving is a very bad thing but yet lots of us still do it because of the convenience and the addiction we all have to our phones. I am going to be doing an extensive amount of research on this topic in order to see the statistics on texting and driving. I did a research project on it a long time ago and it was alarming to see how many people were dying. Another thing that interests me more than anything is how to improve the statistics and what we can do to affect these numbers. Texting and driving can ruin peoples lives in a matter of a second and something that is preventable like this needs awareness. When you text and drive you increase your chances by 23 times of getting in an accident. This scares me and should scare you too. We have to do better as a society and prevent this. I am going to be gathering information about this topic and becoming as knowledgeable as possible so I can help prevent this even if it just helps at least one other person.

<https://symposium.foragerone.com/csu-curc2023/presentations/54483>

45 Effects of Social Media on Female Youth

Maggie Warren

Type: Research Poster

Social media is an up and coming phenomena today; and since it being so new and booming, it's been vital to look at its short term and long term effects. My topic is to study the use of social media

among female youth and how it effects their physical and mental health. Social media has realistically only been a prevalent force within the last fifteen years, so there's a lot of unanswered questions as to how and what is effecting the people that consume media through these online platforms. I believe the use of social media among females under eighteen are going to have high rates of mental health issues, along with physical issues such as eating disorders. By using interviews, surveys, observation, I was able to complete my full analysis on what effect constant social media is having on growing girls. This is will mixed methods research because I will be conducting both quantitative and qualitative data. The importance of this topic is to see how we can protect the minds of the youth for them to be set-up to have the most successful and brightest future possible. It's crucial to be aware of what exposure to sites such as Instagram, Twitter, Snapchat, and TikTok is changing within our female youth.

<https://symposium.foragerone.com/csu-curc2023/presentations/54792>

42 Do big name sports apparel companies have too much power in college sports?

Trevor White

Michelle Matter

Type: Research Paper

When it comes to the realm of college sports, the NCAA (National Collegiate Athletic Association) prides themselves on the amateurism of the sports they govern. Only problem is, they've been hiding a dirty secret this entire time. Most of their big athletes that go to prominent sports schools have been getting money under the table and have been taking bribes from sportswear companies to go to schools where they wear their brand. This all happened before NIL deals came into effect the last couple of years, bringing into question the legitimacy of recruiting and results that have come after the fact. As of now there are a couple of big name cases being investigated by the FBI for their roles in these briberies and those who have been involved in these

activities could be facing prison time. Smaller conferences such as the Mountain West where CSU competes have been the unfortunate losers of these deals as it takes away recruits and therefore making powerhouse conferences drown out these other conferences. With that it also makes sure that smaller schools such as CSU never become competitive because those schools with tighter connections and more money can just pay players to come to their school. Without this smaller schools will crumble under bigger schools and there will never be true competition. To examine this I used both analyzing and data with their budgets and stories that have come out about the true nature of these payments and why they burden college sports.

<https://symposium.foragerone.com/csu-curc2023/presentations/54674>

V5 The Soft Aggression of a Body and its Voice

Lyric Williams

Type: Visual Art

Dance is a subject that can be open to interpretation. Many choreographers use choreography to tell a story, explain an experience, imagine the unimaginable, or move in ways that are pleasing (or unpleasing) to the audience's eye. Also, dance that is rooted in improv includes a variety of styles and will always be unique. Through an exploration of the connection between body and nature, I have created a short dance film that is open to audience interpretation. This is a creative piece that will battle the imposter phenomenon that many artists face. Creativity is presented in individualized ways.

Labrinth. "Never Felt So Alone." Spotify.
<https://open.spotify.com/album/33JqWTchq6piiQdDrRlvJX?highlight=spotify:track:2NbsBSshscKIPRG3kwBbfo>

<https://symposium.foragerone.com/csu-curc2023/presentations/54809>

72 Cloneable Nanoparticle Protein Tagging in Yeast for Electron Microscopy Applications

Audrey Alspach

Alex Hendricks, Dr. Chris Ackerson

Type: Research Poster

When imaging biological matter at a subcellular level, electron microscopy is often used due to its unparalleled atomic-level imaging resolution and raw data acquisition. However, a big problem with biological electron microscopy is notoriously low contrast when comparing structural elements such as proteins. As biological matter has a relatively homogeneous composition, incident electron beams cannot strongly interact with the sample to distinguish structural features without special treatment. To more accurately determine where a specific protein lies within a cell, a clonable heavy metal nanoparticle ("cloneable nanoparticles") can be attached to the protein of interest, increasing electron scattering and thus increasing imaging contrast. My work is directed towards adapting the clonable nanoparticle system to yeast cells. As a proof-of-concept experiment, the protein actin will be "tagged" with a clonable metal nanoparticle and inserted into yeast cells using genetic engineering. The genetically engineered yeast will then be imaged with electron microscopy to evaluate how imaging contrast is improved by clonable metal nanoparticle tags. Provided this goes well, introducing nanoparticle formation and tagging into more complex eukaryotic cells - specifically human cell lines - will be attempted.

<https://symposium.foragerone.com/csu-curc2023/presentations/54731>

110 Investigating the Exopolysaccharides of Desiccation-Tolerant Cyanobacteria

Camille Angeles

Dr. Christie Peebles, Dr. James Henriksen

Type: Research Poster

Cyanobacteria are photosynthetic microorganisms found in most aquatic and terrestrial environments.

Some species of cyanobacteria can survive desiccation. The mechanisms behind their desiccation tolerance are not well understood or widely studied, but their exopolysaccharides (EPS) are thought to play a large role. To investigate the EPS of desiccation-tolerant cyanobacteria, we collected and enriched cyanobacterial cultures from various natural environmental sources and selected for desiccation tolerance and EPS production. We obtained 18 desiccation-tolerant cyanobacteria species in 12 unique mixed cultures and are currently experimenting with water retention tests, EPS production conditions, and investigating the contents of the produced EPS. We are also building a database with genome annotations relevant to EPS production from these cultures.

<https://symposium.foragerone.com/csu-curc2023/presentations/54940>

105 Characterization of protein kinase C in the molting gland of two decapod crustaceans

Laura Antizzo

Talia Head, Donald Mykles

Type: Research Poster

Ecdysis, the act of shedding the exoskeleton, is an important growth event of decapod crustaceans. The molt cycle is a unidirectional process consisting of the stages: intermolt, premolt, ecdysis, and postmolt. Molt-inhibiting hormone is synthesized within the X-organ of the eyestalk ganglia and inhibits the Y-organ (YO). The synthesis of ecdysteroid molting hormones by the YO are necessary for transition through the molt cycle. The activation of protein kinase C (PKC) is hypothesized to stimulate ecdysteroid synthesis through activation of the mechanistic target of rapamycin (mTOR). However, the extracellular ligand and downstream events of PKC activation are not fully understood. We have identified four candidate sequences of PKC isoforms in the YO transcriptome of *Gecarcinus lateralis* and *Carcinus maenas*. PKC isoforms are classified based upon their second messenger requirements. Of the three PKC subfamilies – conventional, novel, and atypical –

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both *G. lateralis* and *C. maenas* transcriptomes contain conventional, two novel, and one atypical transcript. In *G. lateralis* the isoforms appear to have differential expression across the molt stages. Expression of the conventional and novel PKC isoforms increase during premolt stages. The atypical isoforms appear to have comparatively low expression across all molt stages. Distribution of each PKC isoform across various tissues was identified using end-point PCR for both *G. lateralis* and *C. maenas*. Funding is provided by NSF (IOS-1922701).

<https://symposium.foragerone.com/csu-curc2023/presentations/54508>

137 Optimization of a BRCA1/BARD1 ubiquitin sensor

Armando Avitia Fernandez

Dr. Tingting Yao, Dr. Robert Cohen

Type: Research Poster

In eukaryotes post translational modifications (PTMs) on histone tails play important roles in the regulation of DNA transactions and chromatin structure. The addition of ubiquitin, a PTM, to specific lysine residues in H2A has been shown to mediate the cellular responses to DNA damage. Understanding of the dynamics of these PTMs has been done largely through the use of PTM-specific antibodies. However, significant limitations exist with the availability and application of antibodies. We explored an alternative strategy that utilizes a recently-developed fluorescence reporter protein, Fluorescent Activating and Shifting tag (FAST), which can bind reversibly to a fluorogen and induce fluorescence upon binding. Additionally, the FAST protein has been engineered to be split into two halves that can reassociate when brought to close proximity. The splitFAST protein contains two domains, NFAST and CFAST, that can be separately linked to proteins X and Y, respectively. Here, the CFAST domain was linked to histone H2A and the NFAST domain was linked to a ubiquitin-binding domain (UBA). Upon ubiquitination of H2A, the UBA domain can recognize ubiquitin, thus facilitating

reconstitution between NFAST and CFAST. This splitFAST-based sensor of H2A ubiquitination requires optimization of the linker residues connecting NFAST to UBA in order to determine the optimal length that affords the best affinity and specificity for H2A ubiquitinated in the C-terminal tail residues, K125, K127 or K129. Ubiquitination of these residues is catalyzed by the breast cancer genes, BRCA1 and BARD1, which are essential players in DNA double strand break repair and guardians of genome integrity and stability.

<https://symposium.foragerone.com/csu-curc2023/presentations/54908>

145 Anxiety or Arousal? Can Individual Interpretations of Test Anxiety alter its effects?

Jess Balich

Dr. Matthew G. Rhodes, Sarah J. Myers

Type: Research Poster

Test anxiety refers to the psychological and physiological responses regarding possible failure or negative outcomes during an exam. In an educational setting, test anxiety has been known to negatively impact students' overall cognitive performance. Since anxiety is a complex construct, interpretations on levels of anxiety can differ from person to person. In this study, we wanted to know whether test anxiety impacts differed based on an individual's interpretations about their anxiety. Participants were students from Colorado State University enrolled in lower-division psychology courses. We measured students' test anxiety scores at the beginning of the semester and recorded how they thought their anxiety would impact their performance (severely impairs to severely enhances). After students completed exam 1, we assessed the relationship between participants' thoughts on how their anxiety will affect their exam scores compared to their actual exam scores. We looked to see whether the relationship differed based on one's interpretation of anxiety. Results showed that students with higher test anxiety produced lower exam scores. Looking at the relationship between exam scores and

interpretation of anxiety, we did not find significant results. This suggests that regardless of whether an individual believes test anxiety impairs their performance, test anxiety will still have a negative impact on exam performance.

<https://symposium.foragerone.com/csu-curc2023/presentations/54907>

139 Evaluation of HIV-1 Clade C-Derived SHIVC109 Pathogenesis in Humanized Mice

Ella Barnett

Snehal Kaginkar, James Curlin, Leila Remling-Mulder, Ramesh Akkina

Type: Research Poster

Nonhuman primates (NHPs) are critical for modeling in vivo Human Immunodeficiency Virus (HIV) immunopathogenesis to further vaccine development and antiretroviral therapies (ART). However, NHP models cannot sustain HIV infections, causing discrepancies in the testing of pre-clinical HIV therapies. To overcome these challenges, Simian-Human Immunodeficiency Viruses (SHIVs) were developed using sequences from both HIV and Simian Immunodeficiency Viruses (SIVs) to sustain viremia in NHP. SHIVC109 was created by combining the SHIVHXBc2 P3.2 backbone with an R5-tropic HIV-1 Clade C envelope sequence. Though HIV-1 Clade C infections are prolific in regions outside of North America, Clade C remains significantly understudied. Here we characterize the pathogenesis of SHIVC109 in a humanized mouse model for the first time. Humanized hematopoietic stem cell (hu-HSC) mice are produced by xenografting human HSC into neonatal mice, which generate a wide assortment of human immune cells and are capable of sustained infection with HIV, SIV and SHIV viral strains. We initially inoculated hu-HSC mice from multiple immune cohorts with SHIVC109 to determine if they can support productive viral infection leading to chronic viremia and CD4⁺ helper T cell loss typical to that seen in AIDS. Plasma viral loads were assessed by extracting viral RNA from the blood plasma and analyzed using qRT-PCR measured weekly, while CD4⁺ T cell levels were

monitored using flow cytometry bimonthly. Positive viral loads were detected within two weeks after inoculation and mice remained virus positive for subsequent weeks, indicating that hu-HSC mice of varying immune cohorts are capable of sustained infection with SHIVC109. These results showed the utility of SHIVC109 and humanized mice as a model for pre-clinical therapeutic studies relevant to HIV-1 clade C viruses.

<https://symposium.foragerone.com/csu-curc2023/presentations/54624>

117 Impacts of LGR3s on Limb Regeneration of Crustaceans

Kendal Berasley

Jorge L. Perez-Moreno, Donald L. Mykles

Type: Research Poster

Molting is a physiological process through which crustaceans can efficiently grow, develop, and regenerate lost appendages. Understanding the signaling pathways that regulate molting and regeneration constitutes an important area of research for its potentially widespread environmental and food security implications, especially given its relevance to the multi-billion dollar industries of fisheries and aquaculture. For this purpose, the present study examines the signaling pathway of molting in *Gecarcinus lateralis* (black-back land crab), and aims to determine the identity of the receptor for LAFpro (the limb autonomy factor). This factor, likely an insulin-like peptide, regulates the regeneration of new limbs by halting the growth of primary limb buds when additional limbs are lost. LGRs (leucine-rich repeat G-protein coupled receptors) are receptor candidates for LAFpro, since in an analogous system (*Drosophila*) they have been shown to delay metamorphosis from larva to adult when imaginal discs are damaged. These receptors are thought to bind to insulin-like peptides, which delay crabs from entering pre-molt and allow them to regenerate damaged limb buds. The delay is caused by the release of an insulin-like peptide putatively orthologous to Dilp8 in *Drosophila*. Putative LGR

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sequences were identified from the *G. lateralis* transcriptome, and endpoint PCR was used to determine which of these are expressed across multiple *Gecarcinus lateralis* tissues, including regenerating muscles and the Y-organ (the organ responsible for synthesis of molting hormones). Further study will be conducted to fully evaluate expression patterns across the molt-cycle and different limb-regeneration stages. Supported by National Science Foundation grant IOS-1922701.

<https://symposium.foragerone.com/csu-curc2023/presentations/54834>

149 Tracking the activity of *Thermococcus kodakarensis* DNA polymerase B *in vivo*

Marina Black

Gerald Liman, Thomas Santangelo

Type: Research Poster

There are two main DNA polymerases encoded in the Archaeal domain, DNA polymerase B (*Pol B*) and DNA polymerase D (*Pol D*). Both DNA polymerases have been characterized *in vitro* and are equally efficient at replicating genetic materials. However, previous studies have shown that *Pol B* is not essential for the survival of our model organism, *Thermococcus kodakarensis*. This finding implicates that *Pol D* is fully capable of taking over the function of *Pol B* in *T. kodakarensis*. The outstanding questions in the field revolves around characterizing the *in vivo* function(s) of *Pol B*. Typically a DNA polymerase encodes for a steric gate which function is to exclude rNTPs, the building blocks of RNA, from its active site. The steric gate in DNA polymerase only allows dNTP, the building blocks of DNA, to enter its active site. Tracking the *in vivo* function(s) of a DNA polymerase can be done through expression of a mutant DNA polymerase lacking its steric gate, to increase the incorporation of rNTP into the genome. Coupling this steric gate lacking *Pol B* mutant with the RARE Damage and Repair sequencing (RADAR-seq) we can track and correlated the increase of rNTP incorporations in the genome with the activity of the steric gate lacking *Pol B*. Previous attempts to introduce the steric gate

lacking *Pol B* allele into the genome of *T. kodakarensis* via homologous recombination were unsuccessful. Here we utilized a new approach by introducing the steric gate lacking *Pol B* allele in an autonomously replicating plasmid.

<https://symposium.foragerone.com/csu-curc2023/presentations/54913>

85 Comparing Sleep Outcomes Among Alcohol-only, Cannabis-only, Co-users and Non-users

Joseph Cameron, Maia Bransom

Cianna Piercey, Hollis Karoly Ph.D.

Type: Research Poster

Sleep is important and necessary for many important biological processes to function properly. For example, sleep impacts our ability to be alert during the day and keeps our bodily systems healthy. Sleep quality disturbances can result in health conditions associated with blood pressure and functioning of the cardiovascular system, as well as impacts to mood and overall healthy brain function. It is well documented that alcohol consumption can contribute to changes in sleep efficiency such as differences in sleep architecture, later sleep onset latency, alterations to regular biological sleep timing, and making it difficult to fall asleep. While alcohol's effects on sleep patterns are well documented, much less is known about how cannabis interacts with sleep processes. It is important to understand how these substances contribute to sleep changes independently and when co-used. We used college student survey data to compare regular users of alcohol only, cannabis only, alcohol and cannabis, and a control group who did not use any substances (N=1315, AFAB=922, Mean Age=19). When consuming both cannabis and alcohol, participants reported better sleep outcomes versus those who used alcohol only. Cannabis-only users reported earlier sleep onset latency, longer sleep duration, and less disturbances during sleep than any other group. Cannabis use may be associated with differential sleep patterns due to its impacts on mood, with cannabis users indicating the highest ratings of

depression and anxiety. Future directions include replication with a more diverse sample, intensive longitudinal designs, and controlled laboratory studies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54927>

118 The Birds and The Bees: Testing a New PCR Protocol's Ability to Identify Avian Sex

Liz Carlsen

Dr. Jacob Job, Christine Rayne, Dr. Kristen Ruegg

Type: Research Poster

Most bird species in North America are migratory. However, males and females often migrate at different times, which likely has important evolutionary implications. To better understand these implications, we need to be able to study migration in the sexes separately. This can be difficult with some species as males and females can look alike. To combat this issue, scientists have developed protocols that can identify the sex of an unknown bird from a DNA sample. Here, we test the efficacy of a new protocol that looks to improve the accuracy of sexing DNA samples from songbirds. DNA was extracted from the tail feathers plucked from 22 Common Yellowthroats (*Geothlypis trichas*). The sex of each bird was known a priori and served as a positive control to compare results to. Once extracted, DNA was placed in a polymerase chain reaction (PCR) master mix, run through a thermocycler, and then imaged on a 2% 48-well agarose E-gel. Results indicate that the new protocol correctly identified the sex of 20 of 22 samples, with an overall accuracy of 91%. One of the two remaining samples produced inconclusive results, indicating only one sample was incorrectly assigned a sex. This is a marked improvement from using previous protocols. Moving forward, this new protocol holds great promise, but the application of this protocol across species needs to be tested and might be impacted by the quantity and quality of DNA collected from individuals.

<https://symposium.foragerone.com/csu-curc2023/presentations/54857>

200 Socioeconomic Factors and Resting-State Functional Connectivity of the Default Mode Network in Children and Adolescents

Caitlyn Chudzinski

Dr. Emily C. Merz and Dr. Michael L. Thomas, Melissa Hansen, Jordan Strack

Type: Research Poster

Socioeconomic disadvantage has been associated with adverse effects on academic achievement and mental health, but the neural mechanisms underlying these associations are not well understood. The default mode network (DMN) is a neural network that includes connections among the medial prefrontal cortex, posterior cingulate cortex, medial temporal lobe, and lateral parietal cortex (Buckner et al., 2008). The interconnected activation of these regions has been shown when individuals are at rest (Shulman et al., 1997). Activation and functional connectivity in the DMN have been associated with mental health (Buckner et al., 2008, Wang et al. 2014). In the current study, we examine the associations between socioeconomic factors and resting-state functional connectivity (rsFC) in the DMN in children and adolescents. We hypothesize that socioeconomic disadvantage (as measured by lower family income or parental education) will be associated with reduced rsFC in the DMN. The data were obtained from the Pediatric Imaging, Neurocognition and Genetics (PING) study (N = 561, 50.5% female) (Jernigan et al., 2016). The PING study includes functional magnetic resonance imaging (fMRI), which measures fluctuations in the blood-oxygen-level-dependent signal within the brain at rest. Resting-state FC in the DMN was calculated using Analysis of Functional NeuroImages (AFNI) software. These findings will help us to understand the neural underpinnings of the higher risk for mental health problems among those from socioeconomically disadvantaged backgrounds. Further, this understanding could be used to reduce the impact

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of socioeconomic disadvantage on neurodevelopment in children and adolescents by leading to more effective prevention and intervention strategies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54925>

98 Investigating the Molecular Motor Responsible for *erm-1* Localization in *C. elegans*

Karissa Coleman

Dr. Erin Osborne Nishimura, Naly Torres

Type: Research Poster

Cells transport RNA from their nucleus to different target areas within the cell as a form of post-transcriptional gene expression. This mechanism can impact gene expression by either accumulating a desired protein in a specific area of the cell or even targeting mRNA for degradation. Maternally loaded *erm-1* transcripts localize to the plasma membrane during the early stages of *Caenorhabditis elegans* development. The localization of *erm-1* mRNA to the plasma membrane has been shown to be guided by its nascent, encoded peptide, similar to the secretory pathway to the Endoplasmic Reticulum (ER). We hypothesize that the mechanism for mRNA transport to membranes is dependent on molecular motors, similar to transport to the ER. Our preliminary data shows that *erm-1* mRNA transport is microtubule-dependent. Here, we explore whether dynein, a microtubule motor protein, is required for *erm-1* mRNA localization by disrupting dynein through RNA interference (RNAi) followed by imaging *erm-1* mRNA by single molecule fluorescence in situ hybridization (smFISH). To ensure the efficacy of the dynein knockdown by RNAi, I employed an embryonic lethality assay to quantify the efficacy of the dynein knockdown. The findings suggest the RNAi treatment was successful at disrupting dynein. Using this result, we can determine whether *erm-1* mRNA localization to the plasma membrane is dependent on the molecular motor dynein. ERM proteins are highly conserved in many organisms, and impaired mRNA localization in neurons and other cell types causes disease;

therefore, the pathways involved in this mechanism have potential to be generalized to other models.

<https://symposium.foragerone.com/csu-curc2023/presentations/54539>

78 Effect of Management Practices on Economic and Animal Welfare Outcomes for Beef Cattle

Danielle Contreras

Dr. Ann Hess, Dr. Lily Edwards-Callaway, Melissa Davis

Type: Research Poster

The study of management practices of beef cattle investigated the effect that the practices had on animal welfare and economic outcomes. Data was collected from various states, plants, and companies. There were 501 Lots of cattle, with 71,053 cattle altogether. Statistical analysis was used to see the effect on animal hot weight, as an economic outcome. Predictor variables were chosen by AIC model selection. The predictor variables that were selected from AIC were arrival humidity, arrival temperature, kill shift, plant, and sex.

<https://symposium.foragerone.com/csu-curc2023/presentations/54341>

1b PortfoliU Project: How an Open Source Repository of Personal Portfolio Websites can Benefit Students

Elita Danilyuk

Dr. Nathaniel Blanchard

Type: Oral Presentation

PortfoliU Project's mission statement is to build and develop a free open-source repository with the resources, documentation, and information that is designed to help students create a simple personal website portfolio. A personal portfolio webpage is important because it gives students the ability to showcase their skills to potential employers in a meaningful way. However, many students lack the

skills, resources, and information to establish their own web pages. PortfoliU Project was created to help bridge this gap and help break the barrier for students to begin building their personal brand sooner. The websites they construct will showcase their individualized and school projects, resumes/CVs, professional/educational experiences, research work, publications, and anything else they see fit. PortfoliU Project is catered toward computer science students and entry-level individuals who are interested in programming but who may not have the skills to fully build a website from scratch. Additionally, PortfoliU encourages creators to get involved in open-source and to learn from their experience. Since PortfoliU has gone live, 17 users have participated, contributing 30 modifications. Qualitative and quantitative feedback from users says they love it.

<https://symposium.foragerone.com/csu-curc2023/presentations/54802>

131 The Study of Human-AI Teams in Maritime Environments

Blake Davis

Colleen Patton, Turguy Caglar, Caspian Siebert, Dr. Nathaniel Blanchard, Dr. Benjamin Clegg

Type: Research Poster

The capability and use of Artificial Intelligence agents continue to grow in our everyday lives, we want to know if we can collaborate with these agents to accomplish a task with higher precision and efficiency. The Hostile Ship Project trained an AI aid to help human operators identify simulated hostile ships in water based on their movements. By building a simulator to train and test an Artificial Intelligence aid, the project aims to understand how the collaboration between Human operators and an AI aid is affected by altering precise variables within the simulation, such as the number of ships on the screen and when the AI-aid provides feedback. To create more of a real-world scenario for the participant and the aid, we randomly varied the number of ships on the screen from 5 to 20. We watched how the accuracy of the participant by

themselves, the aid by itself, and the Human-AI team decreased as we added more ships to the simulation. Our team found that humans by themselves are notoriously inaccurate at identifying the hostile ship, especially as the number of ships on the screen increases. Human participants by themselves were able to achieve approximately 57% accuracy and Human-AI teams were able to achieve approximately 84% accuracy when attempting to identify which ship was hostile. These results indicate that introducing an Artificial Intelligence agent as an automated aid can improve performance by allowing humans to make faster and more accurate decisions, which has implications for real-world, safety-critical scenarios.

<https://symposium.foragerone.com/csu-curc2023/presentations/54641>

89 Stability studies and spectroscopy characterization of Novel Vanadium Catechol Complexes

André Eberspacher

Kateryna Kostenkova, Debbie C. Crans

Type: Service-Learning Poster

Non-innocent vanadium(V) Schiff base catecholate complexes have been found to be potential treatments for glioblastoma, an aggressive form of brain cancer. The complexes have limited lifetimes in the media which can be monitored by UV-Vis spectroscopy. In the following presentation, we describe a UV-Vis stability study of a vanadium SALIEP (N-(salicydeneaminato)-2-(2-aminoethylpyridine) catecholate complex. The stability has been studied in organic solvents, such as DMSO and acetonitrile, and PBS buffer. The stabilities of the complexes will be compared to the VO[HSHEd] (N-salicylideneaminato)-N'(2-hydroxyethyl)ethylenediamine Schiff base catecholate complex series. The data has shown that the hydrophobic substituents on the catecholate ligand increase the stabilities of the complexes in both organic solvents and PBS buffer and that the stability of the complex could survive targeted injection.

<https://symposium.foragerone.com/csu-curc2023/presentations/54787>

108 Visualizing light-inducible translation shut off at single-molecule resolution in live cells

Gretchen Fixen

Gabriel Galindo, Tatsuya Morisaki, Timothy J Stasevich

Type: Research Poster

All protein-involving processes require the transition from genetic DNA to protein peptide chains. Translation, the conversion of mRNA to protein, involves many regulatory factors that are not well understood. Because of this, translational tracking has been explored for years across the field of biochemistry and only recently, through nascent chain tracking (NCT), have we been able to track single mRNA sites in live cells. Coupled with MS2 tagging systems, we can kinetically analyze translational pathways of various proteins in real time and in live cells. Despite this, there are still limitations with spatially and temporally tracking the recruitment of these translational effectors to translation sites. With the incorporation of optogenetic tools involving the cryptochrome 2 protein (cry2), we can generate biomolecular condensates comprised of GFP-tagged proteins at our reporter mRNAs. One system designed, Cry2Olig, can generate condensates for recruitment. Using this technology, I will recruit GFP-tagged ribosome quality control (RQC) proteins, such as GIGYF and 4EHP, and track their effects on translation signals within the condensates. It has already been seen that GFP-tagged GIGYF and 4EHP will recruit to the condensates, so further exploration on translation can begin. We are now using NCT along with optogenetics to visualize the translational control our quality control proteins have. We hope this will be an excellent tool to investigate translational kinetics in future studies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54753>

208 Implications of reproductive hormones on the HPA axis, stress response, and behavior

Adrienne Frisbee

Dr. Richard McCosh

Type: Research Poster

The HPA axis is a complex system that ultimately produces cortisol, the body's primary stress hormone. Cortisol can act in the body in many ways, including activating the sympathetic nervous system. Chronic exposure to stress can produce detrimental amounts of cortisol which can cause behavioral deficits such as symptoms of depression. The ways in which the HPA axis gets dysregulated through chronic stress can include implications of estradiol. Estradiol can enhance hormone production of CRH and can inhibit the negative feedback loops of cortisol in the HPA axis. These effects can ultimately increase the amounts of cortisol being produced, activate the sympathetic nervous system, and cause behavioral changes.

<https://symposium.foragerone.com/csu-curc2023/presentations/54956>

94 Focal adhesion kinase as a potential target for osteosarcoma treatment

Carina Easton

Kathryn Cronise, Daniel Regan

Type: Research Poster

Osteosarcoma (OS) is the most common primary malignant bone cancer, predominantly affecting pediatric populations in humans. Dogs develop OS at a higher incidence than humans, and several comparative oncology studies have demonstrated strong similarities between human and canine OS disease presentation and response to therapeutics. Emerging data are beginning to elucidate the role of focal adhesion kinase (FAK) as a promoter of oncogenesis and metastasis in numerous cancers, with limited data suggesting a role in OS as well. When phosphorylated, FAK promotes cytoskeletal rearrangements, activation of the MAPK pathway, and the formation of focal adhesions. We sought to

characterize the role of FAK signaling in OS and investigate the therapeutic potential of FAK inhibition. We evaluated FAK activation through western blot analysis in both human (n=4) and canine (n=4) OS cell lines grown in the presence and absence of fetal bovine serum. FAK phosphorylation was observed in all serum-starved human and canine OS cell lines, suggesting constitutive FAK signaling in OS. The effect of FAK inhibition on OS proliferation was analyzed using dose response assays with defactinib, an inhibitor of FAK signaling currently being evaluated in clinical trials. RFP+ OS cell lines (n=4) were treated with serial dilutions of defactinib, and cell quantification revealed that defactinib treatment impeded OS proliferation. Western blot analysis was also performed on human and canine OS cell lines (n=2) cultured in defactinib, resulting in decreased FAK phosphorylation in defactinib treated cells. These preliminary data suggest that FAK could be a potential target for OS treatment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54866>

1b Food For Thought: The relationship between food insecurity and student success

Marcelo Espinoza Diaz, Faraaz Bukhari, Jewelyssa Rodriguez Rodriguez, Kendall Hollins, Calista Douglas, Nevaeh Newton, Dhajia Hopper, Ricky Winston

Stephanie Moreria, Jacob Leavitt, Grace Kirk
Type: Oral Presentation

Food insecurity is a prevalent issue for college students. With the rising cost of living, tuition, and inflation, students are at a high risk for experiencing food insecurity. Programs like Rams Against Hunger (RAH) are designed to support students and provide resources to mitigate the subsequent effects of food insecurity. The goal of our project is to explore if RAH is effective at supporting student success. Student success in this context is defined as GPA, retention, graduation rates, and post-graduation ability to secure a job. To begin, we analyzed data from various surveys conducted by Institutional

Research, RAH, and First Destination. Then we compared deidentified CSU ID numbers and the parameters of success. From this, we were able to create a model student who is the ideal target of people utilizing RAH. If our research finds that these programs are successful at supporting student success, then we intend to use our model to target students who could benefit from this resource. Furthermore, RAH can restructure their outreach and current programs to be more accessible to this model.

<https://symposium.foragerone.com/csu-curc2023/presentations/54882>

93 Sterically Hindered Hydrophobic Vanadium(V) Complexes as Chemotherapeutics

Anna Galaeva

Debbie C. Crans, John Manganaro

Type: Research Poster

Vanadium (V) catecholates complexes are cytotoxic and highly selective for cancerous tissue, and might be effective for treating cancer. Early attempts in the development of these complexes, such as [VO(HSHED)cat], showed a limited success due to fast hydrolysis and degradation. According to our hypothesis, increased hydrophobicity and steric hinderance of the complex would inhibit the rate of hydrolysis and degradation, leading to a greater efficacy. Substitution of starting materials with similar compounds, decorated with one or more *tert*-butyl (tb) groups, resulted in vanadium (V) complexes, such as [VO(HSHED)*tetra*-tb], with higher hydrophobicity and steric hinderance, and extended lifetimes in both DMSO/water solutions, as well as cell culture medium. These compounds were characterized by ¹H NMR, ¹³C NMR, and ⁵¹V NMR, mass spectrometry, and UV-Vis. The efficacy of these compounds as chemotherapeutics was confirmed by testing them on cancer lines, including T98g, which is an aggressive form of glial-cell cancer. It was confirmed that greater steric hindrance and hydrophobicity of the complex lead to slower hydrolytic degradation, which increased the efficacy of [VO(HSHED)*tetra*-tb]. As a result of the heightened

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efficacy of [VO(HSHED)*tetra*-tb], we have worked to develop compounds with greater steric bulk and in larger quantities for animal testing.

<https://symposium.foragerone.com/csu-curc2023/presentations/54683>

132 Development of Cobalt(II)-Based EPRI Probes for pH Sensing

Amanda Gin

Anthony Campanella, Dr. Joseph Zadrozny

Type: Research Poster

Electron Paramagnetic Resonance Imaging (EPRI) is nearly analogous to magnetic resonance imaging (MRI) but probes highly sensitive electronic spins at high microwave frequencies (>1 GHz). Electronic spins are magnitudes more sensitive than nuclear spins which, if leveraged for biological imaging, could offer improved resolution of the local physiology. For example, EPRI can track redox status, oxygenation, and pH in biological systems—key chemical information unavailable through conventional MRI. Despite these advantages, the necessary radiation to achieve resonance and produce a EPRI signal at the magnetic fields used in MRI (ca. 1.5 T) are high frequency microwaves (ca. 35 GHz). Low frequency, high field EPR provides a safer route to harnessing the sensitivity of electrons by minimizing tissue heating caused by high frequency microwaves. To investigate EPRI as a novel imaging technique, we must first understand the effect of ligand structure on the magnetic resonance properties of paramagnetic metal ions. We sought to design a molecular system based on Co(II) due to its paramagnetic nature and large spin ($S = 5/2$ or $3/2$). Through investigation of a pH sensitive tripodal ligand scaffold, we studied the fundamental relationship between electronic and magnetic properties with the goal of understanding how ligand shell influences the observed continuous wave EPR spectra. This project stands to be the first work of local pH sensing by EPR in a metal complex, greatly pushing forward the field of metal-based EPRI.

<https://symposium.foragerone.com/csu-curc2023/presentations/54534>

143 Sediment as a Potential Coral Stressor and Reservoir for Stony Coral Tissue Loss Disease

Charles Gongaware

Eurnett Christopher, Stephanie Sirotzke, Kari Imhof, and Sara Williams

Type: Research Poster

This study explored the effects sediment has on the metabolic rates of scleractinian corals. Physiological responses of *Montastraea cavernosa* were assessed in a series of short-term sediment dosing and respiration measurements. The results of this experiment provide an understanding of the longevity of SCTL in sediment without a direct source for two months. There were no visible lesions on coral subjects. Exposure to diseased sediment had no major influence on respiration rates (which were significant between genotypes). It was also noted that diseased sediment was rejected faster than controlled sediment, throughout the three weeks. Hypotheses to explain these differences in shedding behavior between treatments include nutrient availability and repulsion of bacteria within the sediment. Lastly, bacterial loads were greater in sample sources near sediment level than in water columns.

<https://symposium.foragerone.com/csu-curc2023/presentations/54801>

59 Testing Acute Effects of CBD on Connectivity and Reward Processing in Heavy Drinkers

Devin Henry, Wesley Maclean

MacLean Wesley, Cianna Piercey, Karoly Hollis

Type: Research Poster

Cannabis and alcohol are often used together (Subbaraman & Kerr, 2015), yet there is limited data on the effects of cannabinoids on the brain in those that heavily drink. In the brain, CBD affects the

cannabinoid receptors CB1 and CB2 along with various other receptors (Pertwee, 2008). The CB1 receptor affects the reward-related regions which are crucial in the onset of alcohol use disorder (Parsons and Hurd, 2015). This study aims to understand the relationship between cannabinoids and reward processing. To measure the effects of CBD on reward processing in heavy drinkers, we used fMRI and the MID task. We predict that after a CBD administration (compared to a CBD-placebo administration), fMRI will show differences in the frontal and striatal region connections along with differences in MID reactivity in the mesocorticolimbic dopamine regions. During the MID task, participants saw various shapes which represented a cue for each trial. Participants then saw a white square where they pressed the response button as quickly as possible. Following each response trial, participants received incentivized feedback based on their reaction (\$0 vs \$1). Participants completed 120 trials over two 6-minute runs. Response time thresholds (i.e., difficulty of each trial) were adjusted to ensure each participant receives 66% positive feedback. Additionally, two resting scans were run for 6m30s. These resting state scans allow researchers to explore differences between the brain when not engaged in any task-related processing following the CBD and placebo-CBD administrations. Data collection for this study has been completed and analyses are underway.

<https://symposium.foragerone.com/csu-curc2023/presentations/54947>

100 Socioeconomic Factors, Amygdala Structure, and Anxiety Symptoms During Late Adolescence

Ella Hummels

Melissa Hansen, Jordan Strack, Joselyn Cerrillo, Micheal L. Thomas, Emily C. Merz

Type: Research Poster

Socioeconomic status (SES) is an important factor in emotional development and anxiety symptoms (Mistry-Patel & Brooker, 2022), which have well-established connections to amygdala structure and

function. However, the relationships among these variables have not been fully examined. Amygdala volume differences may represent a mechanism through which socioeconomic disadvantage leads to higher levels of anxiety symptoms. In the current study, we examine the associations among socioeconomic factors, amygdala volume, and anxiety symptoms during late adolescence. In addition, we conduct supplemental analyses controlling for concurrent stress, which has not been accounted for in most studies and allows an understanding of predictors of anxiety symptoms beyond concurrent circumstances. Based on previous findings (Merz et al., 2018), we hypothesize that socioeconomic disadvantage will be associated with decreased volume in the amygdala. We also expect that smaller amygdala volume will be associated with higher anxiety symptoms. Participants are typically developing 18- to 19-year-olds from socioeconomically diverse backgrounds (n=31; M=18.94 years). Socioeconomic background is measured as parental educational attainment, and anxiety symptoms are measured using self-report on the PROMIS Emotional Distress Anxiety Short Form (Pilkonis et al, 2011). T1-weighted magnetic resonance imaging (MRI) data are acquired. FreeSurfer is used to process the data and segment amygdala volume (Saygin et al., 2017). This study will help to understand the neurobiological underpinnings of anxiety and the potential long-term impacts of childhood socioeconomic disadvantage on risk for anxiety disorders.

<https://symposium.foragerone.com/csu-curc2023/presentations/54831>

97 Characterizing the ecdysone cascade components: identification of E78 and transcriptional regulators in *Gecarcinus lateralis*

Avery Hunter

Vanessa Bentley, Dr. Donald Mykles

Type: Research Poster

The molting process is driven by the increase of 20-hydroxyecdysone (20-E), a sterol hormone produced by the crustaceans Y-organs (YO). The molt cycle can

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lead to ecdysis, or the active shedding of the exoskeleton, thus allowing arthropods to grow, develop, and regenerate lost appendages. The binding of 20-E to the ecdysteroid receptor and ultraspiracle/retinoid X receptor (EcR and USP/RXR) heterodimer, members of the nuclear receptor (NR) superfamily, causes the transcriptional cascade of ecdysone response genes (ECRGs). ECRGs are classified as early, early-late, and late genes as they have been shown to be mediated in a temporal fashion. Conventionally, ECRGs are suggested to be regulated through Broad Complex (BrC); however, but that in turn may be regulated by a “master” transcription factor: Chronologically Inappropriate Morphogenesis (Chinmo). Some ECRGs, including E74, E75, BrC, HR3, HR4, and Fushi tarazu (FTZ-F1), have been identified from the blackback land crab (*Gecarcinus lateralis*) *de novo* assembled YO transcriptome. However, reassembly of the RNA-seq reads using a more robust pipeline have allowed improved identification and characterizations of previously identified and novel contigs including E78 and the putative Chinmo. Both isoforms of E78 have been previously characterized in *Drosophila melanogaster*, but their role between ECRGs remains unclear in crustaceans. Isoform E78A has been found to regulate lipid homeostasis in the adult *D. melanogaster* intestine. E78B has been found to play a role in *D. melanogaster* development as an early-late gene. Supported by NSF IOS-1922701.

<https://symposium.foragerone.com/csu-curc2023/presentations/54328>

81 History of "n = 30" Rule in Statistics

Hailey Johnson, Jewel Jemila
Ben Prytherch
Type: Research Poster

If you've taken an introductory statistics class, you've probably seen the “n > 30” rule—it has become so common that it has even been tested on the AP statistics exam. However, the “rule” is far from infallible, and it's not derived from a calculation or proof. Consequently, our research

question is: how did this rule come to the forefront of introductory statistics? What is the history of “n = 30”? Our dual approach included investigating samples of introductory statistics textbooks here at CSU for appearances of the rule, as well as online research of the history of the phenomenon. We had one hypothesis for the origin of “n=30” at first: in the original Student's t-tables from 1917, Gosset wrote that “for ordinary purposes [Normal z-tables] may be used with $n > 30$.” From there, his work has been referenced for more than a century. However, what we were surprised to find through our research was that, as time went on, the “n>30” rule was referenced more and more in the context of the central limit theorem, rather than the t-distribution converging to the Normal distribution. This is particularly concerning as, for more skewed distributions, larger and larger sample sizes are needed, and “n>30” is insufficient. We believe it is hardly necessary to have $n>30$ as another rule for students to memorize in introductory statistics classes for little reason, and which must later be unlearned in more complex statistics.

<https://symposium.foragerone.com/csu-curc2023/presentations/54778>

136 Are Parking Lots Cooking Fort Collins? – Correlation Analysis of Parking Lots and Heat Island Effects using Satellite Imagery and Open Street Maps

Junhwan Kim, Hermela Darebo, Jackson Holden
Tarun Sai Pamulapati, Kunal Agarwal, Dr. Sangmi Lee
Pallickara
Type: Research Poster

The Urban Heat Island (UHI) effect is a critical environmental issue that impacts urban areas worldwide. It refers to the phenomenon where urban regions experience higher temperatures than their surrounding rural areas due to increased heat absorption and retention. In this project, we studied the correlation between the UHI index computed from satellite images (Landsat 8 and 9) and structure data from Open Street Maps (OSM) in Fort Collins, CO for two recent years, 2021 and 2022. Our analyses

show that with Fort Collins, parking lots and UHI are correlated with X using the X2 correlation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54935>

73 Role of MutS2 in Ribosomal Quality Control in *Arabidopsis thaliana*

Kalia Kodrich

Daniel Sloan, Amanda Broz

Type: Research Poster

Protein synthesis is required for an organism's survival. An important aspect of protein synthesis is ribosomal stalling. Proper ribosomal stalling can aid in gene expression regulation, while improper stalling can result in ribosomal collision, causing damage to nascent proteins and translational hardware. Ribosomal quality control (RQC) complexes have evolved in many organisms across the tree of life. In bacteria, MutS2 proteins are thought to function in RQC and homologous recombination pathways. Plants, including *Arabidopsis thaliana* contain two MutS2 proteins (specifically MutS2A and MutS2B), but their function is not currently known. RQC pathways have been studied through drug-induced ribosomal stalling. Erythromycin is a common antibiotic that causes bacterial ribosomes to stall, inhibiting protein synthesis. The impact of erythromycin on *A. thaliana* is not known, but it is hypothesized to target plastid ribosomes, which are structurally similar to their bacterial counterparts. The impact of erythromycin on root growth and photosynthetic efficiency of this model organism was explored through exposure to gradients of erythromycin on developing plants. We found that wild type growth is inhibited significantly at ~40 mg/mL erythromycin. We next treated both wild types, single *mutS2A* and *mutS2B* mutants, and double mutants with erythromycin. We found that MutS2 knockouts have reduced root length and decreased photosynthetic efficiency compared to the wild type when treated with 50 mg/mL of erythromycin. These results show that erythromycin differentially impacts wild type and MutS2 mutant

lines and suggest that in *Arabidopsis* MutS2 proteins may play a role in remedying ribosomal stalling.

<https://symposium.foragerone.com/csu-curc2023/presentations/54844>

114 Structural Break Detection in Neural Spiketrain Data

Vanessa Kokoszka

Jin Peng, Gray Stanton

Type: Research Poster

Examination of multi-electrode neural spiketrain recordings obtained from the hippocampi of trained rats undergoing a memory trial reveals interesting stage-specific patterns in neural activity. In particular, firing rates and co-firing probabilities are seen to vary in an activity-dependent fashion. As the data contain replicates of the same trial with the same rat, persistence of these patterns can be assessed. Motivated by potential applications to this type of data, a frequently-used changepoint detection method based on data compression is adapted to point process data. This adapted method shows promising results in simulation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54822>

107 Making BERT Emotional

David Kott

Dr Michael Kirby, Dr Mayla Boguslav

Type: Research Poster

Recent innovations in natural language processing have allowed generative text models to create conversations indistinguishable from humans. Early release of such models is a necessity to combat the occasionally hostile responses that can deter users. My language model introduces the concept of an emotional meta data token, a way to direct the chatbots response. To showcase its effectiveness, I used the emotion meta data token to generate angry and happy responses to the prompt "what is on your

mind?”. Setting joy to a high level prevents aggressive and toxic responses. Previous work has used outdated models like LSTMs and intricate architecture designs that can make using the models feel unintuitive and cumbersome. Previous models were limited in that emotion was treated as discrete, either present or not. My approach is to set the token at the beginning of the text generation to a linear combination of the 7 examined emotions resulting in a continuous representation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54836>

148 Deoxyuracil repair mechanisms within the hyperthermophilic archaeon, *Thermococcus kodakarensis*

Lucy Latta

Brett Burkhardt, Dr. Thomas Santangelo

Type: Research Poster

Extremophiles are organisms that not only survive, but thrive in extreme environments, and many Archaea are extremophiles. Extreme environments accelerate DNA damage, both due to nutrient limitation (endogenous stress) or extreme heat (exogenous stress). To compensate for the escalated DNA damage, organisms that live in these environments would require unique and efficient mechanisms of DNA repair. *Thermococcus kodakarensis* is an anaerobic, archaeal hyperthermophile that is commonly found on the substrate near hydrothermal sea vents. The multitude of genetic and biochemical procedures uniquely available for *T. kodakarensis* permits dissection of the repair pathways and enzymes promoting DNA repair in this unique, harsh environment. The central goal is to establish the DNA repair pathways within *T. kodakarensis* and to determine what redundancy might exist within these pathways. To explore DNA repair, I aim to define the pathways involved in repairing deaminated bases, specifically deoxyuracil, and investigate the multitude of mechanisms that *T. kodakarensis* has in order to compensate for one of the most prevalent forms of DNA damage. The

procedures demand genetic engineering techniques to construct deletion strains in which the genes that encode for deoxyuracil repair enzymes are deleted from the genome, one by one. Understanding the DNA repair mechanisms for deaminated bases within an extremophile has the potential to broaden our understanding of DNA repair across a multitude of species, as the mechanisms are likely to be highly conserved.

<https://symposium.foragerone.com/csu-curc2023/presentations/54854>

95 Synthesis, Separation, and Characterization of Menaquinone and Demethylmenaquinone Derivatives

Madelyna Le

Skylar Markham, Dr. Debbie Crans

Type: Research Poster

Lipoquinones, like ubiquinones (UQ), menaquinones (MK) and demethylmenaquinones (DMK), are essential lipid components of the electron transport chain (ETC) that shuttle electrons between the proteinaceous membrane to facilitate ATP production in both eukaryotic and prokaryotic cells. We intend to investigate the location and conformation of these molecules by synthesizing model molecules for these studies.^{2,3} We are currently synthesizing DMK-3 using a Lewis-acid catalyzed Friedel-Crafts alkylation used previously for the synthesis of MK-3 derivatives.³ Due to the long isoprene tail chains of these molecules, separation of different isomers formed from the synthesis is nontrivial. The separation requires rather large columns, low polarity mobile phases, and then preparatory Thin Layer Chromatography (TLC) to produce pure product. Since these products are to be used as biological testing substrates, product purity is of high importance to the project with this purity being determined by ¹H-NMR.

<https://symposium.foragerone.com/csu-curc2023/presentations/54756>

77 Synthesis, Characterization, and Stability of Novel Vanadium Catechol Complexes

Tyler Lewis

Andrew Bates, Dr. Debbie Crans

Type: Research Poster

Anti-cancer activities of vanadium compounds have generated recent interest due to a combination of desirable properties for chemotherapy, including strong cytotoxicities, anti-metastatic activities and low systemic toxicities. Despite many vanadium Schiff base/catecholate complexes having limited stability under physiological conditions, a sterically hindered hydrophobic complex [VO(Hshed)(dtb)], where Hshed is *N*-(salicylideneamino)-*N'*-(2-hydroxyethyl)-1,2-ethanediamine has shown increased stability. Additionally, this complex showed high potency against brain cancer cell line T98-G. Due to this potency, increasing complex hydrophobicity through the catechol ligand has been of interest. This work utilizes a one-step reaction to install adamantyl groups that in turn generate several new catecholate ligands. Herein, we report the syntheses and characterization of several novel catechol ligands and the use of them to form new coordination complexes. The complexes were synthesized from the vanadium (V) precursor [VO₂(dea-Hshed)], where (dea-Hshed) is the condensation product of 4-(diethylamino)salicylaldehyde and *N*-(2-hydroxyethyl)-ethylaminediamine, and prepared by using a modified procedure from those found in the literature. Both complexes synthesized, [VO(dea-Hshed)3omad] where (3omad) is 3-methoxy-5-adamantyl catechol and [VO(dea-Hshed)3mad] where (3mad) is 3-methyl-5-adamantyl catechol, were characterized by ¹H NMR, ⁵¹V NMR and UV-Vis spectroscopies. The catecholate ligands were characterized by ¹H NMR, FT-IR and UV-Vis spectroscopies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54856>

141 How abiotic stress changes plants RNA secondary structure

Xiaorui Lou

Dr. Rachael DeTar, Dr. Dan Sloan

Type: Research Poster

RNA secondary structure is an understudied potential mechanism for biological stress response, particularly in sessile organisms like plants. The long-term goal of this study is to test the following; 1) Does abiotic stress such as temperature shock or soil salinity meaningfully alter RNA secondary structure in plants. 2) Do changes in RNA secondary structure induced by stress alter gene expression? 3) If the above are true, does stress-induced regulation of RNA secondary structure and expression influence stress acclimation in plants? In order to pursue these research questions, we first must establish a good test system. Our plan is to use three closely related plants, *A. thaliana*, a temperate climate species *E. salsugeneum*, a cold tolerant species and *A. hierochuntica* a heat tolerant desert plant, to compare how secondary structure varies across species adapted to different kinds of stress. My role in this project was to first determine the appropriate disinfection method for seeds and what kind of media is suitable for seed germination, particularly for poorly studied *A. hierochuntica*. Then, my next objective was to test two types of stress, namely salt and temperature, to determine ideal conditions for further experiments. I discovered that salt stress is the best stress for the RNA 2nd structure because this treatment resulted in the greatest difference in photosynthetic activity and growth between the species.

<https://symposium.foragerone.com/csu-curc2023/presentations/54758>

119 Local adaptation in feather microstructures of an alpine finch

Bailey Lubash

Erica Robertson, Kristen Ruegg

Type: Research Poster

Climate change is a growing pressure for many avian populations, often causing upward shifts in their distributions to track their ideal niche. Local adaptations to an extreme environment, such as an alpine ecosystem, can be a constraint for these populations, as they can prevent these distribution shifts. The Gray-Crowned Rosy Finch (*Leucosticte tephrocotis*) may be especially vulnerable to climate change as they are an alpine species with a constrained breeding range potential. The breeding grounds of the Sierra Gray-Crowned Rosy Finch (*L.t.dawsoni*) are localized to Southern California, with nesting sites above 3000 m in elevation. These regions differ with regards to environmental variables, including temperature and precipitation. This study will investigate differences in feather microstructure, features which are key to thermoregulatory ability, between two populations, one in the Sierras and one in the White Mountains, with the goal of identifying signals of local adaptation. Body feathers from 18 individuals in each location were collected. Five feathers from each individual are being imaged under an Olympus BX51 microscope. *ImageJ* software is then being used to measure barbule length, barbule density, and node density in the plumulaceous and pennaceous regions of each feather. We expect to find variation in barbule length, barbule density, and node density between the two populations, which would indicate adaptations to different environments.

<https://symposium.foragerone.com/csu-curc2023/presentations/54943>

120 Expanding the Toolset: Engineering a Sensor to Detect Ubiquitinated Epidermal Growth Factor Receptor

Claire Lundstrom

Dr. Tingting Yao, Dr. Robert Cohen

Type: Research Poster

Ubiquitin (Ub) is a protein found in all mammalian cells that serves as a signaling modification and is involved in multiple essential processes. Understanding the structure and dynamics of how

the ubiquitin signal regulates many proteins and processes is of great interest in many biomedical contexts. Ongoing work by me and others in the Yao-Cohen lab aims to develop new tools to address a persistent need for toolsets to directly monitor ubiquitination in live mammalian cells. One protein known to be regulated by ubiquitin is epidermal growth factor receptor (EGFR). EGFR is a transmembrane protein that activates a signaling cascade to induce cell proliferation and growth in the presence of epidermal growth factor (EGF). Mutations that disrupt the tight regulation of EGFR signaling are implicated in the development of multiple cancers; as such, factors regulating EGFR have been studied intensively. Further, the dynamics of EGFR ubiquitination play a critical role in the modulation of growth signaling by EGF. To facilitate investigations of ubiquitin's role in this process, here I propose a scheme to engineer protein live-cell biosensors able to detect EGFR ubiquitination for a variety of biomedical applications. Successful development of this sensor will contribute to a more complete understanding of the EGFR pathway, a step towards elucidating its role in cancer and disease states.

<https://symposium.foragerone.com/csu-curc2023/presentations/54924>

96 Attempting to Characterize a Main Component of the Crustacean Molt Cycle: The Molt-Inhibiting Hormone

Ashlynn Madril

Luisanna Hernandez Jeppesen, Jorge L. Perez-Moreno, Mihika Kozma, Donald L. Mykles

Type: Research Poster

The process of molting in crustaceans is not only an essential part of an animal's ability to develop and regrow appendages but is also the result of interactions between multiple complex and involved pathways. One pathway is largely controlled by a polypeptide called the molt-inhibiting hormone or MIH, a member of the crustacean hyperglycemic hormone (CHH) superfamily. The MIH pathway is essential, and MIH

specifically is involved in inhibition of the molt cycle where MIH keeps the Y-Organ, the molting gland, in a basal state which prevents a crustacean from constantly undergoing molting. While some CHH receptors have been characterized in crustaceans, the MIH receptor has not been fully identified. It is expected that the MIH receptor is a G-protein coupled receptor (GPCR) due to previous research finding that the resulting activation from MIH binding follows the GPCR downstream pathway through adenylyl cyclase activation, as well as similar GPCRs found in MIH analogs in insects. This research aims to look at seven possible previously identified CHH-family GPCR's and find the most likely MIH receptor candidate. Using *Gecarcinus lateralis*, the blackback land crab, as a model organism, polymerase chain reactions (PCRs) with custom primers will be used to identify the expression of these putative MIH receptors in different tissues, as well as differential gene expression across multiple molt stages. Identifying the MIH receptor is another step towards understanding the intricate molting process in crustaceans which can help in aquaculture industries. Supported by National Science Foundation grant IOS-1922701.

<https://symposium.foragerone.com/csu-curc2023/presentations/54768>

79 The Effect Of An Anesthesia Block On Two Different Locations In The Fetlock Joint In A Horse.

Cameryn Manley

Ann Hess

Type: Research Poster

Lameness in horses is when the horse has difficulty using the limb normally, this can result in anything from not being able to use the horse for a few days, to having to put the horse down. We are looking at if using veterinary diagnostic blocking can help with diagnosing lameness. This research study was conducted to illustrate the effect of blocking the palmar digital (PDABX) nerves and the palmar metacarpal nerves (LOW4) on improving the

lameness in the fetlock joint. Nine horses and seventeen forelimbs were used in this crossover design, where each horse (with the exception of one) experienced both the PDABX, and LOW4 block. There was one week between each block the horse received. The three response variables looked at were: Subjective Lameness Grade Average, Absolute Vector Sum, and Overall % Change. Each response variable was measured at 5 and 10 minutes after each block, as well as before anything was done to the horse, and a measurement after lameness was induced, but before any blocking happened. For PDABX, we do not have evidence that this block reduces lameness. This suggests that a PDABX block may not be helpful for clinical diagnosis. For LOW4, we have evidence that this block reduces lameness. This suggests that a LOW4 block is helpful for clinical diagnosis.

<https://symposium.foragerone.com/csu-curc2023/presentations/54912>

112 Health Literacy, Food Ordering Behaviors, and Equity in a Large-Scale Survey Study

Smriti Maskey

Yiqing (Skylar) Yu, Dan J. Graham

Type: Research Poster

Healthy lifestyles encompass various essential components, such as physical activity and eating behaviors. In recent decades, unhealthy eating behaviors caused by fast food chains, diet culture, fad diets, and lack of knowledge or misinformation, are also contributing factors to an unhealthy lifestyle. These unhealthy behavioral patterns have been linked to increased mortality rates, cardiovascular disease, diabetes, obesity, depression, anxiety, and other health issues. I have been involved in the development of multiple health promotion projects aimed at promoting active lifestyles and healthy eating. The project presented will focus on food-ordering behaviors and health literacy as it relates to health equity. The research presentation summarizes the relationship between the two. The current findings indicate 1) health literacy and food ordering behaviors are associated

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and 2) a need to develop interventions to promote healthy lifestyles among minoritized groups.

<https://symposium.foragerone.com/csu-curc2023/presentations/54871>

116 Realism in Virtual Reality Nature Immersion

Rachel Masters

Jalynn Nicoly, Dr. Francisco Ortega, Dr. Victoria Interrante

Type: Research Poster

Forest bathing is practice of sensory immersion in a nature environment for stress relief and mental resource restoration. Forest bathing offers many positive effects that can help people's mental health; however, many people who are in the most need of stress reduction benefits do not have access to nature, such as people in hospitals, nursing homes, and large cities. Virtual reality (VR) has the potential to increase accessibility to the benefits of nature by delivering immersive nature simulations that provide similar benefits. To create an effective virtual nature environment (VNE), research needs to be conducted on the components of a nature environment that make forest bathing effective. Biomass, which can be defined as living plants, is a key component under investigation. Additionally, a key issue with creating VNE's is making them deployable on accessible, everyday VR headsets like the Oculus Quest 2. Rendering photorealistic, 3D virtual assets often requires high end headsets and computers for the simulation to run without lagging or causing cybersickness. A research question of interest is if lower fidelity assets that are aesthetically pleasing and foster an escape experience can create similar effects to photorealistic assets. This experiment investigates if photorealistic biomass is essential for restorative effects, or if a lower realism environment that is also aesthetically pleasing can elucidate similar effects.

<https://symposium.foragerone.com/csu-curc2023/presentations/53909>

84 Understanding the Metabolic Guardian of *Thermococcus kodakarensis*: ChIP-seq for Archaea

Jason McDonald

Brett Burkhart, Thomas Santangelo

Type: Research Poster

SurR is a redox-active transcription regulator, simultaneously expressing and repressing the transcription of genes adjacent to its binding sites dependent on the presence of sulfur, regulating genes responsible for growth and metabolism. Chromatin Immunoprecipitation combined with deep sequencing (ChIP-seq) allows for the visualization of protein-DNA interactions and will provide high resolution data confirming the localization of SurR binding regions throughout the genome. Refining ChIP-sequencing techniques specific to *Thermococcus kodakarensis* using SurR will allow for further protein-genome interactions to be identified and better understood. TK1086, the gene encoding SurR in *Thermococcus kodakarensis*, was first constructed into a pTS700 shuttle vector containing an N or C terminal HA tag. The pTS700 plasmid was then transformed into a Tk1086 deletion strain and after recombination, the desired HA-tagged SurR protein would be expressed by final strains. Transformation using a pTS543 overexpression shuttle vector caused ectopic expression in an additional deletion strain. After transformation, HA-tagged SurR protein would first be crosslinked to DNA and later fragmented. After fragmentation, HA-selective antibodies are used to isolate SurR binding regions and we reverse the crosslink event, detaching SurR from binding sites. Sequencing data recovered from purified isolated regions will be compared to the wild-type genome, revealing peaks and locations where SurR binds. Identifying these regions will act as an initial step in understanding cellular response and transcriptional changes in *Thermococcus kodakarensis* in the presence or absence of sulfur.

<https://symposium.foragerone.com/csu-curc2023/presentations/54917>

P3 Fate

Katherine McGuinness
Type: Performance Art

Fate is a musical in progress, written and composed by myself, which I was inspired to write upon realizing that the typical number of songs in a full-length musical lined up with the number of cards in tarot's Major Arcana (twenty-two). Using tarot and mysticism as a jumping-off point, the show explores such issues as free will, grief, and mother-daughter trauma. It follows the story of young single mother Dalia Atropos as she grapples with her identity and tries to find her place in the world, between the ghosts of the past and her cynical idea of a future. I plan on performing three numbers from the show: "Temperance," (2 minutes), "Strength" (6 minutes), and "The Lovers" (4 minutes). "Temperance" gives an overview of Dalia's daily life and establishes her relationship with her ancestors, a group of fortune-tellers tracing back to ancient times who live in her mind and give unsolicited advice. "Strength" occurs at a moment in the show where Dalia is beginning to process her mother's death. It follows her emotional journey as she recalls her tumultuous relationship with her mother and attempts to reconcile that with the very real loss she is experiencing. "The Lovers" is intended as a duet between Dalia and her love interest, Michael, where both women express their fear of commitment but agree to commit to each other.

<https://symposium.foragerone.com/csu-curc2023/presentations/53281>

86 Single-cell RNA Sequencing of *Culex tarsalis* Ovaries

Elizabeth Mielke
Corey Campbell
Type: Research Poster

Rift Valley Fever Virus (RVFV) is a viral disease that affects livestock and humans, primarily in Africa, resulting in mass animal die-offs that lead to

devastating economic and food security losses for the farming community. Over 40 mosquito species are able to act as transmission vectors. RVFV is thought to be maintained in nature in part by transovarial transmission during mosquito reproduction. Transovarial transmission begins with a disseminated viral infection of the adult female and moves to the developing eggs. Previous results indicate that about 30% of mosquito's total transcriptomic response is in the ovaries; consequently, the functionality of this process can be studied within un-infected mosquito ovaries. Single-cell sequencing of mosquito ovaries has not yet been done. *Culex tarsalis* will be the mosquito of choice for this research. The Chromium Next GEM Single Cell 3' Reagent kit will be used to create this library for NGS of RNA from single cells. Cell viability (~90-95%) is critical to successful Next Generation Sequencing (NGS) library preparation. The objective is to identify expressed marker genes that can be used to identify specific ovarian cell types. Marker genes could be used to identify the specific cells that are being infected. Under future work, this information will be used to identify cell types that support RVFV transmittance within the sequenced genome.

<https://symposium.foragerone.com/csu-curc2023/presentations/54902>

80 Type M Error: Consequences of Selection Bias when the Null is False

Nathan Mitchell
Ben Prytherch
Type: Research Poster

Relative risk is a method to quantify effect size when a model has a binary outcome. It can be defined as the probability of some outcome in an exposed group over the probability of the same outcome in a group that wasn't exposed. Thus, this figure informs how much more likely an event is to happen in one group over another. A relative risk of one indicates that there is no elevated risk for the first group and a relative risk greater than one indicates an elevated risk for the first group. Relative risks can also be less

than one but greater than zero, but that scenario was not of interest for this project. This research dives into the Type M error and was derived from “Why Most Published Research Findings Are False” by Ioannidis (2005). Defined by Gelman and Carlin (2014), the Type M error measures how much an estimate is expected to differ from the parameter value given that significance was reached. Simulations were run on different sample sizes in order to estimate the expected Type M error for increasing relative risks. For example, at a sample size of 30, it was found that, when the relative risk is one, the estimate, given it was significant, is roughly 10 times as large as it should be. As the sample size increases, the Type M error decreases and as true relative risk increases the Type M error approaches 1, meaning there is no exaggeration in the effect-size estimate.

<https://symposium.foragerone.com/csu-curc2023/presentations/54647>

102 *In Vivo* Imaging of Gut Bacterial Reporters in *Caenorhabditis elegans*

Andrew Moore

Jessica Hill, Erin Osborne Nishimura

Type: Research Poster

The gut microbiome is a key regulator of health. The gut hosts a diverse population of microbes which affect various aspects of physiology including immune response, metabolism, and cardiovascular function. *Caenorhabditis elegans* is an attractive model organism for understanding host and microbe interactions within the gut, as it has a simple, 20 cell intestine, is transparent, has a stereotyped development that is fully mapped, and naturally harbors diverse microbial species within its intestine. To study bacterial colonization within the *C. elegans* intestine, a series of fluorescent reporters was prepared, allowing for the *in vivo* reporting of persistent colony growth within the intestinal lumen. Worms grown on these reporters are imaged using fluorescence microscopy. These

images are then processed using software designed to examine the spatial patterning of colonization across different species of bacteria. This technique will also be used to examine the effects of commensal gut bacteria on the process of infection by a pathogen. In the long term, this work will examine how a host immune system provides a selective environment to nurture helpful bacteria and defend against harmful bacteria to create a balanced gut microbiome.

<https://symposium.foragerone.com/csu-curc2023/presentations/54840>

221 Synthesis and Characterization of Schiff-Base Metal Catecholate Complexes for Intratumoral Cancer Treatment

Ellie Nelson, Ella Kim

Dr. Debbie Crans, Skyler Markham

Type: Research Poster

Cancer cells, like brain and pancreatic cancer cells, are of considerable interest to scientists to develop anti-cancer therapeutics due to their difficulty to treat and/or aggressive nature. Vanadium is a first-row transition metal well-known for its diverse biological roles and their potential medical applications including anti-cancer and anti-diabetic treatment. Recent work published by the Crans group has shown that hydrophobic Schiff-base catecholate complexes have anti-cancer properties suitable for chemotherapy, and superior activity compared to cis-platin. Currently, we are designing and exploring new complexes and two new Schiff-base catecholate complexes are being investigated from the [V^{VO}(3-OMeSHED)] and [V^{VO}(3-OMeSALIMP)] series. Optimization experiments for these complexes were conducted by changing solvents, temperature, and stoichiometries, which resulted in 35% increased yields in comparison to the reported methods. The optimized method was used to synthesize seven novel [V^{VO}(3-OMeSHED)] complexes, one known [V^{VO}(3-OMeSALIMP)] complex, and one novel [V^{VO}(3-OMeSALIMP)] complex. These compounds were characterized by ¹H NMR, ⁵¹V NMR, and UV-Vis studies, and their

hydrolytic stability was determined. Several compounds of the [V^{VO}(3-OMeHSHEd)] have preliminary anti-cancer results on T98G glioma cell lines.

<https://symposium.foragerone.com/csu-curc2023/presentations/54829>

75 Feline Cognitive Dysfunction Across Young and Aged Felines

Margaret Neuheardt

Amelia Hines, Julie Moreno, and Stephanie McGrath

Type: Research Poster

Feline cognitive dysfunction is a condition that disrupts memory and brain function. Two characteristics of the condition include the presence of misfolded proteins, as well as gliosis. These factors are also characteristic of Alzheimer's disease (AD), which is a neurodegenerative disease that progresses with age and inhibits memory and general brain function. Since these characteristics overlap with feline cognitive dysfunction, information found may be applicable to AD research. Misfolded proteins cause neuronal stress, which contribute to the decline in brain function. Gliosis is caused by a dysfunction within the central nervous system, which can cause the inflammation of microglia and astrocytes. Amyloid beta, P-tau T217, Iba1, S100B, and GFAP were used to stain for misfolded proteins, astrocytes, and microglia respectively. We hypothesize that aged felines will exhibit greater numbers of positive cells within the amyloid beta, P-tau T217, Iba1, and S100B stains than the young group. The GFAP stain (for astrocyte number) remained relatively constant across the age categories. Amyloid beta, P-tau, Iba1, and S100B all had a significant change determined by the number of positive cells within a wide spectrum of feline brains with a variety of ages.

<https://symposium.foragerone.com/csu-curc2023/presentations/55017>

103 Biogenic Amines in Decapod Crustaceans

Julia Newcomb

Talia B. Head, Donald L. Mykles

Type: Research Poster

Ecdysis is the shedding of the exoskeleton, a vital process in crustaceans controlled through a complex signaling pathway. Molting is managed by two main organs: the Y-organ (YO) and X-organ/sinus gland complex (XO/SG). The YO is responsible for producing and secreting ecdysteroid molting hormones, which travel peripherally to tissues to ready them for molting. The production of these ecdysteroid hormones in the YO is negatively regulated by molt-inhibiting hormone (MIH) produced and secreted by the XO/SG. Stimulation of ecdysteroid synthesis in the YO can be induced by a number of ligands. Biogenic amine receptors have been identified in the YO transcriptome. Downstream pathways of serotonin (5-HT) have been linked to the protein kinase C (PKC) pathway leading to ecdysteroidogenesis. Six putative biogenic amine receptors have been identified in the YO of the black-backed land crab (*Gecarcinus lateralis*): 3 serotonin, 2 dopamine, and 1 octopamine. This study aims to characterize the expression of biogenic amine receptors in the *G. lateralis* and *Carcinus maenas* YO, and quantify the effects of serotonin, dopamine and octopamine on ecdysteroid synthesis and secretion. Funding is provided by NSF (IOS-1922701).

<https://symposium.foragerone.com/csu-curc2023/presentations/54961>

134 GPU-accelerated Visualization of Urban Sustainability Datasets

Tyson O'Leary, Federico Larriue

Dr. Shrideep Pallickara, Abby Williams, Nathan Orwick, David Riva

Type: Research Poster

The United States is highly urbanized with more than 80% of the population residing in cities. Cities draw from and impact natural resources and

ecosystems while utilizing vast, expensive infrastructures to meet economic, social, and environmental needs. The NSF has invested in several strategic research efforts in the area of urban sustainability, all of which generate, collect, and manage large volumes of spatiotemporal data. Voluminous datasets are also made available by governmental agencies and NGOs in domains such as climate, ecology, health, and census. In this CURC effort, we demonstrate our GPU-accelerated visualization of urban sustainability datasets. Datasets federated within our Aperture tool include those from federal agencies and research groups. These include the EPA, CDC, HIFLD, NOAA, FEMA, Census Bureau, American Community Surveys, National Ecological Observatory Network, US Geological Survey, ESA, NASA, etc. The domains represented by these datasets include hydrology, ecology, environmental monitoring, evacuation routes, epidemiology, flood hazards, social vulnerability, power plants, superfund sites, air quality and aerosol pollutants, and future climate scenarios under GHG 4.5 and 8.5 trajectories.

<https://symposium.foragerone.com/csu-curc2023/presentations/54895>

125 Experiences of People with Type 1 Diabetes Using the iLet Bionic Pancreas in Primary Care

Courtney Oser

Kelsey Huss, Britney Prince, Elizabeth Westfeldt, Sean Oser, Tamara Oser

Type: Research Poster

Type 1 diabetes (T1D) is a chronic, autoimmune disease that requires multiple daily insulin doses and monitoring of glucose levels. Current treatments include insulin pumps or insulin injections. More recently, software algorithms which link an insulin pump to a continuous glucose monitor have allowed varying degrees of insulin delivery automation. One such system, the iLet Bionic Pancreas (Beta Bionics, Concord, MA), involves multiple control algorithms and machine learning to fully automate insulin delivery. It has been studied extensively in diabetes subspecialty

settings, and a trial done in primary care is nearing completion. As part of that trial, a qualitative study was conducted to help understand perceptions and experiences of participants using the iLet in primary care. Participants, whose usual care consisted of multiple daily insulin injections (not an insulin pump), were recruited from that trial. Semi-structured interviews (n=15) were conducted. Interview guide questions focused on participant perceptions and experiences while using the iLet. Data were analyzed to determine themes. Four themes were identified: 1) Hope for the future because of the device; 2) Alleviation of burden and stress of T1D while using the device; 3) The device made life with T1D easier; 4) Putting trust in the device. Based on the findings of this study, the participants perceived hope for the future, reduced burden and stress, and that the device made daily life with T1D easier, but required that they put their trust in the device.

<https://symposium.foragerone.com/csu-curc2023/presentations/54811>

87 Solution Characterization of Menaquinone Derivatives by using NMR Spectroscopy

Raley Patch

Dr. Debbie Crans

Type: Research Poster

Lipoquinones are essential lipid components of the electron transport chain (ETC) that shuttle electrons between the proteinaceous membrane to facilitate ATP production in both eukaryotic and prokaryotic cells. Menaquinones (MK) are the lipoquinones with a naphthoquinone headgroup present in tuberculosis bacteria. These molecules are very hydrophobic and their solubility in aqueous solution is limited. The properties of these compounds are investigated and will be discussed. Using NMR spectroscopy, the solution properties and specifically the solution structure is investigated. 1D and 2D NMR spectra are recorded and their structures elucidated using 2D NOESY NMR spectroscopy. The 2D ^1H NMR spectra show that the simple truncated MK-derivatives are folded over themselves.

<https://symposium.foragerone.com/csu-curc2023/presentations/54774>

92 Maximum Mean Discrepancy Model-Assisted Estimation for Complex Survey Sampling with Application to Forest Inventory

Jin Peng

Dr. Jay Breidt

Type: Research Poster

The US Forest Service employs field crews to visit randomly selected sites and measures key characteristics including net cubic-foot volume, trees per acre, biomass, and basal area. These on-the-ground measurements are very expensive, and it is of interest to combine them with cheap auxiliary information from satellites or from digital elevation models. There are existing model-assisted methods to combine auxiliary information with measurements, including parametric model-assisted regression estimators (such as generalized regression estimators, or GREG) and nonparametric model-assisted regression estimators (such as local polynomial regression estimators). We implemented a novel Maximum Mean Discrepancy (MMD) model-assisted estimator, which calibrates weighted sample estimates of kernel distances to known population totals of those distances for the auxiliary data. The kernel distances are between the auxiliary data points and a set of kernel means. In our application, we chose a bivariate normal kernel and means selected by k-means clustering. We designed a simulation study to compare the performance of MMD to existing estimators including the basic Horvitz-Thompson estimator and other model-assisted estimators. Our simulation study uses a real dataset of 86084 observations from the US Forest Service as our population and draws 500 repeated stratified random samples, computing the MMD estimator and each of the existing estimators of the four key forest characteristics. For the model-assisted estimators, we use latitude and elevation as the auxiliary information. Our simulation study demonstrates that MMD is comparable to or

superior to the other estimators in the Forest Service application.

<https://symposium.foragerone.com/csu-curc2023/presentations/54373>

1a Triacylglycerol and its Role in the Lifecycle of Arboviruses in *Aedes aegypti*

Samantha Pinto

Oshani Ratnayake, Paul S. Soma, Suad Elmegeghi, Venugopal Pujari, Dean Crick, Elizabeth A. McGraw and Rushika Perera

Type: Oral Presentation

Mosquito-borne diseases account for ~17% of the global disease burden plaguing more than half of the world's populations. Dengue (DENV), Zika (ZIKV) and chikungunya (CHIKV) viruses are arboviruses primarily transmitted by *Aedes aegypti* mosquitoes. Our previous studies have shown that infection with these viruses causes significant changes to the lipid metabolome of the mosquito. Using liquid chromatography-mass spectrometry, we discovered a substantial increase of the glycerolipid class, specifically triacylglycerols (TAGs) following 7 and 14 days-post infectious blood meal with DENV, ZIKV or CHIKV. Notable differences between TAG level trends in flaviviruses (DENV, ZIKV) and alphaviruses (CHIKV) were observed. We hypothesize that TAG levels increase in response to virus infection and may play a significant role in viral replication, dissemination and transmission in the vector. Alternately, TAG levels may influence the mosquito immune response to infection. Additionally, TAG requirements between flaviviruses and alphaviruses may differ during the infectious cycle. To test this hypothesis, we have inhibited TAG synthesis in the mosquito host using a chemical inhibitor followed by infection initially with DENV, serotype 2 (DENV2). Preliminary data shows that the inhibition of TAG synthesis decreased viral titer in the mosquito. This was observed *in vitro* in C6/36 *Aedes albopictus* larval cells as well as *in vivo* with *Ae. aegypti* mosquitoes. Our current efforts are expanding these inhibitor studies to both ZIKV and CHIKV as well as determining how inhibition of TAG

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synthesis impacts viral replication in the midgut, dissemination to the body and transmission via the saliva.

<https://symposium.foragerone.com/csu-curc2023/presentations/54932>

101 Characterization of Catalase and its Role in Molting in *G. lateralis* and *C. maenas*

Kyle Raney

Talia Head, Dr. Donald Mykles

Type: Research Poster

Divided into intermolt, premolt, and postmolt stages, molting is an essential process for crustacean growth and development driven by the X-organ/sinus gland complex (XO/SG) and the Y-organ (YO). During intermolt, the XO/SG periodically releases molt-inhibiting hormone (MIH), which suppresses the YO's production of molt-stimulating ecdysteroids. Entering premolt, the XO/SG reduces the quantity of MIH released, which allows for the excretion of ecdysteroids from the YO. Once the animal has reached postmolt, MIH concentrations increase, and the YO enters a repressed state. Production of ecdysteroids by cytochrome p450 enzymes produces harmful waste products, such as reactive oxygen species (ROS). The defense mechanisms against these are anti-ROS scavenging proteins, such as catalase. From the respective YO transcriptomes, this study identified one possible transcript for catalase in each the blackback land crab (*Gecarcinus lateralis*) and green shore crab (*Carcinus maenas*) through bioinformatic and phylogenetic characterization. Previous proteomic analysis of *G. lateralis* YO across the molt cycle identified multiple catalase isoforms of different molecular weights. We hypothesize a post-translational cleavage of catalase affects the efficiency of the enzyme. This study aims to identify the distribution of catalase transcripts in each species across multiple tissues. Additionally, we hope to track the efficiency of catalase over the molt cycle to determine if it's reaction rate could be used as an indicator of molt stage. Supported by NSF (IOS-1922701).

<https://symposium.foragerone.com/csu-curc2023/presentations/54640>

152 Investigating the Specificity of the Three Ferredoxins to the Membrane-Bound Hydrogenase Complex in the Hyperthermophilic Archaean *Thermococcus kodakarensis*

Danielle Riley, Kate Call

Sere Willams, Dr. Thomas Santangelo, Teagan Rockwood, David Crosby, Jared LeCuyer

Type: Research Poster

Electron flux is critical for maintaining the energetic gains of natural and bioengineered systems. As lone, high-energy electrons are unstable and potentially harmful, electrons are shuttled around cells by electron carriers. The model organism *Thermococcus kodakarensis* utilizes two types of electron carriers in its metabolic pathway: small molecules such as NAD(P)⁺ and Fe-S-containing proteins called ferredoxins (Fds). The metabolic pathway of *T. kodakarensis* contains three distinct Fds each with unique features and physiological roles within the metabolic pathway. Ferredoxin 3 (Fd-3) is the most distinctive of the three Fds, exhibiting a significantly different structure, a larger size, a lower redox potential, and a more sensitive expression pattern than Ferredoxin 1 (Fd-1) and Ferredoxin 2 (Fd-2). The primary role of Fd-3 is to reduce the Membrane-Bound Hydrogenase (MBH) respiratory complex which generates an extracellular proton gradient that serves to generate ATP via ATP-synthase and produce hydrogen gas. Current knowledge supports the hypothesis that the specificity of Fd-3 makes it the sole electron donor to the MBH complex, and that the activity of Fd-3 cannot be replaced by Fd-1 and Fd-2. Our project aims to prove or disprove this hypothesis by establishing whether Fd-1 or Fd-2 can substitute for the activity of Fd-3 as the sole electron donor to the MBH complex in *T. kodakarensis* by deleting genomic Fd-3, tethering Fd-1 or Fd-2 to the MBH complex, and growing up tethered strains in the absence of sulfur (-S⁰) to see if growth is restored.

<https://symposium.foragerone.com/csu-curc2023/presentations/54513>

90 Neuroscience and Structures of Receptors related to Addiction: Introductory Text for Chem 320

Lilli Rose

Connor Dolan, Violet M. Farmer, Deborah A. Roess, Debbie C. Crans

Type: Written Work

Understanding how the nervous system and biochemistry of the brain is critical for learning about the Chemistry of Addiction, a course taught at CSU by Dr. Debbie Crans. Drugs are compounds that mimic the shape of neurotransmitters to fit the specific ligand-gated channels or receptors on the input region of a neuron, allowing them to produce an action potential and propagate a signal throughout the body. The signal created by synthetic compounds could cause the release of natural neurotransmitters dopamine and serotonin and cause the desirable effects of many drugs. Many students who take Chemistry 320 have learned about the basics of the nervous system and biochemistry through other courses, but physiology and biochemistry are not listed as required prerequisites for the class. Hence, a short compact introduction to those fields are necessary and provide in lectures at the beginning of the class, but there is no literature to support this part of the course to aid student learning. My project is to write the sections on the nervous system and biochemistry for a publication called American Chemical Society (ACS) in Focus. The publication will serve as a supplemental text resource for students to review and learn the essential background material. Creating this resource will increase learning by giving students an additional tool and include reading as an additional learning among the VARK learning styles.

<https://symposium.foragerone.com/csu-curc2023/presentations/53497>

76 Evaluating ZIKA viral proteins capacity for CXCL10 induction in human placental cells

Hennio Rubio

Joseph Westrich, Tyler Bettencourt, Erin McNulty, Amy Nalls, Candice Mathiason

Type: Research Poster

Zika virus (ZIKV) was first identified in 1947 in the Ziika forest, Uganda. As a flavivirus, ZIKV is principally spread through mosquito vectors and had relatively low impact for the first 60 years after its discovery. The first major outbreak of Zika occurred on the western pacific Yap Island in 2007, followed by an outbreak in the Americas in 2015. It was during this latter outbreak, ZIKV was identified to be causally associated with negative birth outcomes, most notably neurological diseases and microcephaly in babies born to infected mothers. Although ZIKV has been shown capable of crossing the placental barrier, another factor potentially contributing to negative outcomes is the cytokine CXCL10. CXCL10 is an inflammatory that has pro-apoptotic properties. CXCL10 has been shown to be highly upregulated in the serum of ZIKV patients with negative birth outcomes. Furthermore, CXCL10 has been implicated in being causative for neuronal apoptosis during fetal development. Currently, the mechanisms of ZIKV mediated CXCL10 induction remain unknown. We have previously shown CXCL10 induction is highly correlative to ZIKV burden in human placental cell lines (JEG3). To evaluate the mechanism of induction, we aim to establish separate expression plasmid vectors containing the ten ZIKV proteins. As ZIKV NS5 has been shown to directly interact with proteins known to induce CXCL10 we hypothesize this protein is involved. Lastly, we have shown different ZIKV stains have differential ability to induce CXCL10, thus we aim to determine if specific viral proteins have differing capacity to induce CXCL10.

<https://symposium.foragerone.com/csu-curc2023/presentations/54865>

83 Deleting Uracil DNA Repair Enzymes in *Thermococcus kodakarensis*

Christopher Sanders
Alex Alon, Brett Burkhart
Type: Research Poster

DNA is prone to being damaged from both intrinsic and environmental influences. These mutations can have an advantageous or deleterious effect on how a cell will function. In order to maintain DNA integrity, cells have different DNA repair systems, which recognize mutations that occur within the genetic code. One such species, *Thermococcus kodakarensis*, live in high temperature environmental conditions and are susceptible to spontaneous deamination of cytosine that fabricates into uracil. This in turn can cause mutations that result from nonconical base pairing. When this occurs, recruitment of DNA repair enzymes from nucleotide excision repair (NER) and base excision repair (BER) pathways respond to fix these mutations. Tk has endonucleases from both pathways that recognizes uracil mutations and assist in repairing them. This research is focused on elucidating which DNA repair enzyme is critical for uracil repair within *Thermococcus kodakarensis*. Uracil mutation damage is universal amongst all domains of life. Bacterial and eukaryotic uracil repair pathways are well characterized, whereas there is limited knowledge of this pathway in archaea.

<https://symposium.foragerone.com/csu-curc2023/presentations/54983>

150 5-Methyl Cytosine Function in *Thermococcus kodakarensis*

Jackson Schiltz
Tom Santangelo, Kristin Fluke, Victoria Talbott, Liam Elkins
Type: Research Poster

A large variety of chemical modifications to RNA have been detected in all Domains of life, yet very little about each modification's function is known.

These modifications do not change the nucleotide sequence of the RNA but are rather chemical moieties installed by enzymes that are theorized to have impacts on RNA stability, translation rate, degradation, and more. One specific RNA modification, 5-Methyl Cytosine (m5C), is heavily present in the hyperthermophilic archaeon, *Thermococcus kodakarensis*. Multiple enzymes that implant the m5C (RCMTs) have been identified in *T. kodakarensis* as well as the RNA sites those RCMTs modify. I am to determine the impact of m5C on RNA function. Genomically deleting individual RCMTs from *T. kodakarensis*, or replacing the target cytidine with thymine may result in strains with significant phenotypes that signal 5mC's function. Changes in how fast the cells grow at high temperatures, how much total RNA is present, and how much protein is expressed from the target RNA are all markers that can give clues as to 5mC's purpose. Results from this project will contribute to the fundamental understanding of how RNA modifications contribute to normal cell function.

<https://symposium.foragerone.com/csu-curc2023/presentations/54963>

130 Detecting Déjà Vu with Eye Tracking Data in Virtual Reality

Greyson Sequino, Max McLaurin
Dr. Nathaniel Blanchard
Type: Research Poster

Déjà vu is a feeling that an individual experiences when they believe they have experienced or seen something before, even though their recollection of the previous experience is unclear or impossible. To further investigate this phenomenon, an array of software tools has been leveraged and developed to quantify the correlation between an individual's eye gaze and their state of déjà vu. Eye gaze data has been collected through precision Tobii sensors on an HTC VIVE Pro Eye headset. Research participants were immersed in a virtual scenario that induced déjà vu. Eye gaze data was collected while the participants were immersed in the virtual environment and normalized once the experiment

was completed. This high-resolution data was used in a machine learning pipeline to not only detect a correlation between eye gaze and the experience of déjà vu, but also to investigate whether a model could be trained to detect déjà vu using only eye gaze data.

<https://symposium.foragerone.com/csu-curc2023/presentations/54879>

111 Dishevelled has anti-viral activity in Rift Valley fever virus -infected *Aedes aegypti* mosquitoes

Christian Smith

Dr. Corey Rosenberg, Dr. Rebekah Kading

Type: Research Poster

Rift Valley Fever Virus (RVFV) is a zoonotic virus with periodic outbreaks in Eastern Africa; outbreaks are characterized by livestock death, and infection in humans can cause liver and renal damage, retinitis, hemorrhagic fever, and birth defects or abortion. *Aedes aegypti* (*Aae*) and *Culex tarsalis* (*Cxt*) are vectors of RVFV and we sought to better understand how RVFV MP-12 infections impacts mosquito host innate immune signaling responses by analyzing transcript expression levels. Mosquito-host transcripts related to three different *Wnt*-homologous signaling pathways were analyzed. The *Wingless* (*WG*) pathway is a regulator of cell proliferation and differentiation; *FRIZZLED2* (*FZ2*), *DISHEVELLED* (*DSH*), and *ARMDILLO* (*ARM*) changes were analyzed for this pathway. Janus Kinase/signal transducers and activators of transcription (JAK-STAT) is a multi-functional signaling pathway important for innate immunity; for this pathway *HOMELESS* levels were assessed. Lastly, a negative regulator of the c-Jun N-terminal kinase (JNK) signaling pathway, *PUCKERED*, was also studied. In this study, *Aae* and *Cxt* were infected with RVFV MP-12 via oral bloodmeal and held for 14 days. Upon prolonged infection, transcript expression of RNA from individual mosquito bodies was analyzed and showed significant decrease in expression, in infected mosquitoes. Particularly, in *Aae*, there was a significant inverse relationship between *DSH* gene

expression and viral log copy number, suggesting that *DSH* may be important for antiviral response in *Aae*. This relationship was not seen in any other transcript. dsRNA silencing of *DSH*, via injection into the midgut, resulted in increased levels of viral copy number at 7 dpi.

<https://symposium.foragerone.com/csu-curc2023/presentations/54642>

151 Transcription Regulation in the Archaeal Chromatin Environment

Amelia Stocking

Robert Vickerman, Bree Wenck, Thomas Santangelo

Type: Research Poster

Genomes are organized into chromatin, and chromatin architecture impacts transcription regulation, gene expression, development, disease progression, and cancer. Many archaeal genomes are organized with histone proteins that resemble the core eukaryotic histone fold, specifically the tertiary structure of the eukaryotic (H3/H4)₂ tetramer. Comparable to eukaryotic histones, archaeal histones organize the genome and regulate the progression of the transcription apparatus, although archaeal histones are devoid of eukaryotic-like N and C terminal extensions. Additionally, archaeal histones do not form discrete, octameric nucleosomes but an extended, superhelical structure. This extended structure is permitted, in part, by the lack of N and C terminal extensions but mostly due to a conserved AGA motif at the L1-L1(loop 1 of dimer 1 & 4) interface between the four main helical bundles. Differential analysis on strains designed to disrupt the L1-L1 interface resulted in significant up and down regulation of steady-state RNAs. However, this data does not explain why we observe such a change in the transcriptome. Therefore, we are creating new strains with different mutations in Histone A and Histone B of *Thermococcus kodakarensis* and capturing ternary elongation complexes (TECs). This NET-seq protocol will find the rate-limiting step of archaeal transcription, and find positions where

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RNAP could be regulated by histones or other unknown factors.

<https://symposium.foragerone.com/csu-curc2023/presentations/55019>

109 The Effect of Trauma on Emotion Regulation: the Role of Resiliency

Kira Sturgess

Emma Smith, Bradley Conner

Type: Research Poster

Understanding the severity of traumas and their impact on an individual's will to exist, live, and survive determines how one develops from early adversity (Kira et al., 2020). Historically, the ability to create meaning from distress is interrelated with indicators of resilience, which are connected with the process of self-regulation (Haverfield & Theiss, 2020). Consistently, research suggests the detriment of early life adversity often has a negative impact later in life. The increased vulnerability and susceptibility in childhood to succumb to the emotional impacts of trauma remain a serious concern for physical and mental health later in life. Therefore, adaptive emotion regulation strategies are critical to buffer against the impacts of trauma and foster growth (Chu et al., 2022). This study attempts to investigate the role of resiliency in a college population (n=1,884) as an intermediary in the relationship between trauma and subsequent emotional dysregulation. Using a between-subjects design, this study examines how the trait of resiliency may act as a buffer against negative strategies of emotion regulation such as rumination and impulsivity. To understand this relationship, multiple-linear regression was performed with an interaction between the two predictor variables to create a moderating effect. Interestingly, preliminary findings from this research indicate that resilience significantly impacts the relationship between experiences of trauma and emotion regulation abilities. Predictive analysis indicates degrees of trauma significantly predict emotion dysregulation in college students ($p = .$). Further, the main effects of trauma and the level of resilience in

college students significantly implicate that higher levels of trauma and resilience result in strong degrees of emotion regulation ($b = 1.27$, $p =$). Understanding the importance of resiliency in fostering post-traumatic growth dramatically impacts therapeutic interventions and individual health outcomes. The ability to modulate responses from the environment and create meaning from adversity benefits not only the individual but society as a whole, minimizing the negative aspects of trauma to promote overall well-being.

<https://symposium.foragerone.com/csu-curc2023/presentations/53963>

127 Whispering Through the Machines

Corbyn Terpstra, Brett Wisniewski

Mariah Bradford, Nathaniel Blanchard, Nikhil Krishnaswamy

Type: Research Poster

Automatic Speech Recognition (ASR) technology has become increasingly important in various applications, including virtual assistants, speech-to-text transcription, and language translation. However, ASR models still face challenges in accurately recognizing speech in noisy environments and handling speech variations. This is a particularly important problem for AI systems designed to work in classrooms, since errors in automatic transcription may lead to poor downstream AI performance and potentially impact learning outcomes. In this work, we explored the difference between multiple ASR models, Google and Whisper, in complex ASR contexts: students collaborating on a shared physical task. Google is a widely used ASR model that employs a neural network-based approach, while Whisper is a newer model that uses an ensemble of models and leverages active learning techniques. Our experiments showed that the Google ASR had far more substitutions (transcribing a word but guessing incorrectly) and deletions (missing a spoken word) of words, while Whisper had more insertions (incorrectly transcribing a word when no word was spoken). Whisper overall had a higher

standard deviation, while having a lower word error rate, but was overall more prone to “hallucinating” transcribed speech in segments where no speech existed. We would like to do further experimentation with Collaborative Problem Solving between the models to further improve the accuracy of ASR models in the future.

<https://symposium.foragerone.com/csu-curc2023/presentations/54842>

113 Kinetic comparison of 3C protease among five picornaviruses

Tatiana Vorontsova

Grace Campangola, Dr. Olve Peersen

Type: Research Poster

Unlike eukaryotes, positive strand RNA viruses produce one long genome that encodes one large polyprotein which can be cleaved into all of the necessary proteins the virus needs for its function and lifecycle. Picornaviruses contain 3 distinct domains within the polyprotein: P1, P2, and P3. P1 accounts for the structural proteins that make up the virus particle, i.e., the capsid proteins. P2 and P3 regions provide the non-structural proteins that the virus needs, such as proteases and the RNA polymerase. The focus of this project was P3 region processing, and particularly the 3C protease. The 3C protease has been proven to be the most active protease in the P3 polyprotein, thus a logical target for viral replication intervention. In this experiment, 3C was isolated from five different picornaviruses: CVA21, CVB3, HRVB14, HRVC15, and the well-known Poliovirus. We intend to run several assays on the proteases to study their kinetics and enzymology to better understand the pathways and processing routes these protein products take. This is accomplished through creating substrate constructs that include the protease cleavage sites (Gln|Gly) and several adjacent amino acids, with two terminal ubiquitin molecules. This allows us to tag one end of the construct with fluorescence to gauge enzymatic activity by tracking substrate loss or product gain over reaction times using SDS PAGE gels.

<https://symposium.foragerone.com/csu-curc2023/presentations/54643>

88 Redox Chemistry of Non-innocent Vanadium(V) Schiff Base SALIEP Catecholate Complexes

Drew Walters

Kate Kostenkova, Debbie Crans

Type: Research Poster

Non-innocent vanadium(V) Schiff base catecholate complexes exhibit interesting redox processes in addition to being of interest as anticancer agents. In the following presentation, we describe the syntheses and the properties of a vanadium SALIEP (N-(salicydeneaminato)-2-(2-aminoethylpyridine) catecholate complexes. The complexes have been studied using non-aqueous cyclic voltammetry and ⁵¹V NMR spectroscopy. The chemical structure and properties will be compared to the VO[HSHEd] (N-salicylideneaminato)-N'(2-hydroxyethyl) ethylenediamine Schiff base catecholate complex series. The effect of the compound's half-wave potentials and change in isomer distribution will be investigated. The redox chemistry has been found to depend on the stabilizing catechol ligand for the Schiff base.

<https://symposium.foragerone.com/csu-curc2023/presentations/54769>

104 A Reverse Genetics Approach for Identifying an Acetyltransferase Responsible for Brown Pigmentation in Brown-Colored Algae

Justin Warner

Andrew Paton, Graham Peers

Type: Research Poster

Diatoms are photosynthetic microalgae that are integral to the primary productivity of the oceans. Marine diatoms live in an environment with constant spectral light fluctuations, and to combat such an issue, diatoms contain fucoxanthin: a xanthophyll

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carotenoid pigment that absorbs light in the blue-green region. This allows more efficient photosynthesis for diatoms in light-limited areas of the ocean. Fucoxanthin has also gained significant relevance towards industry and medicine, acting as an anti-inflammatory and potential supplement for treating obesity, diabetes, and cancer. Scientists have known the structure and function of fucoxanthin for some time; however, only recently has a biochemical pathway been proposed. Not all genes involved in this pathway have been identified. Fucoxanthin contains an acetyl group, demonstrating the involvement of acetyltransferase in the biochemical pathway (specifically predicted to convert allenoxanthin to haptoxanthin). In this project, we are using a reverse genetics approach to generate knockout mutants of the diatom *Phaeodactylum tricornutum* to identify the unknown acetyltransferase. We are using the introduction of CRISPR-Cas9 ribonucleoproteins and transformation techniques. 15 acetyltransferase gene candidates were chosen.

<https://symposium.foragerone.com/csu-curc2023/presentations/54945>

1b Bioremediation and Environmental Racism

Trinity White

Dr. Katriana Popichak, Dr. Olivia Arnold

Type: Oral Presentation

The use of microbes and fertilizers with bioremediation is increasing in popularity as a cheap and easy solution to different types of pollution worldwide. Bioremediation is the use of microbes within an environment to remove toxins and has most popularly been used to clean up oil from oil spills, such as the Valdez Oil Spill. Bioremediation is a reasonable avenue for removing pollution from the environment and can be employed to help solve environmental racism. Environmental racism is the disproportionate proximity of certain individuals to environmental hazards, often minorities in the community. A large part of this environmental disparity is due to socioeconomic factors. Areas with high pollution

correspond in large to areas with cheap land prices. Companies that produce more of these hazardous waste products purchase land there. Since these areas are cheaper to live in they often have a statistically higher amount of minorities. However, after these plants are built most individuals living in these areas do not have the resources to move away, subsequently experiencing more pollution. There are three specific areas of pollution that affect marginalized communities more than others; air pollution, soil contamination, and decreased integrity of drinking water. A broad analysis of these pollution routes not only demonstrates what a marginalized individual is exposed to in one day but also, emphasizes the importance of a better system needed to clean up our world. This presentation reviews bioremediation techniques, their feasibilities, and their implementations to reduce the disproportionate exposure to pollutants that marginalized communities face.

<https://symposium.foragerone.com/csu-curc2023/presentations/54825>

133 An Evaluation of Automatic Speech Segmentation

Brett Wisniewski, Corbyn Terpstra

Nate Blanchard, Mariah Bradford

Type: Research Poster

Recently, a multitude of works have explored automatically identifying different collaborative moves individuals could make during a group learning context. Much of this work relies on automatically transcribed speech; however, this work has not established a clear “ceiling” on how accurate these automated methods could be if transcriptions were perfect. In this work, we propose establishing this ceiling using accurate transcriptions and comparing how close established methods are to this ceiling. In this project, I compared manually segmented data to automatic data to see how the segmentations differed.

<https://symposium.foragerone.com/csu-curc2023/presentations/54896>

122 Characterization of biased chromosomal translocation formation in the *Saccharomyces cerevisiae* genome

Mackenzie Wienke

Dr. Juan Lucas Argueso, Camryn Schmelzer

Type: Research Poster

To further understand an observed trend of a translocation bias involving the right arm of chromosome 7 in *Saccharomyces cerevisiae* (Chr7R) we used an assay (*URA-RA3* competition) that can detect the relative participation of different regions of the genome in the formation of chromosomal translocations mediated by Non-Allelic Homologous Recombination (NAHR). We used this system to better understand the relative distribution of NAHR partner repeat sequences across the yeast genome. The assay uses *RA3* insertions on seven different chromosomes arms, and one *URA* insertion, which share homology within the 623 bp *RA* region. Upon recombination, a functional *URA3* gene is generated, and cells acquire the ability to form colonies in media lacking uracil. To determine which of the *RA3* insertions is involved in each of the selected translocations, multiplex PCR and gel electrophoresis were used. As seen in previous studies and confirmed in wild type (WT) studies, we observed a translocation bias where the *RA3* insertion at the Chr7R is disproportionately involved. To expand on reasoning for the translocation bias, we tested the translocation distribution in response to increased DNA replication stress using hydroxyurea (HU), and decreased sister chromatid cohesion by knocking out the *SAP30* gene. The addition of HU resulted in no alteration of the spontaneous translocation distribution, indicating that the translocation bias is not due to an increase in Chromosome 7 breakage. In the *sap30Δ* mutants, the translocation bias was modified compared to the WT studies and decreased the relative frequency of Chromosome 7 as a translocation donor.

<https://symposium.foragerone.com/csu-curc2023/presentations/54752>

82 Analysis of Different Methods for Teaching Sampling Distributions

Silas Wunder

Ben Prytherch

Type: Research Poster

Most introductory statistics classes teach sampling distributions purely in the context of means and t-statistics, statistics that are normally distributed under the central limit theorem. A sampling distribution represents how a statistic is distributed over repeated sampling with a fixed sample size from the same population. This could lead to a misunderstanding of how sampling distributions behave for other non-normal statistics, like the range or minimum, which do not approximate the normal distribution as sample size increases. To test this hypothesis, we ran an experiment in 28 different introductory statistics classes, 13 in the Fall 2021 semester and 15 in the Spring 2022 semester. These classes were split into two groups, one that saw a simulation of how non-standard statistics act over repeated sampling before they were asked a question about how the sampling distribution of the range of data behaves, and one that did not see this simulation before being asked. The group that answered the question before seeing the simulation was then shown the simulation and asked the same question again. The resulting data was relatively inconclusive, as the students from the fall semester showed a greater improvement in correctness after seeing the simulation while the students in the spring semester did not. However, the students in the spring semester performed better on the question across the board, having a proportion of correct answers overall but without as large of an increase in correctness between treatments.

<https://symposium.foragerone.com/csu-curc2023/presentations/54886>

196 Optimizing Molecular Diagnostics for Parasitic Trematode Identification

Ashley Abbott

Annie Forseth, Dr. Ashley McGrew, Dr. Paula Schaffer, and Dr. Traci Kinkel

Type: Research Poster

Johnny Darter fish serve as hosts for parasitic helminths including but not limited to trematodes. Johnny Darter samples collected from the Poudre, Big Thompson, and Platte rivers have shown worrying increases in trematode infection associated with thermal water pollution. Tiger salamander samples collected within Colorado also showed increased parasitic trematode infections. This study aims to develop a standard operating procedure for DNA extraction and trematode identification via diagnostic polymerase chain reaction (PCR) assays. Current efforts to develop a standard protocol to diagnose infections and identify trematode species have shown varying degrees of success with the application of many unique primer sets. Improved PCR tests could identify trematode genus and species infecting fish and other marine life within polluted waters. Our efforts are focused on increasing the yield and quality of DNA obtained from DNA extraction, as well as determining which primers are ideal for use in PCR of trematode DNA. Protocols for amplification and sequencing of 16S mitochondrial rRNA and 18S rRNA will be tested on trematode infected tissue samples collected from 10 Johnny Darter fish and on trematodes isolated from 4 infected tiger salamanders. (Dr. Schaffer, CSU).

<https://symposium.foragerone.com/csu-curc2023/presentations/54936>

193 Investigating Microbiome: The Recent Association Found Between the Cestode Microbiome and *Mycoplasma spp.*

Grace Alexander

Meghan Donaldson, Dr. Traci Kinkel, Dr. Ashley McGrew

Type: Research Poster

A holobiont is the assemblage of a host and the many other species living around or within it. Parasitic infection within a host can disrupt this relationship and create dysbiosis. Recent literature has suggested that cestodes may be a viable holobiont for *mycoplasma spp.* The relationship between the cestode as a holobiont and the host has not been clearly defined. In this experiment, we use a tissue Qiagen kit and 16S amplification in order to extract DNA and identify the microbiome of the cestode to confirm the presence of *mycoplasma spp.* After doing so, we are able to suggest that the cestode microbiome is distinct from that of the host microbiome. This highlights the importance of microbes associated with parasites versus those associated with the host. This also suggests that the microbiome of the cestode potentially introduces new bacterial species to the host holobiont.

<https://symposium.foragerone.com/csu-curc2023/presentations/54588>

207 Peripheral *Mycobacterium tuberculosis* Infection Causes Neurodegeneration and Misfolded Proteins in Guinea Pigs: Understanding the Connection between Peripheral Infection and Increased Risk for Parkinson's Disease

Isla Anderson

Amanda Latham, Charlize Geer, David F Ackart, Amelia Day Hines, Randall J Basaraba, Julie A Moreno

Type: Research Poster

Tuberculosis (TB), a bacterial infection caused by *Mycobacterium tuberculosis* (Mtb), infects approximately ten million people each year. Primarily a lung disease, TB induces a robust peripheral immune response of cytokine producing cells. Cross-sectional studies show associations between TB and increased risk for neurodegenerative diseases, including Parkinson's Disease (PD) and dementia as well as increased cognitive decline in patients co-infected with TB and Human Immunodeficiency Virus (HIV). These correlations exist without diagnoses of central nervous system (CNS) Mtb infection or tuberculosis

meningitis (TBM), where infection progresses to the brain. To better understand the CNS effects of peripheral TB, guinea pigs, a pathologically relevant model to human disease, were infected by low-dose aerosol with Mtb H37Rv. Through behavior testing and immunohistochemical staining, animals with systemic Mtb infection show impaired cognitive functioning and biomarkers of neurodegeneration compared to uninfected controls. Guinea pigs 90 days post-infection demonstrate non-spatial memory loss that we correlate to decreased neuronal integrity and quantifications in the brainstem and hippocampus. Additionally, increased accumulation of phosphorylated alpha-synuclein, a misfolded protein characteristic of PD neuropathology, is found in these same brain regions. These results occur without any detectable bacteria in the brains of these animals, suggesting an alternative mechanism of neurodegenerative toxicity. This data correlates peripheral Mtb infection and damage to the CNS, enhancing our ability to prevent patients with TB from experiencing permanent neurological deficiencies. It also deepens our understanding of how the peripheral immune response affects the brain and contributes to neurological disorders.

<https://symposium.foragerone.com/csu-curc2023/presentations/54928>

2a What's the Point? Acupuncture as a Treatment for Insomnia

Laurel Anderson

Dr. John Didier

Type: Oral Presentation

Thousands of years have honed Traditional Chinese Medicine (TCM) into a holistic medical approach for a variety of ailments, including sleep disorders. Insomnia, specifically, is a common and debilitating condition that impacts a large portion of the population and is not always successfully controlled with medication. Acupuncture, a Chinese practice using needle placement at specific points in the body, can offer an alternative solution. It is based on the theories of Qi, in which energy flows through the

body in a particular way that can be supported and affected by inserting a needle into the energy channels. Due to stigma of TCM in the United States, there is little awareness and acceptance of the practice. Acupuncture, however, has been proven to be successful in relieving symptoms of insomnia—including long sleep onset, early awakening, and poor sleep quality—both qualitatively and quantitatively. There are specific acupoints such as Shen Men and Bai Hui that are common insomnia relief points that provide increased symptom relief over the typical pharmacological treatment. This project will explain the physiological effects and causes of insomnia, as well as how various forms of acupuncture can treat them using both Western and TCM theories.

<https://symposium.foragerone.com/csu-curc2023/presentations/54955>

184 Chemical Composition of Alcoholic and Non-Alcoholic Beer

Paola Arrieta-Molinar, Oscar Rodriguez Perez

Dr. Paul Laybourn, Eva Keohane, Dr. Charlie Hoxmeier

Type: Research Poster

This research focuses on the chemical composition of beers produced by two different yeast strains, *Saccharomyces ludwigii* and *Saccharomyces pastorianus*, with the main difference being the presence or absence of ethanol. The results show that the alcoholic beer sample produced by *S. pastorianus* had an ethanol concentration of 2.06% by volume and contained 39.3 International Bitterness Units (IBUs), while the non-alcoholic beer sample produced by *S. ludwigii* had 5.0 IBUs and 0.21% ethanol by volume. The research explored two techniques for measuring ethanol concentration and found limitations in both, highlighting the need for a more accessible and precise ethanol assay. In addition to the techniques used for measuring ethanol concentration, Gas Chromatography/Mass Spectrometry (GC/MS) was also utilized to further analyze the chemical composition of the beers. The chromatogram obtained from the GC/MS showed that maltose was

present in both samples after fermentation, with a higher overall concentration in the non-alcoholic sample. The presence of other volatile compounds in both samples, such as esters and aldehydes, were also identified. By comparing the retention index (RI) of an unknown compound to the RI of a standard compound, it is possible to make an identification based on the similarity of their retention times. This allowed for confident identification of the volatile compounds present in the beers analyzed through GC/MS. Overall, the project provides insights into the chemical differences between alcoholic and non-alcoholic beer and the impact of yeast strains on their composition.

<https://symposium.foragerone.com/csu-curc2023/presentations/54615>

70 Understanding Orthobunyavirus Reassortment

Audrey Banks

Mark Stenglein, Marylee Kapuscinski

Type: Research Poster

Bunyaviruses (*Bunyavirales*) are an order of segmented RNA viruses that affect humans, animals, and plants. Like many segmented viruses, bunyaviruses can undergo reassortment to produce new viruses with potentially negative phenotypes. Unlike evolution driven by mutation, reassortment allows for significant genome change in a short period of time. Reassortment itself is a complex process that requires very specific conditions for success; however, bunyaviruses have been shown to reassort relatively often with severe effects on human health. As climate change and globalization increase, the conditions for reassortment may be more easily met and the potential for disease spread could be more severe. Using a “minigenome melee” system created by the Stenglein Lab along with traditional methods, this project will investigate the reassortment patterns and barriers of large numbers of orthobunyaviruses. First, this project will test why specific mismatched virus segments fail and how mismatched segments can adapt to survive. Next, the minigenome melee system will be

used to test the hypothesis that viral packaging is not a barrier to orthobunyavirus reassortment. Finally, the project will test the hypothesis that bottlenecks in mosquito populations allow less fit genotypes to survive.

<https://symposium.foragerone.com/csu-curc2023/presentations/53589>

191 Selective cholinergic activation prevents memory loss and the *in vivo* growth of amyloid plaques in Alzheimer’s disease

Ellison Black

Dr. Seonil Kin, Rahmi Lee, Michael Doolittle, Ava Steger

Type: Research Poster

Alzheimer’s disease (AD) is the most common form of dementia with no known cause and cure¹. Studies suggest that one of the main causes of AD is disruptions in synaptic activity of GABAergic inhibitory interneurons by beta-amyloid peptide (A β). This in turn decreases inhibitory activity to increase excitation in pyramidal excitatory neurons in the hippocampus, resulting in network hyperexcitability. Hyperexcitability in the hippocampal network also promotes A β secretion and accumulation, leading to the formation of amyloid plaques, a central pathology of AD. This suggests that the A β -induced reduction of hippocampal inhibition is a crucial trigger for the development of AD. Therefore, enhancing hippocampal interneuron activity is thought to be neuroprotective against AD. We thus hypothesize that A β -induced hippocampal hyperexcitation promotes the *in vivo* rapid growth of amyloid plaques, which can be reversed by increasing hippocampal inhibition. To activate hippocampal inhibition, we injected drugs to stimulate α 7- and α 4 β 2-nicotinic acetylcholine receptors (nAChRs) into 5-month-old amyloid pathology model (5XFAD) mice. hippocampal sections from these mice were stained with Thioflavin S to visualize amyloid plaques. We found that *in vivo* co-stimulation of α 7- and α 4 β 2-nAChRs significantly reduced the total area and average size of amyloid plaques in the

5XFAD hippocampus when compared to the control hippocampus. This suggests that co-activation of these two receptors significantly reduces the growth of amyloid plaques in 5XFAD mice by preventing hyperexcitation in hippocampal pyramidal cells.

<https://symposium.foragerone.com/csu-curc2023/presentations/54431>

162 *Mycobacterium leprae* alters sterols production on host Schwann cells

Lourlie Jannah Baniqued

Dr. John T. Belisle, Dr. Nurul Islam, Dr. Angela De Mello-Marques, and Dr. Fabricio Da Mota Ramalho Costa

Type: Research Poster

Leprosy has been an ever-present chronic infection in our world. It affects the skin and the nervous system and is caused by the bacterium called *Mycobacterium leprae* (ML). *Mycobacterium leprae* are known to infect Schwann cells found in peripheral nerves. Infection of Schwann cells may cause peripheral nerve injury which is categorized as the most severe symptom caused by leprosy. It is known that cholesterol is important for the survival of ML. Although ML is not able to completely metabolize cholesterol, it can oxidize the cholesterol to cholestenone by 3 β HSD enzyme. Oxysterols, oxidized forms of cholesterol, are important for cholesterol homeostasis in the cells. To better understand the importance of cholesterol and oxysterol in infected Schwann cells, we have infected the ST8814 Schwann line, extracted the sterols from the cells and conditioned medium, derivatized with picolinic acid, and analyzed by mass spectrometry (MS). The MS data were analyzed by skyline program and the compounds that were detected in abundance were Cholestenone, 4 β -hydroxy Cholesterol, 5 α ,6 β -dihydroxycholestanol, 7 α -hydroxycholestenone, and 27-hydroxy Cholestenone were some of the compounds that were found in the samples. The detection of these compounds suggests that ML has contributed to the production of the compounds and that some of them have been also secreted by infected cells.

<https://symposium.foragerone.com/csu-curc2023/presentations/54832>

175 Using EEG to Assess Neurocognitive Performance in Athletes with and without a History of Concussion

Jayla Bode

Anne Claire Tangen, Jaclyn Stephens

Type: Research Poster

Approximately 1.4 - 3.8 million individuals each year in the United States sustain sports-related concussions (SRCs). SRCs are no longer viewed as causing impermanent damage, as they can elicit long-term cognitive deficits. Electroencephalography (EEG) has been used for athletes with SRC to detect subtle neurocognitive impairments that cannot be detected with behavioral measures alone. The current study used EEG to investigate how neural activity is affected during dual-task in 42 total athletes: those with no SRC (n=14, 7 females), one prior SRC (n=14, 7 females), and multiple prior SRCs (n=14, 7 females). Data were collected from 64 scalp sites using a Biosemi EEG device while participants completed single- and dual-task paradigms. We looked at event-related potentials (ERPs), specifically the P3 component amplitude, at sites Fz and Pz for each of the three groups using mixed-method ANOVAs. At site Fz, there was no significant effect of task, $p=0.519$, nor group, $p=0.308$, nor an interaction between group and task, $p=0.855$. At site Pz, there was a significant main effect of task where amplitude was higher for the single task, $p=0.002$. However, there was no main effect of group, $p=0.611$, nor a significant interaction effect, $p=0.377$. The findings do not suggest that athletes with prior SRC are experiencing long-term cognitive deficits, as they were evaluated here. However, future work with larger sample sizes and inquiries into potential sex or age effects could reveal subtle deficits in neurocognitive performance.

<https://symposium.foragerone.com/csu-curc2023/presentations/54916>

183 Mutation of a Synaptotagmin Calcium Binding Pocket Produces Congenital Myasthenic Syndrome-like Symptoms in *Drosophila*

Andrew Bollegar

Max Pliskin, Morgan Litchford, Vincent Elias, Kaitlin Reed, Casey Martin, Jasmin Twiggs, Caitlin T. Waring, Joseph A. Seggio, Noreen Reist

Type: Research Poster

Neuronal communication is mediated by activity-dependent synaptic transmission. Depolarization of a nerve results in calcium influx that triggers the fusion of synaptic vesicles with the plasma membrane - this event is regulated by the calcium sensor synaptotagmin. Synaptotagmin is a vesicle protein containing two calcium binding pockets, C2A and C2B, that coordinate calcium via 5 negatively charged residues. An amino acid substitution within the C2B domain of synaptotagmin 2, the isoform found at the neuromuscular junction, has been identified in a patient with congenital myasthenic syndrome (CMS). Specifically, Aspartate 301 has been replaced with glutamate (D1E); the effect of this substitution has not been examined. In this study we sought to determine whether a homologous aspartate to glutamate substitution in *Drosophila* would cause CMS-like deficits in the fly - indicating a role for this substitution in CMS etiology. To mimic expression in the human patient, we expressed a syt-C2B-D1E mutation in synaptotagmin heterozygotes. To measure the physiological effect of the D1E mutation, we conducted electrophysiological and behavioral analyses. We conducted Western analyses to ensure any findings were a result of the mutation. We found that evoked transmitter release and overall activity levels were decreased in syt-C2B-D1E mutants compared to controls. These findings are consistent with the decrease in neuromuscular transmission and overall weakness seen in the CMS patient. Our results indicate that the C2B-D1E substitution induces CMS-like symptoms in *Drosophila* and support the hypothesis that this synaptotagmin substitution is involved in etiology of congenital myasthenic syndrome.

<https://symposium.foragerone.com/csu-curc2023/presentations/54893>

192 Chronic stress induces depression- and anxiety-like behavior, cognitive decline, and social dysfunction

Evelina Bouckova

McKennon J. Wiles, Madison H. Wustrau, Rahmi Lee, Seonil Kim

Type: Research Poster

Repeated stress affects brain functions, which contributes to the development of anxiety and depression, cognitive dysfunction, and social avoidance. After demonstrating rapid and robust antidepressant efficacy, the US Food and Drug Administration (FDA) approved esketamine (the S enantiomer from of ketamine) in 2019, sparking a surge in clinical and public interest around the world. In addition to reducing depression, some research indicate that ketamine may have neuroprotective effects against chronic stress-related neuropsychiatric conditions in both humans and animals. However, the effects of ketamine on these behaviors have not been fully addressed. Moreover, the mechanisms underlying ketamine's neuroprotection against chronic stress are yet largely unknown. A recent study shows that hippocampus is selectively targeted by ketamine at low doses. In fact, this therapeutic dose of ketamine can enhance excitatory synaptic drive and neuronal Ca²⁺ signaling in the hippocampus, which are presumed to underlie its rapid antidepressant effects. However, ketamine is a noncompetitive antagonist for NMDA receptors (NMDARs), major Ca²⁺ channels in excitatory synapses²⁵. Therefore, it is a puzzling question how ketamine enhances glutamatergic and Ca²⁺ activity while blocking NMDARs. Importantly, our recent work discovers a new mechanism of ketamine's antidepressant effects, in which ketamine at the low dose promotes the expression of Ca²⁺-Permeable AMPAR receptors (CP-AMPA receptors) in the hippocampus, a rare subtype of AMPARs, that have larger single channel conductance. Therefore, the ketamine-induced

expression of CP-AMPA receptors can compensate for reduced NMDAR-mediated synaptic Ca²⁺ signaling and enhances synaptic strength enabling ketamine's rapid antidepressant actions in naïve mice. Significantly, the hippocampus is one of the key brain regions controlling depression, social behavior, learning, and memory. More importantly, research shows that an increase in hippocampal activity improves these behaviors. This suggests that the ketamine-induced expression of CP-AMPA receptors can enhance hippocampal activity to be neuroprotective against chronic stress-induced behavioral abnormalities.

<https://symposium.foragerone.com/csu-curc2023/presentations/54743>

197 fNIRS with Neuroimaging Compatible DTS, Correlating with Behavioral and Divided Attention in Sports-Related Concussions

Abril Butler

Dr. Jaclyn Stephens

Type: Research Poster

Dual-task assessments, which simultaneously evaluate cognitive and motor skills, have enhanced sensitivity to deficits originating from sports-related concussions (SRC). Our lab developed a Dual-Task Screen DTS to quickly assess dual-task performance with low-cost, portable instruments. We modified the DTS to support simultaneous neuroimaging, creating a measure called the Neuroimaging-Compatible (NC) DTS. Here, we used the NC-DTS to assess eight healthy athletes and eight athletes with a history of multiple SRCs. This thesis is focused on the behavioral data acquired from the NC-DTS, and we hypothesized that athletes with multiple SRCs would have more dual-task interference than healthy athletes. The NC-DTS includes a lower extremity and an upper extremity subtask (LE and UE subtasks). Each subtask includes three conditions: single motor, single cognitive, and dual-task. Each condition is repeated five times to elicit an average brain response. Dual-task interference were calculated using a formula: (Dual Task Performance – Single Task Performance)/Single

Task Performance, and single-tailed independent t-tests were used to test for differences in dual-task interference between groups. Athletes with a history of multiple SRCs had greater dual-task cognitive interference on the LE subtask, $p = .031$. However, we did not observe significant between-group differences in dual-task motor interference on the LE subtask, $p = .115$ nor on the UE subtask, p values $>.115$. These preliminary results suggest that the NC-DTS may be able to detect subtle residual deficits in dual-task cognitive performance in athletes with a history of multiple SRCs.

<https://symposium.foragerone.com/csu-curc2023/presentations/55015>

185 The Dark Crystal, Tracking Mosquitos with Nanoporous Microcrystals and DNA

Kaleb Davis

Natalie Wickenkamp, Julius Stuart, Ashlyn Chen, Arielle Glass, Robert Fathke, William Schlatmann, Christopher Snow, Rebekah C. Kading

Type: Research Poster

Monitoring of mosquito dispersal is a strong area of current interest for researchers as this information is vital for the control of mosquito borne pathogens. Currently dispersal is tracked through topical fluorescent dyes. This method has many drawbacks and mark-release-recapture can be difficult to deploy. To address these shortfalls, we have developed a novel method of mosquito marking. The objective of this study was to field-validate this novel mosquito tagging technique in the context of seasonal West Nile virus (WNV) surveillance in Fort Collins, Colorado. This novel method involves the use of nano-porous microcrystals which readily adsorb synthetic DNA oligonucleotide barcodes. These DNA-loaded microcrystals are ingested by larval stage mosquitoes when they are placed in their larval habitat effectively marking individual mosquitoes with the DNA barcode. These barcodes are readily scalable and as such can be tied to information such as dose date and location. In our field trial 14 bins which mimic a natural larval habitat were placed in 4 locations to be colonized

and dosed weekly. Testable samples of field caught mosquito homogenate were supplied through the existing West Nile Virus surveillance network and tested for barcode presence via. Polymerase Chain Reaction. Analysis of the barcodes with Next Generation Sequencing will allow us to determine the point of larval origin and to estimate age as well. In our field trials we have demonstrated that these crystals can both be introduced and recovered from wild mosquito populations in a real-world setting.

<https://symposium.foragerone.com/csu-curc2023/presentations/54826>

189 HIV and FIV glycoproteins increase cellular tau pathology via cGMP-dependent kinase II activation

Michael Doolittle

Matheus Sathler, James Cockrell, India Nadalin, Franz Hofmann, Sue VandeWoude, and Seonil Kim

Type: Research Poster

As the development of combination antiretroviral therapy (cART) against human immunodeficiency virus (HIV) drastically improves the lifespan of individuals with HIV, many are now entering the prime age when Alzheimer's disease (AD)-like symptoms begin to manifest. Hyperphosphorylated tau, a known AD pathological characteristic, has been prematurely increased in the brains of HIV-infected patients as early as in their 30s and is increased with age. This suggests that HIV infection may lead to accelerated AD phenotypes. However, whether HIV infection causes AD to develop more quickly in the brain is not yet fully determined. Interestingly, we have previously revealed that viral glycoproteins, HIV gp120 and feline immunodeficiency virus (FIV) gp95, induce neuronal hyperexcitation via cGMP-dependent kinase II (cGKII) activation in cultured hippocampal neurons. Here, we use cultured mouse cortical neurons to demonstrate that HIV gp120 and FIV gp95 are sufficient to increase cellular tau pathology, including intracellular tau hyperphosphorylation and tau release to the extracellular space. We further reveal that viral glycoprotein-induced cellular tau

pathology requires cGKII activation. Together, HIV infection likely accelerates AD-related tau pathology via cGKII activation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54617>

214 Creating an Aerosol Transmission Model for Tuberculosis Meningitis in Mice

Elizabeth Dorst

Sasipha Hokeness, Andres Obregon, Marcela Henao-Tamayo

Type: Research Poster

Tuberculosis is a worldwide epidemic, with about one third of the world's population infected with latent TB. In latent TB cases there is a constant risk of active infection that can commonly be pulmonary or in rarer cases, meningitis. Meningitis tuberculosis (TBM) is understudied and underdiagnosed. TBM also is associated with a high mortality rate due to poor diagnosis and delayed initiation of treatment. Thus, we infected mice with aerosol *Mycobacterium tuberculosis* (Mtb), pharmacologically compromise their BBB, and observe Mtb in their central nervous system. Several methods of analysis were used, such as Anymaze software to observe see motor deficits behavior changes in mice (stiff neck, total time in motion, time resting etc). The purpose of this method is to evaluate if mice have meningitis symptoms. Fluorescent microscopy was used to evaluate the permeability of the BBB and predicted granuloma formations. Evans blue + profusions were performed to view mouse brains and meninges. And, LEDGENDplex cytokine binding assays were used to evaluate the immunological response in blood serum throughout infection. The expected observations are meningitis symptoms in mice, a highly compromised BBB, potentially granulomas in the CNS, and high concentrations of inflammatory cytokines and chemokine in blood serum.

<https://symposium.foragerone.com/csu-curc2023/presentations/54611>

213 Effect of Collagenase on Goblet Cells using an Intestinal Microfluidic Device

Alexis Ehrlich

Hayley Templeton, Amanda Cherwin, Charles Henry, and Stuart Tobet

Type: Research Poster

The colon is characterized by thick mucus layers, diverse cellular heterogeneity, and an extensive bacterial population. Increased intestinal permeability has been implicated in numerous inflammatory disorders. One way that this permeability may occur is through bacterial dysbiosis. Dysbiosis of the luminal composition can lead to hyperpermeability of the intestinal barrier, also known as leaky gut syndrome. Some luminal bacteria and host tissues can secrete collagenases that break down the peptide bonds in collagen, a main component of the extracellular matrix. Specialized epithelial cells, known as goblet cells, provide protection from foreign pathogens through the secretion of mucus. As goblet cells mature, they generate and package mucin granules to be released into the lumen via exocytosis. To generate a model of leaky gut, bacterially derived non-specific collagenase was added to colon explants placed in an intestinal microfluidic organotypic device. Microfluidic devices maintained intestinal wall integrity while providing a physiologically relevant environment for ex vivo colon explants. A dosage curve of collagenase was added to study the modulatory effect on barrier integrity. After 72 hours in the device, tissue was sectioned, and immunohistochemistry was performed against mucin 2 (MUC2). The proteolytic effect of collagenase was analyzed by crypt region—apical vs basal—and targeted differences in mucin distribution. With increased collagenase treatment, goblet cells at the crypt's apical surface were labeled, but with progressively decreasing MUC2 immunoreactivity and altered cellular morphology with higher concentrations. Future studies should address if collagenase is altering signaling pathways that modulate proliferation and differentiation of goblet cells.

<https://symposium.foragerone.com/csu-curc2023/presentations/54910>

178 Indirect Tumor Immunosurveillance Induced by *Staphylococcus aureus* in a Mouse Model of Osteosarcoma

Kayla Fairweather

Laura Chubb, Dr. Nicole Ehrhart

Type: Research Poster

Osteosarcoma is a common malignant bone tumor in canines and humans. The primary treatment for osteosarcoma is surgery and chemotherapy, but the prognosis is poor for patients with metastasis or microscopic residual tumor. An alternative treatment involves stimulating the immune system to recognize and eliminate residual tumor cells. This approach is supported by several studies that have found a correlation between bone infection following limb-sparing surgery in canine and human osteosarcoma patients and increased survival times. The increased survival seen in these patients may be due to indirect tumor immunosurveillance as a result of the innate immune response to an ongoing infection. In this study, an orthotopic osteosarcoma was established in the left hind tibia of C3H mice followed by hind limb amputation 10 days post-injection. PVDF Durapore membrane pouches with 0.1 μm pores were used to encapsulate *Staphylococcus aureus* seeded on silk suture strands. The membrane pouches were then placed in the dorsal mid-scapular region of the mice. It was hypothesized that the encapsulated bacteria would stimulate the immune system to fight residual tumor without causing local or systemic infection. IVIS imaging was used to monitor bacteria migration, residual tumor growth, and metastasis in the lungs, liver, and abdomen. In comparison to the control groups, the group that received pouches containing bacteria showed no significant difference in time to metastasis. An alternative method of implanting the infected suture directly in the femur will be investigated in future studies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54798>

V7 Fort Collins Butterfly Illustrations

Charlize Geer

Dr. Crystal Cooke and Dr. Ashley McGrew

Type: Visual Art

I have always had a passion for entomology. There is something so incredible about insects, from their huge diversity to their ecological roles that form the foundation of the world. I am fascinated by their tiny invertebrate limbs, delicate wings, and complex behaviors. During my time at CSU, I have found a meaningful community that shares my interest in insects. I've been a part of the entomology club here at CSU since my first year, and I now serve as one of the club officers. For my honors thesis project, I chose to complete these butterfly illustrations for the Public Engagement Staff of Fort Collins Natural Areas. This includes the monarch butterfly, variegated fritillary, silvery blue, and Colorado hairstreak. Each illustration is colored pencil on drafting film, based on photos of real specimens courtesy of the C.P. Gillette Museum of Arthropod Diversity. By viewing my artwork, I hope that you can better recognize and appreciate these butterflies in Fort Collins and throughout Colorado.

<https://symposium.foragerone.com/csu-curc2023/presentations/54726>

2a Mechanisms of Neurotoxicity Following Peripheral Infection with a High-Dose of *Mycobacterium tuberculosis*

Charlize Geer

Charlize Geer, Amanda Latham, David F Ackart, Kristin Weninger, Randall J Basaraba, Julie A Moreno

Type: Oral Presentation

More than ten million people fall ill with tuberculosis (TB) every year, a disease caused by infection with *Mycobacterium tuberculosis* (Mtb). Mtb is intensely immunogenic, and respiratory infection leads to the production of pro-inflammatory cytokines and activation of peripheral immune cells. In rare cases, Mtb crosses the blood-brain barrier (BBB) and manifests as a more deadly form of disease known

as tuberculosis meningitis (TBM). Data shows that TB patients are predisposed for neurodegenerative disease and cognitive deficiencies, even without a diagnosis of TBM or central nervous system (CNS) infection. We hypothesize that in a guinea pig model of TB, the peripheral immune response to Mtb impacts the CNS by reducing the integrity of the BBB and causing infiltration of peripheral immune cells into the brain parenchyma, resulting in neuroinflammation. In our study, Dunkin Hartley guinea pigs were infected by aerosol with a high-dose of hypo- and hypervirulent strains of Mtb. After fifteen days post infection, the animals were euthanized and immunofluorescent staining was used to characterize the integrity of the BBB and identify biomarkers of neuroinflammation. Similar to previous findings, activation of the complement cascade and increased glial activation was identified in infected animals. We correlate these findings to changes in the expression of key BBB proteins, Collagen IV and Claudin-V, in infected guinea pigs compared to uninfected controls. These findings demonstrate that CNS damage in TB patients may occur due to the strong peripheral immune response crossing the BBB and pushing resident glial cells into a proinflammatory state.

<https://symposium.foragerone.com/csu-curc2023/presentations/54729>

187 Glial mitochondrial damages are unique to exposure type in dual-hit model of manganese and rotenone.

Megan Hager

Savannah Rocha, Ronald Tjalkens

Type: Research Poster

Rotenone is a broad-spectrum insecticide, piscicide, and pesticide used worldwide. This toxin is known to uncouple mitochondrial complex I, induce regionally distinct α -synuclein aggregation in C57Bl/6 mouse models, and cause symptoms that mirror Parkinson's Disease (PD). Manganese (Mn) is an essential trace mineral needed for enzymatic function, however, excess accumulation results in Manganism, a disease characterized by

Parkinsonian-like symptoms. Recent research implicates glial cell activation and inflammatory involvement disease progression, yet exact mitochondrial mechanisms leading to inflammation in glia remains unknown. To determine if Mn priming increases the inflammatory response caused by secondary rotenone exposure, primary C57Bl/6 glia were isolated from neonatal (P0-P1) mouse pups and grown to confluency in glass chamber slides. Subacute concentrations of Mn (10 μ M) were used to prime cells for 24 hours prior to additions of 100nM rotenone in respective experimental groupings (Control, 10 μ M Mn, 100nM rotenone, 10 μ M Mn+100nM rotenone). Live-cell imaging of mitochondrial calcium concentrations (Rhod-2), mitochondrial membrane potential (TMRE), and intra-mitochondrial reactive oxygen species (ROS, MitoSOX) were fluorescently quantified over time, post addition of rotenone. Rhod-2 data showed increased mitochondrial calcium was present in the dual-exposed group, supporting detrimental mitochondrial effects due to calcium overloading. TMRE data showed decreased mitochondrial membrane potential in the dual-exposed group, indicating sufficient mitochondrial damage via compromised membrane potential. MitoSOX data showed increased intra-mitochondrial reactive oxygen species in 10 μ M Mn and dual-exposed groups, implicating manganese as a driving force of ROS production. Experimental results show that in glial cells, environmental toxin exposure utilizing Mn and rotenone increases mitochondrial stress.

<https://symposium.foragerone.com/csu-curc2023/presentations/54576>

171 Digging in The Dirt: A Search for Novel Antibiotics

Jacob Hall
Dr. Claudia Gentry-Weeks
Type: Research Poster

The growing obstacle of antibiotic resistance calls for further efforts to discover novel antibiotics. In this study, we isolated a *Paenibacillus* species from a soil sample that was shown to have antimicrobial

properties against methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus faecalis*. The objective of this study is to identify the species of this bacterium and to characterize the antimicrobial substance. Multiple identification techniques were used including PCR of the 16S rRNA, MALDI-TOF mass spectrometry, and Biolog biochemical testing. These methods all provided inconclusive results. The next steps for species identification involve next-generation whole genome sequencing and comparison with known *Paenibacillus* species, as well as PCR using species-specific primers. To characterize the antimicrobial properties, an antimicrobial extract was collected, and a disk diffusion assay was performed against 25 different antibiotic-resistant bacteria. Zones of inhibition were observed for 20 out of 25 test bacteria. To identify the antimicrobial substance, we will analyze the bacterial genome and look for biosynthetic gene clusters that could be responsible for the production of the substance. We will also perform transposon mutagenesis, screen for loss of antimicrobial production, and identify the specific genes encoding proteins of the biosynthetic pathway. This research will contribute to understanding how the bacterial genome can be used to identify antimicrobial substances that are being produced. This will help speed up the process of antibiotic discovery to combat the growing antibiotic resistance problem.

<https://symposium.foragerone.com/csu-curc2023/presentations/54814>

2a The characterization of soil bacterium to identify the natural Navajo Nation soil biome

Nizhoni Hatch
Dr. Phillida Charley
Type: Oral Presentation

From the 1940s to the 1980s, the demand for nuclear weapons during World War II caused the extraction of nearly 30 million tons of uranium ore from Navajo Nation lands. Today, the mines are closed, but over 500 abandoned uranium mines are in different stages of remediation or reclamation. These

processes involve closing mine portals and replacing contaminated soil with non-radioactive soil. There is little research on how the introduction of foreign soil impacts the bacterial makeup of the natural soil, which is crucial for plant, wildlife, environmental, and human health. To understand how the remediation process affects the native Navajo Nation soil biome, we collected soil samples from a control area and abandoned uranium mines in Sweetwater, AZ. We analyzed the control bacteria to identify the baseline properties of the natural soil microbiome. We characterized four different biochemical properties of twenty-three bacterial isolates from the control soil sample: anti-bacterial, anti-fungal, quorum quenching, and quorum-sensing capabilities. The control group exhibited ten bacterial isolates with anti-bacterial activity, fourteen with anti-fungal activity, four with quorum sensing, and fifteen with quorum quenching activity. The next steps involve identifying the control bacteria and characterizing the bacteria from the disturbed soil around abandoned mines. Comparing the biochemical properties across the soil groups will determine if the remediation process alters the balance of the native soil biome and impacts plants and wildlife.

<https://symposium.foragerone.com/csu-curc2023/presentations/54346>

1a Investigating virtual versus hands-on interventions in promoting increased performance, confidence, and engagement in a large general microbiology course

Ray Hernandez

Delaney Worthington, Amelia Hines, Katriana Popichak, Erica Suchman & Jennifer McLean

Type: Oral Presentation

<https://symposium.foragerone.com/csu-curc2023/presentations/54898>

202 Bull Sperm Capacitation by Extracellular Vesicles Produced by the Reproductive Tract

Marcie Jung

Dr. James K. Graham, Mindy Meyers, Brandi Dunn, Fiona Hollinshead

Type: Research Poster

Frozen semen is widely used with good success in the dairy and in beef industry using artificial insemination (AI). However, when used for vitro fertilization (IVF) frozen-thawed (FT) bull semen produces variable results. Cryopreservation damages sperm plasma membranes, increases membrane fluidity, changes sperm binding to the zona pellucida, and induces premature acrosome exocytosis, which reduces longevity and viability. Extracellular vesicles (EVs), in seminal plasma (SP) and oviductal (O) fluids, can affect sperm via their cargo to enhance sperm motility, acrosome reaction, and capacitation in vitro. In this study, we investigated how EVs produced by reproductive tract epithelium affect frozen-thawed bull sperm function. EVs were collected from male and female bovine reproductive tracts: Seminal plasma (SP), Estrus oviducts (EO), Diestrus oviducts (DO), and Organoid (OO) EVs. We hypothesized that seminal plasma (SP) and Diestrus (DO) EVs would inhibit sperm capacitation, and Estrus (EO) and Organoid (OO) EVs would stimulate sperm capacitation. Sperm capacitation (including an increase in plasma membrane fluidity, the phosphorylation of certain proteins and acrosomal status) was measured using flow cytometry and sperm binding to the zona pellucida, using a perivitelline membrane assay. Results showed seminal plasma (SP) EVs reduced the acrosome reactions and membrane fluidity of sperm, compared to control cells.

<https://symposium.foragerone.com/csu-curc2023/presentations/54330>

167 Dexamethasone pre-treatment improves aerobic exercise capacity of rats in hypobaric hypoxia

Jack Jenson

Malachi H. Peterson, Luke A. Whitcomb, Katelyn E. Maher, Dorcas D. Ka, Katie J. Sikes, Ryan W. Maresh, Adam J. Chicco

Type: Research Poster

Acute exposure to high altitude (HA) severely limits aerobic exercise performance, but also initiates an acclimation response that improves HA exercise capacity following prolonged exposures. Previous work in our lab found that blocking glucocorticoid receptors (GR) in vivo in rats prevented the acclimation of exercise performance at a simulated altitude of 5260m following 15 days of exposure in the CSU Hypobaric Chamber Facility, suggesting that GR-signaling may be an important contributor to the HA acclimation response. The present study tested the hypothesis that sustained GR activation in normoxia is sufficient to improve HA exercise performance. Male F344 rats were administered daily injections of the synthetic GR agonist dexamethasone (DEX; 0.75 mg/kg/d i.p.) under normoxic conditions (Fort Collins, CO) for 8 days before a graded exercise test at a simulated altitude of 5260m. Despite eliciting a marked loss of body weight and hindlimb muscle mass, HA running performance in normoxic DEX-treated animals was similar or superior to rats acclimated to HA for 15 days. This corresponded to higher levels of GR protein and very long-chain acyl-CoA dehydrogenase in skeletal muscle compared to controls, indicating that DEX may improve HA exercise capacity by augmenting GR signaling and fatty acid oxidation in hypoxia.

<https://symposium.foragerone.com/csu-curc2023/presentations/54874>

173 Dietary Inclusion of Rice Bran Increases Functional Food Properties of Meals and Snacks

Maya Jones

Lei Zhang, Madison Tipton, Bridget A. Baxter, Elizabeth P. Ryan

Type: Research Poster

Rice bran is a functional food that controls and prevents metabolic disturbances and inflammation involved in major chronic diseases. This study identified nutritional and metabolomic composition of five meals/snacks (baked pasta-marinara, Pizza-Margherita, blackberry cobbler, caraway crackers, and strawberry-pineapple smoothie) used in human dietary intervention trials. Each meal/snack contained 15g of heat-stabilized rice bran and placebo control foods had 0g. Nutrient, metabolite, and bioactive compounds were analyzed using an integrated food and nutritional metabolomics approach. The objective of this study is to evaluate the nutrient profiles with and without rice bran inclusion. We hypothesize that the nutrients and bioactive compounds differ in presence or abundance for improved gut health properties when rice bran is added as a food ingredient. The relative abundance of 22 distinct metabolites were identified as unique or increased in meals/snacks containing rice bran compared to control. Nine of these 22 metabolites have reported evidence to prevent or control the progression of type 2 diabetes. Linoleic acid and total fiber were also higher in foods with rice bran compared to control. Ten of the 22 metabolites with differential abundance were associated with cooking methods (baking, boiling). Probiotics in yogurt for smoothies and crust with yeast for pizzas showed microbial digestion of chemical substrates from rice bran. These findings enhance our understanding for rice bran as a novel ingredient in prepared meals/snacks and informs future food technology for products tested in clinical trials and public health programs for prevention and control of obesity associated chronic diseases, including colorectal cancer.

<https://symposium.foragerone.com/csu-curc2023/presentations/55009>

201 HPV Vaccination Rates in New Mexico and Future Directions for Promoting the HPV Vaccine Among Young Adults

Sreeya Kairamkonda

Prajakta Adsul

Type: Research Poster

The Human Papillomavirus (HPV) is the most common sexually transmitted infection in the U.S. and is attributed as a cause for cervical, penile, vaginal, vulvar, anal, and oropharyngeal cancers. Vaccination is an effective cancer prevention strategy and the Advisory Committee on Immunization Practices recommends HPV vaccinations for everyone between 11-26 years of age. Despite these recommendations, national rates have been consistently low (compared to other recommended vaccines) and very little research exists around HPV vaccination in New Mexico (NM). We used a mixed methods study design (i.e. sequential explanatory) to first describe NM's HPV vaccination rates and second, identify strategies to improve vaccination rates. Using data from NM Statewide Immunization Information System, we found that in 2021, 21.12% of individuals between 0-17 years (n= 680,449) and 41.87% of individuals between 18-26 years (n= 431,710) received at least one dose (of the recommended two or three doses) of the HPV vaccine. Furthermore, in the age group of 18-26 years, more females received the vaccine compared to males. A comprehensive literature review revealed several interventions directed at parents and providers to improve vaccination rates for the 11-17-year age group, with limited research focused on the young adult (18-26 years) population. Therefore, we conducted interviews with clinical and community partners to identify strategies to improve catch-up vaccination rates with a focus on young adults between the age of 18-26 years. Informed by these research efforts, we provide three key recommendations. First, we recommend examining attitudes and beliefs among young adults to inform the design of socio-behavioral interventions targeting vaccination uptake. Second, there is a need to explore communication strategies to help young adults

make informed decisions around HPV vaccinations. Finally, we recommend incorporating interventions targeting HPV vaccination for young adults in state cancer control plans to impact population health.

<https://symposium.foragerone.com/csu-curc2023/presentations/54101>

155 Creating Rotavirus Vaccine Constructs Using A Probiotic "Lactobacillus acidophilus" Platform

Paris Kiehl

Ben Swartzwelter, Allison Vilander, Gregg Dean

Type: Research Poster

Rotavirus is the most common diarrheal disease in infants, with greater than 200,000 deaths per year. While vaccines are available and administered, they have a lower efficacy in children from low- and middle-income countries. To combat this, the Dean and Vilander Labs are developing an orally administered, probiotic vaccine wherein the bacteria *Lactobacillus acidophilus* (La) is modified to express rotavirus antigens that elicit durable, adaptive immune responses in target populations. The goal of this project was to architect a series of recombinant La that express variations of the antigen VP7, a glycoprotein on the outer shell of the rotavirus virion that is a critical target for viral neutralization. In this study, a plasmid was designed with the VP7 sequence inserted between segment of the La genome. Plasmid transformation into La occurred through electroporation, and the VP7 sequence was integrated into the La genome following a standardized double crossover procedure. Future studies will assess gene expression and the efficacy of the vaccine construct in murine and porcine models.

<https://symposium.foragerone.com/csu-curc2023/presentations/54823>

199 Visualization of Probiotic Rotavirus Vaccine Interactions with Host B Cells

Sophie Kiehl

McKenzie Fletcher, Gregg Dean, Allison Vilander

Type: Research Poster

Rotavirus causes the death of 215,000 infants and children worldwide each year. The Dean and Vilander labs have developed a live, orally administered probiotic-based vaccine against rotavirus. It is a recombinant form of the bacterium *Lactobacillus acidophilus* (rLA) that expresses VP8 (a rotavirus capsid protein) and two immune-stimulating adjuvants, FliC, and FimH, on its cell surface. This project visualized how rLA interacted with the host's B cells in mouse models. Naïve, germinal center, activated, and memory B cell types were investigated. Mouse tissues along the gastrointestinal (GI) tract were stained with fluorescently labeled antibodies specific to B cells and then visualized with multispectral imaging. Image analysis was performed by the machine learning software Visiopharm®, which was trained to identify and quantify rLA and B cells. By visualizing the interaction between the vaccine and the host's immune cells, this project was an important step in demonstrating the vaccine's ability to generate an adaptive immune response through B cell activation in immune sites along the GI tract.

<https://symposium.foragerone.com/csu-curc2023/presentations/54839>

153 Age Differences in Myelin Content Quantified Using Advanced Diffusion MRI

Jacob Lonergan, Miles Hopkins

Grace Hiner, Samantha Umland, Raghuram Kakinada, Neveah Newton, Nick Stirbis, Andrea Mendez Colmenares, Aga Z. Burzynska

Type: Research Poster

Human white matter (WM) contains mostly myelinated axons, whose properties determine the speed of transmission of neural signals within the brain (Filley & Fields, 2016). The aging WM has been

studied predominantly using diffusion tensor imaging (DTI) which estimates the magnitude and directionality of water diffusion. Considering DTI lacks specificity for axonal or myelin integrity, the current study explored the use of a more advanced diffusion MRI technique, called Neurite orientation dispersion and density imaging (NODDI, Zhang et al., 2012). NODDI allows voxel-wise estimation of intracellular volume fraction (Vic) reflecting axonal density, orientation dispersion index (ODI), and isotropic volume fraction (Viso). The aim of this study was to explore the associations between DTI, NODDI, and age in a sample of cognitively and neurologically healthy adults (age 20-80, n=30). Our analyses focused on the genu corpus callosum (GCC) as the WM region known to be most vulnerable to aging. As expected, we observed a significant negative association between GCC FA and age ($r(1,29) = -.72$, $ppp = .04$), however, no relationship was observed between GCC ODI and age. GCC FA was also strongly associated with GCC Vic ($r(1,29) = .89$, $pp = .02$). Taken together, the relationship between age, DTI, and NODDI parameters point towards alterations in WM composition and microstructural integrity in the aging brain. Thus, NODDI offers a promising tool to dissociate age differences in fiber orientation from axonal integrity.

<https://symposium.foragerone.com/csu-curc2023/presentations/54645>

212 Metagenomic Analysis of Varying Data Sets: *Lactobacillus* Vaccine Vector

Joy Love

Reed Woyda, Zaid Abdo

Type: Research Poster

Metagenomics includes the extraction, sequencing, and the subsequent analysis of microbial communities. This field of study works to identify those microbial populations and to understand biochemical pathways. In this study, we introduce a computational pipeline that uses these principles. The computational pipeline was developed that separates DNA contaminants from microbes of interest with the ultimate goal of understanding

how and when specific microbial communities change in set conditions or treatments. This was determined via (1) quality control programs that discarded inadequate genomic data after extraction, (2) aligned those trimmed genomic reads to a known genetic contaminant, and then (3) displayed the sequences that did not map that contaminant with their taxonomic classification. To increase the robustness of the computational pipeline we tested varying data sets. The following experiment describes one of those data sets. Rotavirus is the most common cause for dysentery in young children and the leading cause of mortality due to diarrhea and dehydration. Unfortunately, the vaccine for Rotavirus is less effective in developing countries, although these countries are more heavily affected. Over 85% of deaths from Rotavirus dysentery occur in developing countries but the vaccines reduce severe disease by 30-60%. This is compared to a 90% decrease in other settings. To create a more effective vaccine, it is important to understand the biological response for potential vaccines. Specifically, the vaccines impact on the host microbiome. This study used a vaccine developed by the Dean lab at Colorado State University, which used a recombinant *Lactobacillus acidophilus* as a rotavirus oral vaccine vector to assess immune and microbiome responses in mice. The fecal contents of two female mice were taken before and after they received the vaccine vector. DNA was extracted from the fecal samples, quantified, and then sequenced. From there, Metagenomic analysis was performed using a computation pipeline to determine if the difference between the groups was significant. We hypothesize that there will be no significant difference between each female at the two timepoints, but there will be a significant difference in the microbiome before and after the mice receive the vaccine vector. We expect that there will be higher expression of *Lactobacillus acidophilus* after they receive the vaccine vector, but there will be a normal expression of *Lactobacillus acidophilus* in the mice that have not received the vaccine vector. The goal of this study was to increase the robustness of the computational pipeline used in this experiment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54810>

161 SARS-CoV-2 ORF8 Protein: Effects on Human Lung Epithelial Cells and Clues towards COVID-19 Origin

*Logan Lowe, Katie McClatchey, Meredith Brazael
Kristin Rugh, Logan Ridenbaugh, Sam Sorenson, Alan Schenkel*

Type: Research Poster

Severe acute respiratory syndrome Coronavirus (SARS-CoV-2) caused a global pandemic in 2020. When looking at the phylogenetic tree of all coronaviruses, the split between the human strain and the bat and pangolin strains was recent. The recent split points to the genes and protein sequences having many similarities but some possibly important differences. One heavily conserved sequence between the pangolin and human strains is the ORF8 gene. Our hypothesis is that the changes between bat and human variants of the Coronavirus ORF8 gene may affect interferon signaling and MHC Class I expression. In our research we are transfecting the ORF8 gene from SARS-CoV-2 directly into human epithelial cells to test the effects that ORF8 has on MHC class I expression. This will give us insight into the purpose of the ORF8 gene and why it is so heavily conserved. If we are able to determine that the ORF8 gene is necessary for the virus to replicate and spread in humans then we will be able to look for the ORF8 gene as a clue to the original source of the human virus.

<https://symposium.foragerone.com/csu-curc2023/presentations/54950>

203 Neuroinflammation In Canines With Clinical Signs Of Canine Cognitive Dysfunction

*Nikole Z. Madrid
Nhu Linh Trinh, Amelia D. Hines, Breonna Kusick,
Stephanie McGrath, Julie A. Moreno*

Type: Research Poster

Canine Cognitive Dysfunction (CCD) is a naturally occurring neurodegenerative disease in aging canines and is pathologically similar to human Alzheimer's Disease (AD). CCD is characterized by clinical signs such as barking for no reason, no longer greeting their humans, having accidents in the house, and not wagging their tail as much as usual, to name a few. CCD in aging canine may lead to persistent neuronal inflammation and protein misfolding, and while the cause is unknown, it may be linked to environmental factors such as diet, air pollution, and heavy metals. In canines with clinical signs of CCD, the persistent neuroinflammation leads to neurotoxicity causing cell death and worsening signs and symptoms of CCD. Currently neuronal inflammation, known as gliosis, associated with CCD is diagnosed with analysis of postmortem canine brain tissue using immunohistochemistry (IHC) staining. The pathological markers for gliosis GFAP and S100 β were used to visualize activated astrocytes and Iba1 for activated microglia. In ongoing longitudinal clinical studies, plasma and CSF were also analyzed across three groups; young, aged, and aged with CCD. This study allows for ongoing analysis of canine samples to examine connections between pathological findings in the brain tissues and markers in the CSF and plasma. Our studies and others show that canines make excellent sentinel translational models for aiding development of diagnosis and treatment of AD.

<https://symposium.foragerone.com/csu-curc2023/presentations/54962>

158 Elucidating the effects of temperature change on oviposition and progeny viability of *Aedes aegypti* mosquitoes

Olivia Martinez

Dr. Emma Harris, Dr. Rebekah Kading

Type: Research Poster

Temperature is known to affect the transmission efficiency of mosquito-borne viruses, particularly those spread by the *Aedes aegypti* mosquito. With the rising issue of climate change, investigating how environmental changes impact mosquito fecundity

will inform future action for vector control. Preliminary data from the Kading laboratory has shown impaired egg deposition when adult *Aedes aegypti* mosquitoes were exposed to temperatures varying from typical environmental conditions. This study will further investigate the relationship between altered temperatures, oviposition rates, and progeny viability within bloodfed *Aedes aegypti* mosquitoes. We hypothesize that temperature variation will negatively impact egg viability and subsequent offspring. Bloodfed female mosquitoes (n=50) will be housed individually at lower (18°C) or higher (32°C) than standard (28°C) rearing temperatures. Post bloodfeed, egg production will be measured via dissection of adult mosquito ovaries and natural deposition. Laid eggs will be hatched and larval development recorded. Data collection is ongoing. Elucidating the relationship between mosquito fecundity and temperature is of great importance for anticipating infectious disease dynamics in a complex and shifting global environment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54905>

179 Analysis of Inclusivity of Published Science Communication Curricula for Scientists and STEM Students

Rachel McMillan

Randy Vickery, Kaitlin Murphy, Sydney Alderfer, Jasmine Donko BS, Nicole Kelp PhD

Type: Research Poster

Science communication researchers have outlined various models of how scientists interact with non-scientists – from a linear/deficit-based approach, to a two-way/dialogue-based approach, to a network/inclusion-based approach. Science communication should embrace the more inclusive technique, with a holistic model that incorporates cultural knowledge, values diverse disciplines, considers social contexts, and encourages scientists to co-produce knowledge and solutions with others. However, science communication tends to be inequitably distributed, with only certain voices and

perspectives owning the narrative. We hypothesized that a contributing element to this disconnect could be science communication education for scientists and scientists-in-training does not encourage movement towards the more inclusive and interdisciplinary models, but instead relies on more traditional linear models. To address this hypothesis, we analyzed n=82 published science communication training programs. We coded the trainings as promoting a deficit, dialogue, or inclusive model of science communication. We found 40.24% followed deficit, 52.44% followed dialogue, and 7.32% followed inclusive. Training targeted towards undergraduate STEM students was mostly deficit model, while training targeted towards graduate students and scientists was mostly dialogue model. These findings present an opportunity: training for scientists on communication could incorporate more focus on interdisciplinarity, inclusivity, and intersectionality. Additionally, undergraduate students can and should begin their training in science communication with an understanding of inclusivity rather than deficits, which will empower the next generation of scientists to capitalize on their own diverse cultural funds of knowledge as well as promote inclusive science communication practices in their future scientific endeavors.

<https://symposium.foragerone.com/csu-curc2023/presentations/55773>

174 Longitudinal SARS-CoV-2 identification in human stool and relationships with systemic immune activation markers

Nicole Natter

Taru Dutt, Bridget A. Baxter, Madison Tipton, Emily N. Gallichotte, Emily Fitzmeyer, Gregory D. Ebel, August Luc, Jim Huang, Carol Wilusz, Stephanie M LaVergne, Julie Dunn, and Elizabeth P. Ryan

Type: Research Poster

According to the World Health Organization severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) has infected over 760 million since its emergence in December of 2019. SARS-CoV-2 Diagnostic tests typically involve nasopharyngeal (NP) and saliva analysis alongside wastewater testing for community spread. A 2022 meta-analysis revealed mechanisms of persistent fecal positivity is

not well understood. This observational cohort study of adults with confirmed SARS-CoV-2 infection analyzed stool samples by real-time PCR or ddPCR over the course of six months to one year (NCT04603677). The stool SARS-CoV-2 detection rate significantly decreased during convalescent stages and following vaccination. For the 158 participants with COVID-19 enrolled, 126 adults provided one stool sample. We analyzed 82 females and 44 males, and 51.6% tested positive in stool between 1-594 days post NP positive pcr, and 10.3% had persistent positive stool detection between 4-458 days. We hypothesized that persistent virus detection in stool is associated with low-grade inflammation and post-acute sequelae (PASC) and therefore measured T cell subsets for activation markers by flow cytometry, including intracellular Ki67+ and PD1+ expression. Multi-plex ELISA was used for plasma IL-6, d-dimer, and IL-8 levels. Results support differences between immune markers for adults with and without persistent stool virus. There were 6 adults with persistent stool virus that reported PASC. We conclude that intestinal colonization of virus merits further investigations with persistent immune activation. Future studies are needed to evaluate differences between variants for gastrointestinal involvement during and after infection and symptoms resolve.

<https://symposium.foragerone.com/csu-curc2023/presentations/54892>

25 Glial-mediated neuroinflammatory response to Simvastatin in a murine, *in vitro* model

Elizabeth Ninke

Shelby Fainelli, Corinne Wilson, Olivia Arnold, Mark Zabel, Julie Moreno, Katriana Popichak

Type: Research Poster

Heart disease is the leading cause of mortality in the United States, accounting for around a third of all deaths. While statins are a family of drugs widely prescribed to lower the risk of cardiovascular-related diseases by decreasing cholesterol synthesis, the side effects of statins on the body's most cholesterol rich organ, the brain, remain

largely unknown. Cholesterol facilitates fundamental neuronal functions such as regulation of signal transduction, ion channel permeability, and overall homeostasis of the central nervous system as it is a major constituent of the myelin sheath and membrane lipid rafts found in neurons and glial cells, including astrocytes and microglia. Astrocytes provide neurotrophic support and microglia are the immune cells of the brain, both necessary for optimal neuronal health and function. Thus, we *postulate that if cholesterol synthesis is essential for healthy neuronal function, then chronic inhibition of cholesterol synthesis from statin use results in a glial-mediated neuroinflammatory response associated with neurodegenerative diseases such as Parkinson's disease or Alzheimer's disease.* To test our hypothesis, we utilized a commonly prescribed statin, simvastatin; due to its lipophilic properties and widespread use. Glial and neuronal health analysis occurred in a primary murine, *in vitro* model to exhibit how glial viability is not affected from direct simvastatin exposure. Measurement of inflammatory cytokines and neuronal exposure to glial-conditioned media, however, will inform whether glial-neuronal signaling is altered by the popular cholesterol therapeutic, shedding light on the role that statins may play in the development of neurodegenerative disease later in life.

<https://symposium.foragerone.com/csu-curc2023/presentations/54901>

23 Simvastatin-Mediated Neuroinflammation Induces Neuronal Cell-Death

Ana Owens

Elizabeth Ninke, Shleby Fanielle, Corinne Wilson, Olivia Arnold, Mark Zabel, Julie Moreno, Katriana Popichak

Type: Research Poster

High cholesterol is a major health concern mostly affecting people aged 40-60 yrs.; as a result, LDL cholesterol--bad cholesterol--builds up in the arteries, and if left untreated, can lead to heart attack, stroke, or even death. Statins, effective

medications used to combat plaque build-up and LDL cholesterol circulation in the body, are shown to impair cognitive function, and although reversible, leads to concern regarding older individual's brain health. Many neurodegenerative diseases are associated with old age and accompanied by glial cell inflammatory response, which leads to neuronal cell death. Further, cholesterol synthesis, regulated by glial cells (astrocytes) in the brain is essential for myelin sheath surrounding neurons; necessary for neurons to relay signals. Thus, we *hypothesize that chronic statin use leads to neuronal cell death largely regulated by neuroinflammatory response.* Here, we show that glia conditioned media (from glial cells treated with simvastatin) decreases neuronal cell viability in an *in vitro* mouse model utilizing an immortalized neuronal cell line, Neuro-2a, and primary neurons, suggesting that statin use promotes neuronal cell death due to altered glial-neuronal communication. Future experimentation for this project includes the measurement of neuronal death markers, gene expression, and neuronal response to liver conditioned media from liver metabolic studies. Taken together, these data demonstrate the importance of interrogating statin effects on neuronal health, possibly linking statin exposure to the development of neurodegenerative disease later in life.

<https://symposium.foragerone.com/csu-curc2023/presentations/54968>

21 Establishing molecular mechanisms of glial-mediated response in chronic pain and associated disease

Emily Perkins

Elizabeth A. Ninke, Ana T. Owens, Mark D. Zabel, Julie A. Moreno, Katriana A. Popichak

Type: Research Poster

More than 1 in 5 adults in America experience chronic pain (CP), often concomitant with other health conditions ranging from cancer to fibromyalgia, to rheumatoid arthritis. Although understanding of pathological pain is improving, many findings revolve around neuronal

mechanisms. Recently, glia cells (non-neuronal brain cells) have emerged as key players within pathological and CP mechanisms demanding further examination. Gliosis or glial activation, characterized by neuroinflammation and activation of the transcription factor, NF- κ B, is shown to accompany chronic pain in many in vivo models, requiring further interrogation into the key cellular mechanisms associated with CP. Thus, we hypothesize *that an in vitro model of CP elicits neuroinflammatory response due to NF- κ B-dependent signaling in glial cells, specifically microglia, that promotes neuronal injury in a model of chronic pain.* To test this hypothesis, we propose to measure inflammatory expression in primary glia isolated from 2 unique transgenic mice, microglial-specific- NF- κ B knockout (KO) and NF κ B-luciferase expressing transgenic mice that have been treated with Complete Freud's Adjuvant (CFA) or Bone Derived Neurotrophic Factor (BDNF). Here, we measured glial cell viability and proinflammatory gene expression in response to CFA exposure at varying concentrations, demonstrating that NF- κ B KO is protective. Additionally, we will expose primary neurons to glia conditioned media from glial experiments and measure neuronal viability to determine the role that NF- κ B mediates glial-derived neuroinflammation. Taken together, these data reveal the importance of glial response and cellular mechanisms in the elucidation of potential therapeutic targets to inhibit chronic pain associated with a multitude of debilitating disorders.

<https://symposium.foragerone.com/csu-curc2023/presentations/54661>

165 Directionality analysis of transcallosal communication utilizing the ipsilateral silent period in people with multiple sclerosis

Sydney Petersen

Dr. Brett Fling, Jordan S. Acosta, Andrew C. Hagen

Type: Research Poster

Multiple sclerosis is a neurodegenerative disease characterized by damage to the central nervous

system (CNS). The CNS includes structures such as the corpus callosum: the largest white matter tract connecting the cerebral hemispheres. In persons with multiple sclerosis (PwMS), degradation of the corpus callosum can result in asymmetric gait due to the lack of coordination of bilateral movement. The ipsilateral silent period (iSP) is a measure of interhemispheric inhibition. iSP metrics were utilized to relate differences in directionality from the two cerebral hemispheres, as most PwMS have hemispheres that are more and less affected by the disease. Twenty-nine participants completed the study and iSP metrics of duration, average depth, and maximum depth were analyzed for interhemispheric inhibition. Muscle activity of the first dorsal interosseus muscle was monitored while single pulse transcranial magnetic stimulation (TMS) was delivered to the

ipsilateral primary motor cortex. We hypothesized that reduced transcallosal inhibition may be an underlying neuropathological mechanism driving gait asymmetry in PwMS due to directionality differences between more and less affected hemispheres. While there were no significant differences in the directionality of iSP metrics from the less to more affected hemispheres, these findings suggest interhemispheric inhibition may be preserved in people with MS, and other factors may be driving gait asymmetry. More investigation regarding underlying neural mechanisms is necessary, and research investigating the neurophysiology and gait metrics are pivotal to individualize potential rehabilitation protocol for people with MS.

<https://symposium.foragerone.com/csu-curc2023/presentations/54770>

195 At the Intersection of Parasitology & Molecular Biology: A Diagnostic Approach

Price Pettit

Traci Kinkel, Megan Moran

Type: Research Poster

Parasitic helminths encompass three major groups: Trematoda, Cestoda, and Nematoda; this project will focus on nematodes, which are commonly known as roundworms. We hypothesize that nematodes possess a unique and distinct microbiome than that of their host. This project aims to analyze and differentiate various nematode microbiomes to understand the bacterial prevalence inside these parasites as compared to their hosts. From preliminary research in this lab, we have evidence that nematodes do have distinct microbiomes from their host, and this has been shown to be made up of predominantly *Pseudomonas* sp. We anticipate being able to compare and contrast the microbiomes from several other types of roundworms in this study. Through the research completed in this lab, we wish to determine the core bacteria that make up the microbiome of nematodes; ultimately helping to improve our understanding of these diverse helminths and how they survive in their host.

<https://symposium.foragerone.com/csu-curc2023/presentations/54860>

160 DEPTOR gene knockdown may partially prevent remodeling of placental oxidative metabolism associated with Intrauterine Growth Restriction

Emma Pinsinski

Dr. Adam Chicco, Dr. Fredrick Joseph Rosario, Luke Whitcomb

Type: Research Poster

Intrauterine growth restriction (IUGR), a condition in which fetal birth weight falls below the 10th percentile, affects roughly 10% of all human pregnancies. Causes of IUGR range from genetic predisposition to maternal health complications and placental insufficiency. Our lab recently demonstrated that brain and heart tissues of fetuses from IUGR mouse pregnancies have reduced mitochondrial respiratory capacity. Further, we showed that global knock-down of DEPTOR, an

endogenous inhibitor of mechanistic target of rapamycin (mTOR) in IUGR fetuses prevented these abnormalities. Due to its high mitochondrial density and essential role in regulating fetal nutrient supply, we hypothesized that such effects are similarly observed in the placental labyrinth zone (LZ) of mice during IUGR pregnancy. Consistent with this prediction, immunoblotting revealed selective deficiencies in mitochondrial electron transfer system protein abundance of IUGR LZ sections compared with samples from normal pregnancy controls. DEPTOR knock-down tended to prevent some, but not all, of these IUGR-related differences. These results suggest that IUGR induces remodeling of placental oxidative metabolism that could impact fetal development. Future experiments will investigate the role these changes may play in mediating metabolic abnormalities observed in fetal tissues from IUGR pregnancies, and the impacts of DEPTOR silencing on these parameters.

<https://symposium.foragerone.com/csu-curc2023/presentations/54797>

181 Creating a Research-to-Practice Tool for Making Cultural Adaptations to Family-Based Intervention Programs for Latine Immigrant Families

Alejandra Quesada-Stoner

Nathaniel Riggs, Aubrie Radford

Type: Research Poster

Several evidence-based family-strengthening programs (EBPs) that exist are geared toward preventing substance misuse; however, most of these programs are geared toward white, middle-class communities and are rarely designed in a culturally responsive way for Latine immigrant communities. Considering the vast health disparities and socioeconomic barriers among Latine immigrant communities, it is crucial to culturally adapt programs to better serve these communities. By conducting an extensive literature review, I found ways programs can implement various surface structural modifications to their programs by changing their language, marketing

strategies, and the channels they use to recruit their target demographic. Additionally, the literature pointed to several deep structural modifications that can be made with the consideration of extended families, addressing cultural differences between immigrant parents and youth, socioeconomic status, religion, and acknowledging discrimination, bias, and immigration status. Using Canva, I have created an electronic tool for prevention scientists to use when culturally adapting family-based intervention programs serving Latine communities. The tool is intended to be used as an overview for practitioners to rely on when taking the initial steps of culturally adapting their program to better serve the needs of Latine immigrants. This tool has the potential to increase the effectiveness of EBPs for Latine immigrant families by ensuring that they are culturally appropriate and sensitive to the unique needs and values of this population. With this tool, my hope is that Prevention Scientists will take the initial steps to bridge the gap in research to practice for immigrant Latine families.

<https://symposium.foragerone.com/csu-curc2023/presentations/54349>

1a Regulation of *Staphylococcus aureus* potassium transport by cyclic di-AMP

Logan Ridenbaugh

Dr. Casey Gries

Type: Oral Presentation

Staphylococcus aureus is a leading cause of healthcare and community associated infections often involving skin and soft tissue infection or biofilm formation associated with implanted medical devices. A key aspect of *S. aureus* pathogenesis is its ability to adapt to environmental changes both within and outside the host. Potassium (K⁺) transport is responsible for maintaining a state of homeostasis in a variety of bacteria, including *S. aureus*, which encodes one constitutive low-affinity transport system, Ktr, and one inducible high-affinity pump, Kdp. In this project, we specifically investigated the molecular

regulation of Ktr system. The Ktr system consists of two membrane ion channels, KtrB and KtrD, and a single gating protein, KtrC, that regulates both KtrB and KtrD. When the cell requires K⁺, KtrC will open the KtrB/KtrD channels. To slow or stop the influx of K⁺, previous studies have found that the second messenger cyclic di-adenosine monophosphate (c-di-AMP) will bind KtrC. For this project, we mutated specific KtrC amino acids, R169 and N175, previously shown to be required for c-di-AMP binding, to prevent c-di-AMP-mediated regulation. We hypothesize that cells harboring the KtrC mutations will have enhanced growth in low K⁺ conditions as c-di-AMP binding can no longer inhibit KtrC activity. Surprisingly, we found that the *S. aureus* KtrC_{R169A/N175A} had a growth defect in higher physiological K⁺ concentrations (2.5-10 mM), however, in lower K⁺ concentrations there was no apparent growth advantage, as anticipated. Ongoing investigations are aimed at determining the mechanism(s) by which c-di-AMP regulates Ktr-mediated K⁺ uptake.

<https://symposium.foragerone.com/csu-curc2023/presentations/54867>

1a The Role of Niemann-Pick Type C2 (NPC2) Genes During Ivermectin Blood Meal Response in Mosquito *Plasmodium* Vectors

Molly Ring

Dr. Brian Foy, Dr. Palo Lado

Type: Oral Presentation

The endectocide ivermectin (IVM) is being used as a novel vector-borne disease control strategy given its ability to kill mosquitoes and interfere with egg production in surviving mosquitoes. We are studying the mass drug administration of IVM to humans in West Africa to disrupt the spread of malaria. This strategy depends on drug pharmacokinetics in the treated host, and so mosquitoes invariably will ingest sublethal concentrations depending on when they bite a host relative to the last time they were treated. When mosquitoes ingest a blood meal containing sublethal IVM concentrations, more genes are upregulated than downregulated, and

certain classes of upregulated genes predominate. We have found that members of a specific gene family (Niemann Pick Type C2 family; NPC2) are the most upregulated following ingestion of an IVM-containing blood meal. NPC2 traffics cholesterol in vertebrates but may also serve as carriers for other semiochemicals and hydrophobic compounds in arthropods. We used qPCR to measure the transcript levels of two IVM-responsive NPC2 genes AGAP002848 and AGAP002847, and the bloodmeal-responsive NPC2 gene AGAP002851. Transcript levels will be detected in *Anopheles gambiae* mosquitoes that have been given varying concentrations of IVM-dosed bloodmeals. In future experiments, we will clone these three transcripts to make dsRNA that can be used for RNAi knockdown assays via intrathoracic injections. We hypothesize that transcript knockdown of AGAP002848 and AGAP002847 will lead to increased mortality following digestion of an ivermectin spiked blood meal while knockdown of AGAP002851 transcript will lead to sterol transport disruption and egg production interference.

<https://symposium.foragerone.com/csu-curc2023/presentations/54519>

188 Prenatal exposure to valproic acid disrupts pups' communication, which is dependent on δ -catenin function

Scott Roh

Hadassah Mendez, Matheus Sathler, Michael J. Doolittle, Anastasiya Zaytseva, Hannah Brown, Morgan Sainsbury, Seonil Kim

Type: Research Poster

Valproic acid (VPA) is an effective and commonly prescribed drug for epilepsy and bipolar disorder. However, children born from mothers treated with VPA during pregnancy exhibit an increased incidence of autism. Although VPA may impair brain development at cellular level, the mechanism of VPA-induced autism has not completely addressed. The previous study has found that VPA treatment strongly reduces δ -catenin mRNA level. δ -catenin is important for the control of glutamatergic synapses

and strongly associated with autism. Interestingly, VPA inhibits dendritic morphogenesis in developing human neurons, which is also found in neurons lacking δ -catenin expression. We thus hypothesize that prenatally exposure to VPA significantly reduces δ -catenin levels in the brain, which disrupts glutamatergic synapses, resulting in autism. Here, we found that VPA inhibited the development of cultured mouse cortical neurons, which is reversed by elevating δ -catenin expression. Moreover, prenatally exposure to VPA significantly reduced δ -catenin levels and impaired animals' communication measured by recording ultrasonic vocalization in newly born mouse pups. Lastly, VPA exposure decreased the level of a key scaffolding protein and receptors found in glutamatergic synapses. Therefore, these results suggest that VPA-induced autism pathology can be mediated by loss of δ -catenin functions.

<https://symposium.foragerone.com/csu-curc2023/presentations/54820>

159 Characterization of Novel Antibody Pairs for Detection of Urine LAM in TB Suspects

Andrea Russell

Anita Amin, Delphi Chatterjee

Type: Research Poster

Lipoarabinomannan (LAM) is a lipoglycan present on the cell wall of *Mycobacterium tuberculosis*, the pathogen that causes tuberculosis (TB). LAM has previously been shown to be present in detectable quantities in urine and serum samples of TB patients, and has antigenic properties which make it a useful tool for the development of TB diagnostics. Present work was done to identify new antibody pairs that may improve upon current diagnostic capabilities and be useful in future development of diagnostics. The following human monoclonal antibodies were obtained from our collaborator Jacqueline M. Achkar at Albert Einstein College of Medicine: T2AM02, T1AM09, T2AM11, T1AM65, P1AM25, A1AM23, A2AM30, and L1AM04. These antibodies are specific to different mannose and arabinose motifs of the LAM molecule, and have

been characterized by their binding affinity to various segments of LAM by the Achkar Lab in a glycan array against synthetic glycans. We used these antibodies in varying combinations, along with human monoclonal antibody A194, in our capture ELISA system for detection of CDC1551 LAM spiked into non-endemic urine. Upon determination of the optimal antibody pairs, we moved forward to test the best antibody pair combination in both our lateral flow immunoassay, and capture ELISA system with blinded clinical urine samples.

<https://symposium.foragerone.com/csu-curc2023/presentations/54784>

2a Can the amplification assay, RT-QuIC, be used to detect Canine Cognitive Dysfunction? A translational model for Alzheimer's Disease

Samantha Scherner

Amy Nalls, Julie Moreno, Candace Mathiason, Nate Denkers, Joe Westrich

Type: Oral Presentation

The World Health Organization predicts that Alzheimer's disease (AD) and AD-related diseases (ADRD) will be the second leading cause of death in the United States within the next decade. Early diagnosis has proven to be difficult as most patients seek care only once the disease has progressed. Development of *in vitro* assays to detect amyloid presence in biological samples early in disease stage is paramount. Canine cognitive dysfunction syndrome (CCD) is a well-recognized neurodegenerative disease in older dogs and serves as an ideal naturally occurring surrogate for AD/ADRD in humans. Here we employ the *in vitro* amyloid conversion assay, real time-quaking induced conversion (RT-QuIC), to detect low concentrations of misfolded proteins associated with CCD. Misfolded proteins present in tissues and fluids are amplified by RT-QuIC when the misfolded protein coerces a recombinant substrate, in this case amyloid beta 1-42 (A β 1-42), into the misfolded shape. Real time readout is achieved by the intercalation of a fluorescent dye, Thioflavin T, between the growing amyloid fibrils. We aim to use

A β 1-42 to amplify amyloid fibrils present in canine brain, CSF and serum extracellular vesicles. The use of human A β 1-42 protein substrate requires the optimization of the RT-QuIC assay to ensure positivity and negativity when applied to biological samples. Our preliminary findings indicate that RT-QuIC amyloid seeding presence in canine brain is higher in older dogs and correlates with A β detection by immunohistochemistry. Future directions include assessment of additional canine brain samples and extension of the assay to canine extracellular vesicles harvested from CSF and serum. Findings from this project will feed translational studies to assess human AD patient samples. An *in vitro* biomarker for AD and CCD will help further the development of therapies for these and other neurodegenerative disorders.

<https://symposium.foragerone.com/csu-curc2023/presentations/54614>

210 Intrapulmonary modulation of CD1b glycoproteins in a guinea pig model

Emily Schmid

Dr. Mac Harris, Emily Schmid, David F. Ackart, Hadley E. Gary, Sarah K. Cooper, Steven Porcelli, Tan-Yun Cheng, Ildiko van Rhijn, Macallister C. Harris, D. Branch Moody, Brendan K. Podell

Type: Research Poster

Adaptive immunity is traditionally dependent on protein antigens; however, CD1 glycoproteins present lipid antigens to stimulate cell-mediated and humoral immunologic responses. *Mycobacterium tuberculosis* (Mtb) is a lipid-rich bacterium, with Mtb lipids playing a significant role in disease pathogenesis of tuberculosis. In the guinea pig, CD1b expression has been shown to respond to Mtb infections, exhibiting dynamic change over the course of an infection. To further determine the impacts of CD1b-restricted immunity on Mtb infection, directed modulation of CD1b expression *in vivo* is needed. In this study, modulation of CD1b expression in naïve animals was achieved by treatment with a pleotropic growth factor, FLT3-L, for up-regulation, and anti-sense

synthetic RNA morpholinos, for down-regulation, and compared to saline control animals. Three experimental groups were treated through intrapulmonary delivery of compounds as follows: 1) saline control, 2) FLT3-L, and 3) morpholino. RT-qPCR demonstrated that treatment with FLT3-L showed an increase in relative expression of specific CD1b orthologs compared to both baseline and morpholino treatments. In concordance, flow cytometry data exhibited increased CD1b+ cells in the FLT3-L-treated animals and significant decrease of CD1b+ cells in morpholino-treated animals. Microscopic cellular assessment, via chromogenic immunocytochemistry and immunohistochemistry, further established the ability of FLT3-L to upregulate and morpholino to down regulate CD1b expression *in vivo*. This experiment serves as a proof of concept for successful modulation of CD1 expression on antigen presenting cells *in vivo*. Cumulatively, this study lays the groundwork for future experiments investigating the role of CD1 glycoproteins in the pathogenesis of Mtb infection.

<https://symposium.foragerone.com/csu-curc2023/presentations/54949>

209 Osteosarcoma exosomes track to the lungs and elicit pro-metastatic changes in alveolar macrophages

Sophi Schofield

Laurel Haines, Eric Palmer, and Dr. Daniel Regan

Type: Research Poster

Osteosarcoma (OS) is the most common primary bone cancer, and it occurs with a higher incidence in children and adolescents. Metastasis most often occurs in the lungs and is associated with a 70% mortality rate despite adjuvant chemotherapy. OS lung metastasis is promoted by factors released from the primary tumor that “prime” the resident cells of the lung to support the growth of tumor cells upon their arrival. One of these factors are nano-sized extracellular vesicles known as exosomes. Exosomes can elicit changes in the supportive cells of a distant organ to promote metastasis to that specific site. We hypothesize that OS exosomes

traffic to resident cells of the lungs, including alveolar macrophages, and trigger immunological and structural changes to the lung microenvironment. We aim to investigate OS exosome biodistribution *in vivo* in a mouse model and determine their effects on resident alveolar macrophages.

<https://symposium.foragerone.com/csu-curc2023/presentations/54457>

180 Targeting neuroinflammatory pathways using Nanoligomers™ reduces glial inflammation and protects the brain from spongiosis and neuronal loss in prion disease.

Payton Shirley

Sydney J Risen, Sean Boland, Sadhana Sharma, Grace Weisman, Amelia D Hines, Arielle JD Hay, Vincenzo Gilberto, Stephanie McGrath, Anushree Chatterjee, Prashant Nagpal, Julie A Moreno

Type: Research Poster

A key factor in the development of neurodegenerative diseases including prion disease is neuroinflammation. Currently there are no effective nontoxic treatments to halt pathogenesis and progression, which includes accumulation of misfolded proteins and glial inflammation, followed by irreversible neuronal death. We hypothesize that by utilizing Nanoligomer™ in prion diseased mice we can downregulate the two key neuroinflammatory targets to be neuroprotective. To test this, we examined different brain regions of the prion infected mice to identify the impact the Nanoligomer™ will have on glial inflammation, spongiosis, and neuronal loss. The four brain regions; hippocampus, cortex, thalamus, and cerebellum were examined to assess the impact on glial inflammation and spongiosis. To assess the impact of neuronal loss the hippocampus brain region was examined. Prion-diseased mice treated with Nanoligomer™ showed decreased microglia and astrocyte inflammation in all four brain regions assessed. Spongiotic change, formation of vacuoles as the prion disease advances, was significantly reduced, and therefore protected against in all brain

regions assessed in mice treated with Nanoligomer™. Within the hippocampus neuronal numbers were notably protected when mice were treated with the Nanoligomer™. Therefore, Nanoligomer™ treatment is independent of the misfolding of the PrP^{Sc} and inhibits the inflammatory pathways, ultimately preventing neuronal death and slowing the progression of neurodegenerative diseases.

<https://symposium.foragerone.com/csu-curc2023/presentations/54937>

215 Physiological stress effects blood-brain barrier and microglial responses in the paraventricular nucleus of the hypothalamus

Alyson Stewart

Julietta Sheng, Stuart Tobet

Type: Research Poster

The brain is a highly vascularized organ. Unlike other organs, the vascular supply to the brain is restricted by a blood-brain barrier (BBB) that is an essential component for brain protection. The BBB consists of several different cell types that contribute to its physical ability to prevent toxins and some cells from entering specific brain compartments. The paraventricular nucleus of the hypothalamus is a center for autonomic functions such as stress responses and cardiovascular function. While it is known that poor diet has adverse effects on the heart and cognitive health, there is opportunity to analyze how poor diet effects cellular function in the brain. Given the effects that high fat diet has on the body, it was hypothesized that chronic high fat diet exposure will alter the blood brain barrier function. To better understand BBB structure, function, and failure, adult mice on a high fat diet were exposed to a physiological stressor and the capillaries of the PVN were examined for molecular leakage by using fluorescein isothiocyanate (FITC). To determine if brain leakage elicited an immune response, we used immunohistochemistry for visualizing ionized calcium-binding adaptor molecule 1 (IBA-1) in microglia. Preliminary data shows more leakage of FITC after physiological stress. Furthermore, there

were changes in microglia size and shape (activation) in the of the PVN in comparison to control mice. There was a stronger effect of HFD with restraint in females versus males, this could be a result the faster HPA axis response that occurs in females. The effects that physiological stress has on the BBB may provide insight into further understanding the functions of the cellular components of the BBB and how to manipulate the barrier.

<https://symposium.foragerone.com/csu-curc2023/presentations/54744>

177 Significant Differences in Right-Lateralized Frontoparietal Activation During Dual Task In Athletes Cleared to Return-to-Play after Concussion

Anne Claire Tangen

Jayla Bode, Brian Tracy, Jaclyn Stephens

Type: Research Poster

In a recent study, 43.5% of athletes sustained a second sports-related concussion (SRC) upon return-to-play, suggesting that they returned prematurely. In the first eight weeks after SRC, neurons in the brain are vulnerable to permanent damage from repeat injuries due to a decrease in cerebral blood flow (CBF), which is associated with neuronal activity. Here, we directly evaluated task-based neuronal activity in seven athletes with recent SRC who had been cleared to return-to-play and seven age- and sex-matched healthy athletes. We hypothesized that athletes with recent SRC would have significantly different brain activity during dual tasks as compared to healthy athletes. Task-based neuronal activity was assessed with functional near-infrared spectroscopy (fNIRS) while athletes completed dual tasks (e.g. walking and walking + a verbal cognitive task). Neuronal activity was quantified as task-induced change from baseline in oxygenated hemoglobin (HbO). A one-way mixed-method ANOVA was used to test for task differences in HbO. Compared to healthy athletes, athletes with recent SRC had significantly less activation in the right prefrontal cortex and significantly greater

activation in the right posterior parietal cortex in both the upper extremity and lower extremity subtasks. While deactivation of the frontal lobe is consistent with previous literature, hyperactivation of the parietal lobe could indicate a compensatory mechanism. This aberrant neuronal activity could suggest that athletes are physiologically not ready to return to their sport, despite having been cleared on the basis of symptoms.

<https://symposium.foragerone.com/csu-curc2023/presentations/54807>

198 An exploration of molecular diagnostics in parasitology across different species types

Sheridan Taylor

Dr Traci Kinkel, Dr. Ashley McGrew

Type: Research Poster

Species of intestinal parasitic worms exist across three diverse groups within two phyla. Nematodes, of the phylum Nematoda, are known as roundworms. The other two groups, Cestoda or tapeworms and Trematoda or flukes, represent distinct classes within the Platyhelminth phylum. Within each of these three groupings, distinct species share some similar morphologic features. Today, diagnostic processes in parasitology rely on microscopy and evaluation of the morphology of these helminths and their ova; this requires a specialized set of skills and knowledge that may not be accessible to those with backgrounds in adjacent fields. The field of molecular diagnostics provides an open door for the definitive identification of parasitic helminths, but standardized processes for handling these diverse samples have not been developed. Through trial and error, we sought to better define and optimize standard procedures for the diagnosis of parasitic species across the three groups using molecular biology and PCR. We implemented and compared various DNA extraction techniques for their ability to produce quality DNA products among the diverse samples. We then amplified gene segments across similar species types and compared them for their ability to produce amplification of DNA segments to be

sequenced for further evaluation. We also compared different primer sets for conserved loci within eukaryotic parasites, including mitochondrial DNA, to determine which primer sets may provide the broadest application for diagnostics among similar helminth types. Standardization of this procedure may allow more confidence in species identification of these helminth organisms as sequence data is generated in further studies.

<https://symposium.foragerone.com/csu-curc2023/presentations/54942>

205 Amyloid Beta and Phosphorylated Tau - The Potential Cause of Alzheimer's Disease And Neurodegenerative Diseases In Canine Dog

Nhu Trinh

Dr. Julie Moreno, Amelia Hines, Nhu Linh Trinh, Nikole Madrid

Type: Research Poster

Neurodegenerative diseases such as Alzheimer's, Parkinson's, and Huntington's diseases, develop with time in aging canines. There are many unknown factors involved in the pathogenesis of canine cognitive dysfunction, however, there is one essential idea that has been explored and believed to be the potential cause, which is the misfolding of proteins called amyloid beta and phosphorylated tau in canines' brain tissues, specifically in the hippocampus and cortex, where information is processed and memory is stored. The abnormally aggregated proteins initiated Alzheimer's disease and caused the induction of cellular stress, the action of immunity, and neurotoxicity. To visualize the presence of the misfolded proteins in tissues, we use the amyloid beta, A, and phosphorylation-tau AT270 and T217 antibodies in Immunohistochemistry (IHC) techniques creating an antigen-antibody complex to detect the presence of the existing misfolded proteins, antigens, in the tissues. The final procedure is to image and evaluate the A and phosphorylation-tau AT270 and T217 stainings across three ranges of ages of canine dogs. From the obtained images, we see that young canine dogs under 4 years old have none or do not have

many misfolded proteins. Middle-aged dogs, from 5 to 7 years old, have various numbers of misfolded proteins. Older dogs, from 8 years old and older, have much more misfolded proteins and some are bigger in size. To be able to rationally and scientifically determine the presence of A and phosphorylated tau is important in Alzheimer's disease diagnosis and research. Succeeding in this research topic can help with the success of developing treatments for neurodegenerative diseases.

<https://symposium.foragerone.com/csu-curc2023/presentations/54649>

29 Blood Borne Prions Detected in Free Ranging White-Tailed Deer

Devon Trujillo

Amy V. Nalls, Erin E. McNulty, Nathaniel D. Denkers, Samantha K. Scherner, Ethan P. Barton, Christopher A. Cleveland, Natalie Stilwell, James M. Crum, Daniel M. Grove, Jeremy S. Dennison, Jennifer R. Ballard, Edward A. Hoover, Mark G. Ruder and Candace K. Mathiason

Type: Research Poster

Chronic Wasting Disease (CWD) is a prion disease that infects captive and free ranging cervid species (deer, elk, moose and reindeer). Due to the highly transmissible and always fatal nature of CWD, antemortem methods to detect and monitor infectivity are becoming increasingly important. While prions have consistently been detected in blood throughout the course of disease, they are presumed to be present in small concentrations making detection difficult. Here, we used lipase iron oxide metal extraction and real-time quaking-induced conversion (IOME RT-QuIC) to assess the presence of amyloid seeding (prions) in buffy coat cells collected from free-ranging white-tailed deer in herds with high CWD prevalence from Arkansas, Tennessee, and West Virginia. These whole blood samples were collected by collaborators from the Southeastern Cooperative Wildlife Disease Study and processed at Colorado State University. Our findings provide clear evidence for the presence of

hematogenous prions in the wild native host, permitting antemortem CWD diagnosis. Additionally, IOME RT-QuIC of buffy coat cells from one deer was shown to detect prion seeding activity where it previously did not in other tissue types. These findings reveal CWD at different stages of disease, confirming assay reproducibility and highlighting the ability of our methods to detect CWD in healthy yet infected deer. This study is applicable to the further development of antemortem testing for prion and amyloid diseases affecting humans and animals.

<https://symposium.foragerone.com/csu-curc2023/presentations/54781>

166 The Relationship Between the Gut Microbiome, Urothelial Cells, and Recurrent Urinary Tract Infections

Caley Valdez

Dr. C. Preston Neff

Type: Research Poster

Urinary Tract Infections (UTIs) affect 150 million people/year globally. They can become recurrent (rUTI), resulting in a severely diminished quality of life. Abundance of inflammatory *Prevotella* bacteria in the stool has been associated with increased rUTI susceptibility, suggesting that the gut microbiome plays a role in genitourinary health. We explored this relationship using fecal bacterial community (FBC) isolates that were either *Prevotella*-rich (pro-inflammatory) or *Bacteroides*-rich (non-inflammatory) cultured with a novel urinary bladder cancer (UBC) urothelial cell line. We found that UBC cells cultured with *Prevotella*-rich FBCs showed decreased proliferation compared to cells cultured with *Bacteroides*-rich FBCs, which did not have an impact on cell growth. We also found that these UBCs do not secrete IL-15, an important cytokine for epithelial maintenance. However, they do differentially secrete more IL-6, a pro-inflammatory cytokine, when cultured with *Prevotella*-rich FBCs compared to *Bacteroides*-rich FBCs. Interestingly, the UBCs did not express toll like receptors 2 and 4 (TLR2 or TLR4), which are important for the

recognition of bacterial products, indicating another pathway for their activation by inflammatory bacteria found in FBCs. Lastly, these UBC urothelial cells do not form barrier, preventing studies to examine barrier integrity. Our data indicate that while there is a likely link between the gut microbiome and genitourinary health, this UBC urothelial cell line is not a suitable model to comprehensively conclude on the mechanisms behind this relationship. Thus, further investigation is required to understand the relationship between the gut microbiome and rUTIs.

<https://symposium.foragerone.com/csu-curc2023/presentations/54872>

156 Time-dependent identification of gait abnormalities in a murine MPTP model of Parkinson's disease

Christina Wallace

Dr. Ronald Tjalkens, Casey McDermott

Type: Research Poster

Parkinson's disease (PD) is the world's fastest growing neurodegenerative movement disorder that is characterized by loss of dopaminergic neurons in the substantia nigra pars compacta (SNpc). Neurodegeneration of the dopaminergic neuronal soma in the SNpc and projecting fibers leads to altered dopamine-dependent signaling of the indirect and direct basal ganglia pathways. Resulting clinical motor manifestations include difficulty initiating voluntary movement, resting tremor, bradykinesia, and short-shuffling gait. Although the exact cause of PD is unknown, aging, environmental exposures, genetic, and a combination thereof are thought to contribute to disease onset. Murine modeling of motor disturbances has previously been achieved by exposure to 1-methyl-4-phenyl-1, 2, 3, 6-tetrahydropyridine (MPTP), however, disturbances over the course of dosing has yet to be fully investigated. Given this, we hypothesized that mice exposed to MPTP would present with time-dependent gait abnormalities in the parameters of average speed, cadence (steps/second), and run

duration. To assess this, we exposed C57Bl/6 mice to 25mg/kg of MPTP every other day for 7 days. Baseline gait measurements were recorded on the Noldus CatWalkXT Trackway system prior to first dose and subsequent gait-analysis was performed 24 hours post-dose 2 and 4. Time-point analysis performed using 2-way ANOVA revealed decreases in total run duration and cadence at the post-dose 2 timepoint, and continued decreases in cadence at the post-dose 4 timepoint in MPTP exposed animals. These results suggest that gait abnormalities in mice exposed to MPTP occur as early as 5 days post-initial MPTP administration, supporting fluctuations in neurotransmitter release and regulation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54877>

211 Effects of Pesticide Exposure on Seed-Based Connectivity of the Hypothalamus

Samantha Weed

Michael Thomas

Type: Research Poster

The hypothalamus functions to control the body's homeostasis through regulating the endocrine system, emotions, appetite, circadian rhythms, and the autonomic nervous system. When the hypothalamus is not regulated properly, it can cause many issues such as low weight, no stress response, or late puberty onset. In animal models, pesticides interfere with functions of the hypothalamus. Pesticide exposure can cause adverse side effects for not only the body but also the brain. Pesticides have been known to interfere with neurotransmitters such as glutamate, GABA, dopamine, and acetylcholine. In general, pesticides cause neuroinflammation, cognitive deficits, and endocrine dysfunction. In this study we aimed to determine if pesticide exposure in agriculture workers correlates with differences in seed-based connectivity which is the way the hypothalamus interacts with other brain regions. We hypothesize that there will be abnormalities with hypothalamic seed-based connectivity specifically with the amygdala, pituitary gland, and adrenal glands

because these structures normally function as a network. We analyzed connectivity data from 35 participants, 12 of whom work in agriculture. Of all the participants 40% are male, 100% are White, 2.86% are Hispanic or Latino and the average age was 50.89. The results showed a correlation between pesticide exposure and abnormal seed-based connectivity in the hypothalamus. In the future, we hope to find a potential intervention to mitigate effects pesticide exposure has on the hypothalamus.

<https://symposium.foragerone.com/csu-curc2023/presentations/54934>

154 Dunkin-Hartley Guinea Pigs as an In-vivo Rodent Model of Naturally Occurring Alzheimer's Disease

Kristin Weninger

Amanda S. Latham, Kristen Glennie, Isla K. Anderson, Maureen Walsh, Karyn L. Hamilton, and Julie A. Moreno

Type: Research Poster

Approximately 50 million people worldwide are living with Alzheimer's Disease (AD) or dementia, and the research regarding these diseases has been rapidly evolving. Current research utilizes genetically engineered mice or human-derived stem cells to study neurodegenerative disease and the process of aging. However, these methods do not replicate natural forms of aging and they do not translate to clinical settings. Our preliminary data shows that the outbred, Dunkin Hartley guinea pig demonstrates early onset neurological changes that are characteristic of AD, including the accumulation of misfolded proteins, while other strains show delayed neuropathology. Therefore, we hypothesized that the Dunkin Hartley strain of guinea pig is a time-efficient model of naturally occurring AD and brain aging. To test this hypothesis, a study comprised of young, 5 months old, and aged, 15 months old, Dunkin Hartley guinea pigs was performed. Young and aged pigmented guinea pigs were also used as controls because they demonstrate delayed progression of age-associated

neuropathology. To determine if cognitive deficits and behavioral changes are found in this animal model, testing including y-maze, the novel object recognition test, and the open field test were completed. These tests allow us to analyze the overall exploration of both spatial and non-spatial long-term memory loss in these animals. In addition to behavior testing, we correlate cognition changes to biomarkers of neurodegeneration and glial inflammation. Through this data, we establish that the Dunkin Hartley guinea pig is an appropriate rodent model to study AD and dementia.

<https://symposium.foragerone.com/csu-curc2023/presentations/55025>

190 Ketamine's rapid antidepressant effects are mediated by Ca²⁺-permeable AMPA receptors in the hippocampus

McKennon Wiles, Evelina Bouckova

Anastasiya Zaytseva, Madison H. Wustrau, Isabella G. Schmidt, Hadassah Mendez-Vazquez, Latika Khatri, Seonil Kim

Type: Research Poster

Ketamine is shown to enhance excitatory synaptic drive in the hippocampus, which is presumed to underlie its rapid antidepressant effects. Moreover, ketamine's therapeutic actions are likely mediated by enhancing neuronal Ca²⁺ signaling. However, ketamine is a noncompetitive NMDA receptor (NMDAR) antagonist that inhibits excitatory synaptic transmission and postsynaptic Ca²⁺ signaling. Thus, it is a puzzling question how ketamine enhances glutamatergic and Ca²⁺ activity in neurons to induce rapid antidepressant effects while blocking NMDARs in the hippocampus. Here, we find that ketamine treatment for one hour in cultured mouse hippocampal neurons significantly reduces calcineurin activity to elevate AMPA receptor (AMPA) subunit GluA1 phosphorylation. This phosphorylation ultimately induces the expression of Ca²⁺-Permeable, GluA2-lacking, and GluA1-containing AMPARs (CP-AMPA). Such ketamine-induced expression of CP-AMPA enhances glutamatergic activity and synaptic plasticity in

cultured hippocampal neurons. When a sub-anesthetic dose of ketamine is given to mice, it increases synaptic GluA1 levels, but not GluA2, and GluA1 phosphorylation in the hippocampus within one hour after treatment. These changes are likely mediated by ketamine-induced reduction of calcineurin activity in the hippocampus. Using the open field and tail suspension tests, we demonstrate that a low dose of ketamine rapidly reduces anxiety-like and depression-like behaviors in both male and female mice. However, when *in vivo* treatment of a CP-AMPA antagonist abolishes the ketamine's effects on animals' behavior. We thus discover that ketamine at the low dose promotes the expression of CP-AMPA receptors via reduction of calcineurin activity in the hippocampus, which in turn enhances synaptic strength to induce rapid antidepressant actions.

<https://symposium.foragerone.com/csu-curc2023/presentations/54291>

206 The Influence of Youth in Bottlenose Dolphins

Cassidy Worgan

Type: Research Poster

In both humans and animals, little is understood regarding the effects of the younger counterpart. The influence of youth is underexplored in complex social creatures, humans and dolphins alike. How adult dolphins are influenced by their younger counterparts, like humans, is unknown. Using observational data collection techniques, a respiration rate baseline for two adult male dolphins will be taken while residing in an open sea enclosure. After introducing a juvenile male dolphin, the respiration rate of the adult dolphins will be recorded using the same collection techniques. The respiration rates will be analyzed comparatively to evaluate changes. The goal is to discover and evaluate the influence of the juvenile dolphin's addition affects adult dolphins. How the activity level and respiratory rate of adult male dolphins are affected by the introduction of young dolphins will also be explored. Using previous knowledge, the

anticipated results will show an increase in respiration rate in correspondence to an increase in activity level, caused by the introduction of the juvenile dolphin. Due to the nature of the housing of these dolphins, assumptions can be made regarding aspects of housing captive bottlenose dolphins of different ages together through the use of this data. This, in combination to further research on wild populations, will lead to the betterment of captive animal care. Additionally, this research will further the understanding of the mechanisms of bottlenose dolphins for allocating resources such as metabolic energy and oxygen.

<https://symposium.foragerone.com/csu-curc2023/presentations/54952>

186 The Dual-Hit Environmental Toxin Model of Parkinson's Disease Induces Mitochondrial Damage in Glial Cells

Nicole Yates

Savannah Rocha, Luke Whitcomb, Adam Chicco, Ronald Tjalkens

Type: Research Poster

Many toxic environmental exposures have been linked to Parkinsonian-like deficits due to the inherent capacity to cause direct and indirect damage to supportive glial cells and dopaminergic neurons. Rotenone is a naturally occurring pesticide and piscicide that acts as a mitochondrial complex I uncoupler, inducing reactive oxygen species (ROS) production and reduction of net ATP. Similarly, manganese exposure and accumulation within mitochondria is known to increase calcium retention, affect complex II, and induce ROS. Mitochondrial dysfunction within glial cell types occurs in genetic and idiopathic PD, where the exact damage exerted on the mitochondrial respiratory complexes and resulting ROS production remains unknown. To address this question, primary murine glial cultures were exposed to subacute concentrations of Mn (10 μ M) and rotenone (100nM) and respiratory capacity and extramitochondrial hydrogen peroxide generation were investigated using the Oroboros O2K respirometer/fluorometer.

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The resulting data showed decreases in total respiratory capacity and increases in total extramitochondrial ROS production of glial cells that were exposed dually to manganese and rotenone compared to individually exposed or control groups. This mitochondrial damage was rescued by the addition of cyclosporin A, indicating that mitochondrial dysfunction and death in the dual-exposure model proceeds via a calcium mediated pathway. This data shows that calcium accumulation is a driving factor in the damage of mitochondria, and for the first time, we demonstrate that the compounding effects of two subacute environmental toxin exposures, that do not induce pathology individually, is capable of causing mitochondrial dysfunction and death in glial cells.

<https://symposium.foragerone.com/csu-curc2023/presentations/54815>

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234 A Seasonal Comparison of Nocturnal Migratory Bird Passage over the Contiguous United States

Annika Abbott

Dr. Kyle Horton, Dr. Liba Pejchar

Type: Research Poster

Billions of birds pass through the United States each year while undergoing migratory journeys. As a result of environmental, demographic, and geographic variation, the abundance of birds passing over the US differs between the spring and fall migratory periods. Here, I take a macroscale approach to examine this seasonal variance in migratory passage. I used weather surveillance radar (WSR) data to quantify seasonal differences in passage at each of the 143 WSR stations in the contiguous US. Cumulative passage was greatest in the eastern half of the United States, with Texas standing out as a hotspot of bird density. More birds passed over the US in the fall, with 79% of stations experiencing higher rates of passage in fall than in spring. Of the minority of stations with greater passage in the spring, 37% were located in the Pacific Flyway. The greatest differences in seasonal passage existed along the west coast, with higher densities of birds in spring, suggesting the presence of looped migration strategies. By providing new insights on how seasonal densities of migrating birds vary geographically, these results can inform times at which conservation could be prioritized in a given region (e.g., critical action periods for implementation of programs such as Lights Out or the mitigation of hazards like wind turbines), allowing for more targeted conservation efforts to support migratory bird populations.

<https://symposium.foragerone.com/csu-curc2023/presentations/54064>

218 Whose stories are being told? Reframing the Narratives behind Conservation in Higher Education

Tallan Barrow-Traylor

Erin Weingarten, Alex Lage

Type: Research Poster

While conservation has been responsible for the preservation of some of the world's most precious resources (such as through the creation of protected areas), it has also continued legacies of settler-colonialism and has attempted the cultural erasure of Indigenous ways of knowing, being, and doing. Since its inception, conservation has been responsible for the perpetuation of inequitable and oppressive practices. The research for this project seeks to reimagine and reframe conservation through a lens of social justice. Specifically, we sought to understand student reactions to course content when exposed to social justice topics in conservation. The data in this study was collected in the form of three incrementally assigned reflections over the semester. This data was taken through the process of collaborative coding and analyzed to identify patterns within the student reflections. We have developed codes and potential themes for the data. We found that students exhibit a strong, shocked, emotional response to hearing of the hidden realities of America's capitalistic, patriarchal, and colonial system. Resources that have been critical to this learning are videos, podcasts, and tiktoks in addition to reading or hearing personal experiences. Through the reflections, we see that students have already begun to disclose that their reality and position within conservation make more sense after learning about the hidden truths of conservation science.

<https://symposium.foragerone.com/csu-curc2023/presentations/54931>

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229 Advancements in purifying aggregate protein through inclusion body separation

River Blessing, Morgan Dunn

Greg McKittrick, Dr. James Henriksen, Dr. Rich Conant

Type: Research Poster

Recombinant protein expression is the process of inserting an encoded gene into a bacterial colony so that it produces a target protein. This process has unlocked new and more effective ways to obtain proteins for research, but it requires a significant amount of work. Once the protein is produced, researchers must remove all other cellular material from their samples to purify the protein solution. After recombinant expression, some proteins form inclusion bodies, amorphous aggregates that are insoluble in most solutions. In this study, we aim to determine the efficacy of a new step in the protein purification process; the separation of insoluble inclusion bodies from the remaining soluble materials. Since most cellular materials are soluble, the separation of inclusion bodies is an easy, simple method of reducing sample contamination before further purification. Gel electrophoresis results showed that samples contained much less confounding material after the isolation of inclusion bodies, indicating that the protocol could be a helpful addition to the purification process for aggregate proteins.

<https://symposium.foragerone.com/csu-curc2023/presentations/54883>

146 Manipulating Extremophile Metabolism to Determine Specificity of Protein Interactions and H₂ Production

David Crosby

Sere Williams, Dr. Tom Santangelo, Dani Riley

Type: Research Poster

The ability of organisms to survive at extremely high temperatures is scarcely understood and is of great scientific interest because thermostable enzymes are invaluable for research and industrial applications. The primary goal of our research is to

understand how the hyperthermophilic archaeon, *Thermococcus kodakarensis*, efficiently grows and utilizes energy. I am investigating the metabolism of this unique, genetically tractable microbe to understand how hyperthermophiles flourish in such harsh conditions and produce biological hydrogen efficiently. More specifically, I am trying to understand if proteinaceous electron carriers can transfer electrons between donors and acceptors specifically or if their activity is interchangeable. It's important to note that *T. kodakarensis* uses small molecule electron carriers such as NAD(P)H, however, this organism also has three different ferredoxins that have distinct roles in its metabolism. These three ferredoxins offer more efficient possibilities in metabolism due to their specific interactions with other proteins and membrane-bound complexes. Experimentally, deleting one of these ferredoxins will ultimately lead to the cell's death. However, if we manipulate the genome to tether the other two ferredoxins to these electron acceptors we can analyze if those changes can compensate for the deletion. By manipulating this extremophile's metabolism by tethering ferredoxins, we can better understand the unique metabolism *T. kodakarensis* possesses and see how specific the roles of these proteins are.

<https://symposium.foragerone.com/csu-curc2023/presentations/54958>

237 Effects of Declining Pacific Salmon Populations on Marine-Derived Nitrogen in Coniferous Riparian Forest Soils

Tara Flood

Type: Research Poster

Damming and other water-channel developments on the Lower Snake River block or delay the migration of anadromous fish. It also destroys the quality and quantity of spawning habitat for Pacific salmon (*Oncorhynchus spp.*), contributing to the 2.2-5% decline in the abundance of seven endangered salmon species across the Pacific Northwest each year. Prohibiting salmon from spawning and dying in their natal freshwater streams leads to a loss of

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MDN in soils, causing an overall decrease in net nitrification and therefore depleting nitrite (NO_2^-) and nitrate (NO_3^-) pools for terrestrial and aquatic plants. The wet and slightly acidic soils of the Pacific Northwest riparian region support plants which prefer Nitrogen (N) in the form of NH_4^+ and NO_3^- . Their preference for these forms of N results in an increase in biomass production and the uptake of other essential nutrients. Nearly 25% of the N taken up by the foliage of coniferous trees and other riparian plants is derived from the MDN that salmon make available for primary producers. Research in temperate rainforests in North America found that foliage health and tree basal area growth directly correlate with the presence of Pacific salmon. This project seeks to further analyze how limited MDN results in decreased deposits of NO_2^- and NO_3^- in coniferous riparian zones and hinders biomass production.

<https://symposium.foragerone.com/csu-curc2023/presentations/54914>

223 Population Structure of Mottled Sculpins in a Regulated Stream in Colorado

Christopher Georgalos

Dr. Yoichiro Kano, Nitsa Platis, Brien Rose, Dan Kowalski, Brett Johnson

Type: Research Poster

Otoliths are calcified structures found in the inner ear of fish, which are used as indicators of age, growth, and life history. Otoliths grow continuously throughout a fish's life, forming rings that can be counted to estimate the age of the fish. Aging otoliths is an essential tool in fisheries management and conservation biology, as it provides information about population size, mortality rates, recruitment, and to develop fisheries management plans. The population structure of Mottled Sculpin *Cottus bairdii* was studied in a regulated river, the Blue River in Colorado, to characterize effects of flow and temperature alterations related to main stem impoundments. Mottled Sculpin otoliths were removed, mounted in resin, and sectioned across the horizontal plane. They were subsequently read

under a microscope and compared to length frequency histograms to characterize population structure. Otolith age estimations were required due to length frequency histograms not having clear peaks that delineate age classes. Comparison of length frequency histograms in conjunction with otolith aging show 6 age classes. This study provides baseline data on fish age structure and growth in a high-elevation river affected by dams.

<https://symposium.foragerone.com/csu-curc2023/presentations/54953>

239 Aquatic Macroinvertebrate Communities In Urban Waters Of Fort Collins, Co

Anna Hall, Cailin Stevens

Dr. Stacy Lynn, Fernando Carvallo, Prof. Dan Preston

Type: Research Poster

The expansion of urban areas has become a significant threat to biodiversity, and aquatic macroinvertebrates are among the species that are affected by ongoing urbanization. These small organisms are distributed worldwide, and urban water bodies are not exempt from their presence. Understanding their distribution is crucial, as they are known to serve as indicators of ecosystem health. To shed light on this topic, we conducted a study during the fall of 2022, sampling 27 different urban water bodies in Fort Collins, CO. Our team collected data by subsampling and identifying the organisms to their respective species order. Our preliminary findings indicate a correlation between species biodiversity, resilience, and distribution, as well as habitat type and habitat health. Our study shows that ponds tend to have the highest level of biodiversity, while ditches and canals have lower levels. These results have significant implications for the urban ecosystem health of Fort Collins, as pollution and land use have increasingly impacted the area. However, further research into community structures is recommended to gain a comprehensive understanding of the environment. In conclusion, our study highlights the importance of monitoring and preserving the health of urban water bodies and the biodiversity they support.

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<https://symposium.foragerone.com/csu-curc2023/presentations/54779>

225 Using Radar to Investigate Changes in Mexican Free-tailed Bat Ecology in Southern Texas

Lauren Hatch, Ethan Grady

Yuting Deng

Type: Research Poster

In the Southern US, many insectivorous bat species, like the Mexican free-tailed bat (*Tadarida brasiliensis*), play key roles in agroecology, providing pest-control services to local farmers. However, the migratory and wintering behaviors of *T. brasiliensis* are understudied with a majority of knowledge coming from data collected from the Bracken Cave roost around San Antonio, Texas. To address this gap in knowledge, this study utilized weather surveillance radar data, collected from 2000-2020 in order to investigate changing emergence patterns of *T. brasiliensis* across various roosting locations in Southern Texas. Specifically, this study aimed to differentiate these emergence patterns between naturally occurring roosting locations and urban roosting locations. Urban roosts were found to emerge at later times than natural roosts. This research demonstrates the potential for new studies on the *T. brasiliensis* ecology and behavior on broad spatial scales, and how those patterns change over time.

<https://symposium.foragerone.com/csu-curc2023/presentations/54786>

219 Tropical forest root biomass and traits in response to a throughfall exclusion experiment across forests with different rainfall and soil fertility

Erinn Hayward, Hayden Warner, Leo Thomas, Daniel Dominguez-Vidal, Hilary Johnson

Amanda Longhi-Cordeiro and Dr. Daniela Cusack

Type: Research Poster

Tropical forests have some of the largest soil carbon (C) pools, which are related, at least in part, to large stocks of root biomass. Despite the importance of root biomass for soil C storage, effects of climatic drying on root dynamics are poorly understood in tropical forests. In addition to total root biomass, root morphology can be important for both transfer of C into soils, and for plant function. We hypothesized that climatic drying promotes proliferation of fine root biomass in tropical forests, and that these roots would be longer and thinner (i.e., greater specific root length [SRL]), with greater AMF colonization for water acquisition, compared with control conditions. We predicted that these roots would also turn over more rapidly, and thus contribute to soil C stocks with drying. Fine root biomass and productivity were significantly affected by throughfall exclusion, season, depth and site, AMF was affected by the throughfall exclusion, and other root traits mainly varied by site. Overall, there was greater fine root productivity when water was more available.

<https://symposium.foragerone.com/csu-curc2023/presentations/54887>

V1 The Sound of Silence: Noise Pollution in a Developing World

Alex Hey

George Wittemyer

Type: Visual Art

This student-made documentary sheds light on the issue of anthropogenic noise pollution and its impact on the natural world. By creatively displaying an often-unheard auditory issue, the short film showcases the unique partnership between Colorado State University and the National Park Service to collect and analyze acoustic data to better manage noise levels in our natural spaces.

To gather information, I conducted interviews with faculty members at Colorado State University and collaborators at the National Park Service. The experts discussed the effects of noise pollution on

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the environment and human health. They provided valuable insight into the effects of noise pollution on wildlife, such as behavioral changes, hearing loss, and how noise pollution can affect the reproduction and survival of some species, leading to long-term ecological imbalances.

Additionally, the project features Colorado State University undergraduate students who participate in analyzing acoustic data from national parks, which is then used to implement real-world changes in noise management. The documentary emphasizes the importance of preserving natural soundscapes for the health and well-being of visitors to national parks and how exposure to natural sounds has numerous benefits, such as reducing stress, improving cognitive function, and increasing overall happiness.

This film will serve as an advertisement on the lab's website to prospective students hoping to gain research experience in the Listening Lab, be displayed at the new CSU Spur's Impact Map interactive exhibit, and be posted on Colorado State University's social media accounts to hundreds of thousands of followers.

<https://symposium.foragerone.com/csu-curc2023/presentations/53970>

242 A Gender and Age Comparison of the Characterization of Problematic Plants in Tanzania

Hilary Johnson

Dr. Stacy Lynn, Connor McCarty

Type: Research Poster

This study focuses on gender and age differences for the characterization of problematic plant species in Northern Tanzania using local and non-western knowledge framework. The objectives of this study were to 1. Identify key differences among gender and age groups based on the characterization of problematic plant species and 2. Determine key species and characterize traits related the Maasai livelihoods and socio-cultural dynamics. Ecological

disturbances such as land use land cover changes, altered nitrogen and carbon cycles, and climate change can influence the increase problematic plant species and impact the livelihoods of these communities including pastoral livestock husbandry, cultivation, well-being, and ecosystem of this region. Problematic plants might include species that are hazardous to livestock or recognized for taking over cultivated fields. The characterization of these problematic plants and age and gender group dynamics are largely not understood. Cultural, social, and economic factors can influence the transmission of Traditional Ecological Knowledge (TEK), where there is variation in the ways in which people recognize and utilize plant resources. Individual ranking and scoring for the problematic plants were identified for the salience and severity indices. Our results found Alairahirah to be most problematic for the junior and elder male participants, while the junior female participants identified Sangari as most problematic plant, and elder female participants, Almererwaki. Future results could lead to more effective natural resource management practices by the classification of these problematic species and understanding of community socio-cultural dynamics, improving pastoral livelihoods, and enhancing diversity and inclusion in research.

<https://symposium.foragerone.com/csu-curc2023/presentations/54841>

1b Peekaboo, where are you? : Using camera traps and occupancy models to aid in identifying the probable habitat preferences of *Muntiacus vuquangensis*

Amber Kruis

Minh Nguyen

Type: Oral Presentation

On the border of Lao PDR, Vietnam, and Cambodia lays the Annamite Mountain range, a rugged tropical forest that harbors many diverse endangered species. The large-antlered muntjac (*Muntiacus vuquangensis*) is just one of the elusive species that calls the range home. The species was only recently

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discovered in 1994 but is already facing a high risk of extinction due to illegal hunting. Nevertheless, information on the species' ecology is still limited, hindering its conservation. By using available data from a camera trapping survey in Khoun Xe Nongma Provincial Protected Area, we investigated how habitat variables may affect use of an area by the large-antlered muntjac. We applied a single species, single occupancy model to estimate the probability of use of 50 camera trap sites between October 1st 2018 to January 3rd 2019. Five covariates; elevation, slope, aspect, curvature, and ruggedness were used to examine the probability of site use in the model. The most parsimonious model was where elevation and curvature altered occupancy and site use. This data can possibly help when determining future observation sites, management plans, and monitoring the effects of climate change or fragmentation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54933>

217 Educating Students to Address Racial and Social Injustice in Conservation Science

Alex Lage

Erin Weingarten, Tallan Barrow-Traylor

Type: Research Poster

While conservation is a word with positive connotations to some, conservation has led to the marginalization and attempted cultural erasure of many local and Indigenous communities around the world. For this project, a class was designed that taught higher education students about social and racial injustice in the field of conservation and how conservation scientists can more ethically perform conservation research and practice. Students conducted three reflections throughout the semester detailing their experience in this class through time. After the semester, researchers designed a code book highlighting the various codes and themes that demonstrated student response to the material over time. Frequencies of codes and themes were calculated. Results showed that students experienced a strong emotional response

to learning about the hidden realities behind conservation practice, received a stronger understanding of multiple perspectives, and discussed the essential nature of learning this material in community. Students also benefited from positive content, learning how to lean into a growth mindset and tools to best minimize harm in research. Overall, the study found that students value the class and are experiencing change over time after learning about social and racial injustices within conservation.

<https://symposium.foragerone.com/csu-curc2023/presentations/54851>

235 Proposed Study: The distribution of an exotic and native species of Gecko on Nellis Air Force Base, Nevada

Ashley Martinovich, Ashlee Ducharme

Nate Gwinn

Type: Research Poster

In the Southwestern US, exotic species are of significant concern to wildlife management. The exotic gecko *Cyrtopodion scabrum*, also known as the bowfoot gecko, was first detected in Nevada in 2015. Subsequently, *Cyrtopodion scabrum* has been found in other Southwestern states, yet *Cyrtopodion scabrum* and their effects on native geckos in the Southwest have not been studied. This research proposal studies the potential impacts of *Cyrtopodion scabrum* on the native western banded gecko, *Coleonyx variegatus*, on Nellis Air Force Base (NAFB). With predesignated transects, we will conduct population surveys and collect body metrics of these two species. Using spatial analyst tools, we will analyze the geographic distribution of each species on NAFB, and if the species numbers differ in urban and non-urban areas. We expect to see exotic geckos pushing out the native geckos on natural landscapes. This study could inform management decisions regarding *Cyrtopodion scabrum* regarding its effect on *Coleonyx variegatus*.

<https://symposium.foragerone.com/csu-curc2023/presentations/54455>

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236 Testing the Heat Stress Capacity of Plants Using an Arduino Based System

Rylee McMillan

Scott J. Bradfield, Madeline Erb-Suciu, Troy Ocheltree

Type: Research Poster

The purpose of this project is to test the heat stress capacity of certain plant species. We will primarily be testing on C3 and C4 grass species but hope to be able to apply the same methodology to other species later. To test the ability of these plants to resist heat damage, we use an in-house-made Arduino-based microclimate-controlled chamber. The system is composed of an insulated box, heaters, temperature sensors, a humidifier, an SD module, an OLED screen, an RTC clock Arduino Uno and Nano, Adafruit Feather M0 Adalogger, Scale, and two power supplies. The system has the capacity to self-modulate heat and humidity based on time and/or an inputted data set, giving us the ability to subject plants automatically increasing temperatures, manufactured datasets, or real-life past temperature data. Moreover, this system can detect and record changes in plant weight over time, enabling us to track plant water-loss rates over time. Finally, the system can compile collected data automatically into a .csv file, enabling easy analysis of experiment results. Though we only have preliminary data, the information we have collected is promising. We hope that using this system to expose plants to controlled temperatures and humidities will provide valuable data regarding heat stress tolerance in those plants, giving us a better understanding of various plant species' physiological limits in controlled and uncontrolled environments.

<https://symposium.foragerone.com/csu-curc2023/presentations/54812>

222 The Impact of Two Large Hurricanes on Nutrient Transport Within a Tropical Watershed

Isabel McPherson

Paulson, J.P., Racine, G., Tenorio, E., Fadum, J., Hall,

E.K

Type: Research Poster

Compared to temperate lakes, tropical lake ecosystems' distinct attributes (morphology, hydrology, and the growth of anthropogenic pressures) have contributed to their unique diversity and sensitivity to change. Degradation of water quality in tributaries can have a significant effect on the overall health of the lake into which they drain. However, there is a lack of understanding of how tributary nutrient transport is altered by various aspects of global change. One aspect of global change is ephemeral weather events, like hurricanes, that are increasing in frequency and intensity. Because of the novelty of these larger and more frequent storms, it is challenging to assess hurricanes' long-term and short-term impacts on lake ecosystems. Honduras has recently undergone two major hurricane occurrences: Hurricane Eta (Category 4), which occurred from November 3rd – 5th (2020), followed by Hurricane Iota twelve days later. We measured discharge and nutrient inputs (NH₄⁺, NO₃⁻ and TP) from four tributaries to Lake Yojoa, Honduras, for the year prior (March 2019-March 2020) and the year following (March 2021-March 2022) the two hurricanes. We use this study to examine how large seasonal precipitation events affected the chemical and physical properties of four of the six primary tributaries that flow into Lake Yojoa. This study helps address how hurricanes' increasing frequency and intensity impact societally critical inland waters of the tropics.

<https://symposium.foragerone.com/csu-curc2023/presentations/54559>

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123 Alternative Cookstove Intervention and Respiratory Health

Isabelle Munsell
Dr. Kayleigh Keller
Type: Research Poster

In many low and middle-income countries (LMIC), households use open burning of biomass fuel for cooking and heating their homes. The resulting household air pollution can increase people's risk for respiratory health outcomes. In an attempt to explore the impact of replacing open-burning stoves with more efficient cookstoves, a randomized intervention study was conducted in a rural community in Nepal over the course of three years. Using a step-wedge design for the installation of cookstoves, respiratory health measurements were taken both before and after the installation of the new cookstove. These measurements included FEV1 and FEV6, which measure the total lung volume capacity within one and six seconds respectively. After cleaning the data and conducting explanatory data analyses, we conducted a paired t-test to conclude that there is an effect of the treatment on respiratory health outcome with an estimated difference of 0.0034 Liters ((0.00019, 0.0067), p-val = 0.038). Overall, this data indicates that replacing previous inefficient cookstoves did have an impact on respiratory health outcomes for individuals.

<https://symposium.foragerone.com/csu-curc2023/presentations/54911>

240 Activity Patterns of 3 Nectarivorous Bat Species in Northern Mexico

Lahrs Quinlan
Emma Gomez, Tanya Dewey, and Kathryn Stoner
Type: Research Poster

Up to 99% of angiosperms in tropical areas rely on animals for pollination (Fleming et al., 2009). Nectarivorous bat species play an important role in pollination and facilitate genetic connectivity across the landscape by carrying gametes substantial distances between plants (Trejo-Salazar et al.,

2016). In Mexico, agave plants (in the genus *Agave*) are used by people for food, fiber, and alcohol. They contribute significantly to Mexico's economy and are pollinated almost exclusively by bats (Trejo-Salazar et al., 2016). Competition among pollinating bat species can lead to niche and resource partitioning. This refers to when competition forces species to adopt different patterns of resource use or ecological roles (Fleming et al., 2009). Bats may stagger their visits to plants throughout the night with certain species being more active at a certain time. This is a result of coevolution and reduces interspecific competition. For my project, I analyzed camera trap data from Coahuila, Mexico to identify the activity patterns of three nectarivorous bat species, *Leptonycteris nivalis*, *Choeronycteris Mexicana*, and *Antrozous pallidus*. I found that niche partitioning of activity times does exist between several of these species. This indicates that there is a dominant species which displaces the other species. By foraging at specific times, nectarivorous bats can reduce competition and feed more effectively. Filling in the knowledge gap surrounding these nectarivorous bat species and their ecology can help reduce their extinction risk by providing useful information to wildlife managers and by demonstrating their importance to the environment.

<https://symposium.foragerone.com/csu-curc2023/presentations/54577>

220 Comparison of the ability of eBird and Weather Radars to detect swallow and martin roosts

Tido Ramos
Maria Tiburcio Dias Belotti
Type: Research Poster

Swallows and martins (family: Hirundinidae) are highly specialized aerial insectivores which, like others of that guild, have been facing regional and continental population declines. After they finish breeding in North America, some migratory species of this family, particularly Tree Swallows (*Tachycineta albiventer*) and Purple Martins (*Progne*

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subis), aggregate overnight in communal roosts which can gather thousands to hundreds of thousands of individuals. These roosts are so dense that they are easily detected by networks of Weather Surveillance Radars which, together with citizen science, have recently risen as powerful tools for large-scale monitoring of avian populations. In this study, we aim to compare the ability of these two data sources to detect communal roosts of swallows and martins. To do this, we downloaded and processed all eBird checklists containing Hirundinidae species from 2013 to 2021 across the contiguous United States. Additionally, we employed a combination of machine learning and human supervision to detect and filter communal roosts from the Weather Surveillance Radar archive only on the 2,462 days where we had positive eBird checklists. Afterwards, we partitioned the areas sampled by the radar stations into 837 hexagons, and conducted a month-wise correlation study between the number of radar roosts and the number of effort-corrected eBird checklists within each hexagon. The results of this study can help us learn how to combine these two datasets to build a broader understanding of the communal roosting stage of swallows and martins. With this, we can better-inform conservation measures to revert their population declines.

<https://symposium.foragerone.com/csu-curc2023/presentations/54948>

231 Utilizing Remote Sensing to Assess the Effect of Snow on Bark Beetle Outbreaks

*Shannon Reilly
Ehsan Khedive
Type: Research Poster*

Spruce bark beetle outbreaks have been negatively impacting Engelmann spruce, so the distribution of Engelmann spruce and spruce bark beetle outbreaks in Colorado was evaluated. In addition, we were exploring how snow depth, snow cover, and physiography could be potentially impacting the severity of the outbreak. This is due to snow cover protecting the spruce bark beetles in the wintertime.

Higher elevations have a higher potential for an outbreak because of the increased frequency of Engelmann spruce and abundant snow cover. In this research MODIS data, radar data, and spruce bark beetle outbreak data from prior research were utilized in ArcGIS Pro and the extracted data were analyzed in R software. The expected results are that higher snow cover can have the potential to increase spruce bark beetle outbreaks by increasing the overwintering survival of the beetles. Although climate change is increasing the risk of spruce bark beetle outbreaks to occur, overwintering survival is an important aspect of the outbreak, so snow cover should be considered an indicator of potential outbreak severity.

<https://symposium.foragerone.com/csu-curc2023/presentations/54873>

227 Using ArcGIS to Identify Fine Particulate Air Quality Monitor Deserts in the Mountain West and Implications for Vulnerable Populations

*Madison "Dewie" Roth
Savannah D'Evelyn, Dr. Luke Montrose
Type: Research Poster*

Wildfire smoke activity is increasing in the western US and smoke exposures are impacting downwind communities. Wildfire smoke is a complex mixture of gasses and particles. However, ambient concentrations of fine particulate matter (PM2.5) are commonly used as a proxy measurement for the mixture because it is a dominant constituent in smoke and it has known deleterious impacts on the lower airways. The elderly are particularly vulnerable to such exposures. The purpose of this project was to highlight PM2.5 air quality monitor coverage across the Mountain West region in relation to vulnerable elderly populations. The Mountain West region is consistently impacted by smoke and Skilled Nursing Facilities (SNFs) house a high number of elderly residents. Our hypothesis for this project was that some SNFs in the Mountain West fall in "monitor deserts" which we designate as areas with limited access to accurate air quality data. Using ArcGIS software, we identified monitor

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coverage based on EPA guidelines and categorized SNFs into facilities receiving precise air quality readings and facilities located in monitor deserts. We found that the average distance from facilities to air quality monitors was 15.83mi when only considering regulatory monitors whereas this changed to 14.07mi when we included average distance from both regulatory and low cost monitors. Our findings indicate where high risk communities are that could benefit from more precise air quality data to better inform decisions about their interaction with unsafe ambient air including wildfire smoke events.

<https://symposium.foragerone.com/csu-curc2023/presentations/54830>

232 Secondary Metabolite Analysis to Understand Tree Response to Spruce Beetles

Alex Rusch

Ehsan Khedive

Type: Research Poster

Bark beetles (*Dendroctonus rufipennis*) have long been a significant source of disturbance in the Rocky Mountain region, but the frequency and intensity of outbreaks have increased in recent years. This trend can be attributed to the warmer temperatures and drier conditions associated with climate change, which have created more favorable conditions for bark beetle infestations. In response to these stressors, trees have needed to modify their defense mechanisms in order to better defend themselves against pests, yet unfavorable climate conditions have made it difficult for trees to adapt to these conditions. This is because when trees experience drought, they often allocate more resources to survival functions like maintaining water balance and less to secondary functions like resin production. As a result, the production of resin may decrease, leaving trees more susceptible to damage from pests and pathogens. Additionally, drought stress can alter the composition of volatile organic compounds (VOCs) released through resin, reducing the resin's ability to repel pests and pathogens. To

better understand how drought stress affects the production and composition of resin, we are exploring the differences in defense strategies by examining the varying components within resin compounds from a mesic (wet) site in Cameron Pass, Colorado and a xeric (dry) site in Alma, Colorado. This research aims to provide insights into how trees defend themselves under drought stress, as the global climate continues to warm, and insect herbivory increases.

<https://symposium.foragerone.com/csu-curc2023/presentations/54899>

126 Impacts of the Cameron Peak Megafire on Ground Squirrel Body Mass

Kadin Samlaska

Dr Lise Aubry, Dr Caitlin Wells

Type: Research Poster

The high elevation location of the Colorado State University Mountain Campus has facilitated the study of the Wyoming Ground Squirrel and the Golden Mantle Ground Squirrel, two fossorial species that can inhabit the alpine and hibernate over winter. Following the Cameron Peak Megafire in 2020, I wondered whether the fire impacts these species through reduced forage. I focused on a life history trait important to small mammal persistence, i.e. body mass. Because body mass is a good predictor of body condition and survival in ground squirrels, I predict a significant decrease in average body weight for males and females, across both species, following the mega-fire. Data was collected from 2018-2022 during the active, above-ground season when both species are most active from June through August. This data was organized by species and sex and analyzed using program R to create box plots and conduct appropriate statistical tests for body mass group comparisons (i.e. t-test and ANOVA). The statistical analyses detect changes in body condition and trends across years while controlling for variables such as sex. A significant difference between the body mass data collected in 2018-2020 compared to 2021-2022, would suggest the Camera Peak fire had an effect on ground

squirrel body mass, with potential impacts on body condition, survival, and local persistence. However, the results showed no change or increased body mass after the mega-fire. Further research could improve an understanding of their ability to adapt to natural disasters.

<https://symposium.foragerone.com/csu-curc2023/presentations/54881>

135 The Effect of Water Bowl Material on Downstream Biofilm Formation in Canines

Brodie Thomas

Dr. Traci Kinkel

Type: Research Poster

Periodontitis, or gum disease, affects over two-thirds of the canine population. This disease is caused by an overgrowth of bacteria on the surface of the teeth. Symptoms of gum disease include bleeding or inflamed gums, loose or missing teeth, weight loss, bloody saliva, and irritability. Thus, this disease can have a huge impact on quality of life in canines. The purpose of this research project was to evaluate the effect of the material of dog's water bowls on the formation of biofilms. Samples were opportunistically collected over the course of three days, in which a canine companion drank from a provided water bowl. To test our hypothesis, we utilised the following experimental design. First, three separate water bowl materials were used: plastic, ceramic and stainless steel. To evaluate biofilm formation in these containers, 10mL of tap water and 200uL of our inoculum was added. The CFU/mL of each bowl material was calculated over the course of seven days, using an OD reading. This led to results that corroborate stainless steel displays reduced bacterial growth within the water dish, whilst ceramic and plastic materials display log level increases in bacterial growth, respectively. This work ultimately will help pet owners properly manage their water bowls to prevent bacteria accumulation in the water.

<https://symposium.foragerone.com/csu-curc2023/presentations/53860>

216 A Five Factor Approach to Exploring Cellular Personality

Brandon Weigand

Erika Szymanski

Type: Research Poster

Personality refers to the cognitive patterns displayed by individual organisms, defined by one's thoughts, feelings, and behaviors and morphed by genes and experiences. Much has been learned about the importance of human personality variation and how it shapes and affects individuals across time and space. However, researchers assessing animal personality have slowly uncovered the possibility that humans are not alone in the acquisition, development, and radiation of unique personality traits. Some researchers have attempted to universalize the "language" of non-human species research by turning to personality tests commonly applied to humans. Samuel Gosling is perhaps the best known pioneer of the strategy, formulating a modified species-specific Five-Factor Model test (FFM) which has been used to analyze major personality dimensions in a variety of non-human taxa, suggesting that personality is an extensive, functional, and evolutionary phenomena. Despite the implicit ubiquity of personality across species, research into the smallest form of life, individual cells, has remained non-existent due to the lack of similar metrics that could adequately capture personality at the deepest level. A modified FFM test for individual cells may find a candidate species in *Stentor coeruleus*, a large single-celled organism with a well-known tendency to habituate to external stimuli, a hallmark of personality development in humans. This research proposes to develop a modified, but theoretical, FFM test for *Stentor coeruleus*. This new conceptual assessment attempts to investigate personality at the cellular level, with results hinting at a broad genetic basis and establishing personality as pervasive force across psychological time.

<https://symposium.foragerone.com/csu-curc2023/presentations/54646>

128 Discovering Africa's Biodiversity Through Acoustic Data & Machine Learning

Eryn Wheeler

Dr. Nathaniel Blanchard, Videep Venkatesha, Sara Bombaci

Type: Research Poster

Africa is facing a rapid loss of biodiversity and cascading effects on its ecosystems. This creates a need to gather data to cover the gaps in understanding Africa's biodiversity patterns. Our goal to combat this problem is to train an open-source machine learning algorithm that detects and classifies amphibians, bats, mammals, and bird species based on their acoustic data. We partnered with Snapshot Safari to augment their established camera trap infrastructure with AudioMoths - low cost acoustic recording devices designed for field recordings. We collected 2TB of acoustic recordings collected from a multitude of sites across several months. We detail our collection and present some preliminary results. While we are working and waiting for results, we hope that our algorithm will provide a significant and wide-use tool to advance collaborative research and discoveries of Africa's biodiversity.

<https://symposium.foragerone.com/csu-curc2023/presentations/54669>