

2021

SHOWCASE

OF UNDERGRADUATE SCHOLARS

Celebrating Bold Dreamers and Strategic Thinkers



UNIVERSITY OF KENTUCKY
APRIL 27 - APRIL 29, 2021



SCHEDULE OF EVENTS

TUESDAY 4/27
9:30 AM

WELCOME MESSAGES & PRESENTATION OF THE EXCELLENT UNDERGRADUATE RESEARCH MENTOR OF THE YEAR AWARDS

Dr. Chad Risko, Director of Undergraduate Research

Oscar Istas, Research Ambassador, Announcement of the Excellent Undergraduate Research Mentor of the Year award winners

Katie Land and Frannie Salisbury, Research Ambassadors, Closing Remarks

TUESDAY 4/27
10 AM

STUDENT PRESENTATIONS BEGIN

APRIL 27 - APRIL 29



200+ LIVE PRESENTATIONS
27 ZOOM SESSIONS

[View Schedule of Events](#)

ACKNOWLEDGMENTS

Dr. Chad Risko | Jesi Jones-Bowman | Evie Russell | Judy Duncan | Anna Claire Littleton
Carol Street | Lynn Hiler | Student Review Committee

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Welcome to the 2021 Virtual Showcase of Undergraduate Scholars

The Office of Undergraduate Research welcomes you to the 15th Annual Showcase of Undergraduate Scholars (2021). This year's showcase will be a virtual platform with its theme "Celebrating Bold Dreamers and Strategic Thinkers". This UK tradition commemorates the remarkable accomplishments of our undergraduate researchers and encourages them along the path of intellectual achievement. It also allows us to celebrate and thank our faculty mentors and staff for their dedication who work tirelessly on behalf of our students.

As one of the nation's leading research institutions, UK offers a breadth of experiences and opportunities that actively engage students in their education. Through undergraduate research and creative activities, students work closely with leading scholars to gain in-depth knowledge about their fields of study and have opportunities to apply classroom learning to real life situations. The Showcase of Undergraduate Scholars highlights the invaluable educational impact that undergraduate research can have on promoting student success.

This year, we have over 200 student presentations representing 50 diverse disciplines and 16 colleges. The showcase includes 10-minute oral presentations presented live on zoom with audience Q&A sessions to follow, a virtual project gallery⁷ and digital abstract book. The 2021 Excellent Undergraduate Research Mentor Award winners will also be announced.

The Showcase demonstrates that true academic enrichment is best achieved by collaborations and partnerships among faculty, academic departments, colleges, units, and programs dedicated to academic excellence. We thank the many dedicated mentors who guided the research projects and creative activities presented this week. These mentors provide exceptional undergraduate research experiences, as well as support and promoting the undergraduate research initiatives. It can be said that good teachers and research supervisors help advance a student's knowledge and skill set, but mentors are credited with life-changing inspiration and support.

Please join us in welcoming and congratulating all the undergraduate student presenters at this year's Virtual Showcase of Undergraduate Scholars. This event is truly an occasion for us to be proud members of the University of Kentucky.

Sincerely,

The Office of Undergraduate Research

Dr. Chad Risko
Director

Evie Russell
Assistant Director

Jesi Bowman
Student Program and Marketing Specialist



MENTORS MAKE A DIFFERENCE. INSPIRING IDEAS.

2021 EXCELLENT UNDERGRADUATE RESEARCH MENTOR NOMINEES



Christine Brainson
Neuroscience



Lauren Cagle
Writing, Rhetoric, and Digital Studies



Jaspreet Chahal
Sociology



Christopher Crawford
Physics & Astronomy



Esther Dupont-Versteegden
Rehabilitation Sciences



Rachel Farr
Psychology



Hartley Feld
Nursing



Abigail Firey
History



Molly Fisher
STEM Education



Christopher Fry
Athletic Training and Clinical Nutrition



Matthew Gentry
Biochemistry



Katie Goldey
Health Sciences



Patrick Hannon
Obstetrics and Gynecology



David Hildebrand
Plant and Soil Sciences



Melinda Ickes
Kinesiology and Health Promotion



Pradeep Kachroo
Plant Pathology



Daniel Lee
Neuroscience



Elizabeth Lorch
Psychology



Rachel Hogg-Graham
Public Health



Julie Pendergast
Biology



Randa Remer
Health Sciences



Clare Rittschof
Entomology



Carlos Rodriguez-Lopez
Horticulture



F. Douglas Scutchfield
Public Health



Ashley Seifert
Biology



Himanshu Thapliyal
Electrical and Computer Engineering



Tara Tuttle
Honors



Ellen Usher
Counseling, and School Psychology



Nathan Vanderford
Toxicology & Cancer Biology



Eric Weber
Educational Policy Studies & Evaluation



Kevin Yeager
Earth and Environmental Science



Thomas Zentall
Psychology

Nominees who have previously won the award:



Luke Bradley (2018)
Neuroscience



Robin Cooper (2015)
Biology



Jonathan Golding (2016)
Psychology



Nicholas McLetchie (2008)
Biology

The Excellent Undergraduate Research Mentor Award recognizes UK faculty members who have demonstrated an outstanding commitment to mentoring undergraduate researchers, provided exceptional undergraduate research experiences, as well as supporting and promoting the undergraduate research initiatives on campus.



2020 5-Minute Fast Track Research Competition TOP 10 STUDENT FINALISTS

FINALS ROUND | TUESDAY, OCTOBER 20 | 5pm - 7pm

	First Name	Last Name	Research Area	Presentation Title	Mentor
1	Maya	Abul-Khoudoud	Molecular and Cellular Biochemistry	Personalized Medicine for a Fatal Epilepsy, Lafora's Disease	Matthew Gentry
2	Halle	Shannon	Chemical Engineering	Bio-inspired immobilization of casein-coated silver nanoparticles on cellulose acetate ultrafiltration membranes	Isabel Escobar
3	Amy	Keith	Qualitative Research on Cultural Competency and Humility	"Distinctive and Unique People": Healthcare Students' Discomfort in Defining Diversity	Randa Remer-Eskridge
4	Courtney	Martin	Toxicology and Cancer Biology	Content Analysis of Oral Histories of Cancer in Appalachia Kentucky	Nathan Vanderford
5	Oscar	Istas	Physiology	Effects of a Bacterial Endotoxin on Fruit Fly Larvae	Robin Cooper
6	Olivia	Huffman	Sports Psychology	"So You Think You Can Learn? Athletes' Views on Academic Ability"	Ellen Usher
7	Kayli	Bolton	Molecular and Cellular Biochemistry	Abnormal Accumulation of Glycogen and Glycosylation in Brain Tumors	Matthew Gentry
8	Miranda	Kunes	Equine Nutrition	Feed to Feces: Investigating In Vitro Starch Digestion of Horses	Laurie Lawrence
9	Emily	Keaton	Sociology and Appalachian Studies	The Archetypal 'Appalachian Strong-Woman' as Atypical: Examining Divisions between Rural and Urban Household Gender Roles	Edward Morris
10	Katie	Land	Reproductive Endocrinology/ Toxicology	Ovulation is Inhibited by Exposure to an Environmentally Relevant Phthalate Mixture via Decreased Prostaglandin Levels in Mouse Antral Follicles In Vitro	Patrick Hannon

2020 SUMMER RESEARCH AND CREATIVITY FELLOWS

Amina Addington - Mentor: Dr. Horace Bartilow
Income Inequality: A Marxist Theory of State Repression

Chelsea Bass - Mentor: Dr. Rachel Farr
How do Family Conversations About Sex Relate to Feelings of Support and Future Parenthood Among LGBTQ+ People?

Michael Bealer - Mentor: Dr. David Heidary
Screening Anticancer Metal Complexes for Their Mechanism of Action Through Bacterial Cytological Profiling

Sydney Blocker - Mentor: Dr. Steve Davis
Mapping the History of the Anti-Apartheid Movement from Cape Town, South Africa to London, England: A Study of Correspondence Between London's Elites and Grassroots Activists in Cape Town.

Eliot Bradshaw - Mentor: Dr. Jonathan Golding
The Influence of Alcohol and Rohypnol on Legal Decision-Making

Calisse Burand - Mentor: Dr. Rachael Farr
Lived Experiences of Youth with LGBTQ+ Parents: Perceptions of LGBTQ+ Parenting and Future Parenthood

Lauren Collett - Mentor: Dr. Nathan Vanderford
Qualitative Content Analysis of Youths' Personal Written Accounts of Cancer in Appalachian Kentucky

Patrick Edwards - Mentor: Dr. Tiffany Barnes
Descriptive Representation and Women's Empowerment in South America

Alyssa Feldner - Mentor: Dr. Elizabeth Lorch
Narrative Comprehension in Children At-Risk for ADHD

Anna Foose - Mentor: Clare Rittschof
Honeybee Allogrooming and Pesticides

Anna Garlock - Mentor: Dr. Shannon Sauer-Zavala
The Therapeutic Alliance in the Unified Protocol

Lauren Hudson - Mentor: Dr. Nathan Vanderford
Appalachian Kentucky Cancer Education Intervention

Michelle Imarah - Mentor: Dr. Lindsey Bryson
Predicting Landslides in Kentucky Based on the Analysis of Hydrological Parameters

Rachael Kral - Mentor: Dr. Hanna Poffenbarger
Determining the Effects Soil Properties on the Sensory Characteristics of Wheat

Lara Larson - Mentor: Dr. Fanny Chapelin
Determining the Effects Soil Properties on the Sensory Characteristics of Wheat

Grace Markowski - Mentor: Dr. Peggy Keller
Sleep Problems and Daytime Autonomic Nervous System Functioning in Children

2020 SUMMER RESEARCH AND CREATIVITY FELLOWS

Courtney Martin - Mentor: Dr. Nathan Vanderford

Qualitative Content Analysis of Oral Histories of Cancer in Appalachian Kentucky

Anna McCowan - Mentor: Dr. Ming-Yuan Chih

Needs Assessment of Chemotherapy-Related Toxicities in London, Kentucky

Shelby McCubbin - Mentor: Tara Tuttle

Working Title: A Descriptive Analysis of Impostor Syndrome in High-Achieving Undergraduate Students

Lydia Pack - Mentor: Dr. Elizabeth Lorch

Differential Effects of Two Interventions for Children At-Risk for ADHD

Andrew Reynolds - Mentor: Jason Dovel

Baroque Trumpet Ensemble Compact Disc Recording Project

Angela Sanchez – Mentor: Dr. Chris Sass

Parking Lot 2.0: Upgrading User Experience of the Ubiquitous Urban Parking Lot

Binit Singh - Mentor: Dr. Nelson Akafuah

An Approach to Solve Gas Turbine Problems by Integrating It with Concentrated Solar Cells

Alexis Taylor – Mentor: Dr. Jeffrey Osborn

Identifying Genetic Loci in the African Green Monkey that Associate with Hypertension

2020 SUSTAINABILITY SUMMER RESEARCH FELLOWS

*** Funded by the UK Student Sustainability Council*

Anna Foose - Mentor: Dr. Clare Rittschof

Honeybee Allogrooming and Pesticides

Bridget Bolt - Mentor: Dr. Carlos Rodriguez-Lopez

Soybean Methylation and the Effect on the Microbiome

Kaela Jackson – Mentor: Dr. Tammy Stephenson

Power of Produce Club





Mohammad Abou El-Ezz

The Effects of Levetiracetam on Glutamatergic Synaptic Transmission: Crayfish NMJs

Paula Ames & Jaden Hayes

Middle School Classroom Instruction on the Cause of Seasons: Developing Spatial Ability Differentially Through Modeling

Quinn Andrews

Federal Restrictions in Pharmacotherapeutics: Motivations for Medicinal Alcohol Prescriptions During Prohibition

Humza Anwar

Creating a Novel Healthcare Delivery Model to Address Social and Health Disparities in Lexington, Kentucky

Francisco Beltran

Investigating Colletotrichum's Antibacterial Potential

William Bodron

Electronic Logbook Automation for the n2EDM Experiment at Paul Scherrer Institute

Kayli Bolton

Abnormal Accumulation of Glycogen and Altered Glycosylation in Brain Tumors

Lindsay Borger & Maria Camarato

Professional Noticing of College Students' Mathematical Thinking

Michael Buoncristiani

Mass Spectrometry Imaging Reveals Distinct Differences in Glycogen Accumulation in Lung Tumors from Appalachian Patients

Callum Case

The Coal Court: Jurisprudence and the Transformation Eastern Kentucky

Briley Chambers

To Serve, Protect, and Reflect? Exploring Racial Disparity in the Louisville Police Department

Hannah Johnston

Human APOE Genetic Variants Contribute to Lung Cancer Disparities

Austin Coke

Lost History: Uncovering Lexington's Early Jewish Community

Benjamin Cortas

Electronic Logbook Automation for the n2EDM Experiment at Paul Scherrer Institute

Sydney Daniels

Virtual Authentic Learning Experiences in Molecular Biology Using Data Sonification



Anna Foose

Role of Grooming Behavior in Pesticide Resistance and Infection in Honey Bees (Apis mellifera)

Caleb Gooden

Investigating the Role of TAS3 in Root Nodulation in Trifolium Pretense

Austin Haley

Development of Coarse-Grained Bulk Water Model Using New Hybrid Coarse-Graining Approach

Usman Hamid

Effect of Adolescent Binge-Like Alcohol Exposure on Adult Alcohol Consumption in Sprague Dawley Rats

Claire Hilbrecht

"Save Our Red River": a Historical Analysis of the Methods Used by Environmentalists to Preserve the Red River Gorge in Kentucky

Jordan Hinton

Impact of Free, Locally Sourced Lunch Program on Food Insecurity and Stress Reduction Among College Students

Haley Jacobsen & Adam Peters

Empowering Middle Level Intervention Students to Love Mathematics

Hannah Johnston

Translation in Color, Form, and Tone

Mirindi Kabangu

Long-term Persistence of an Influenza-like virus in a laboratory Axolotl Population

Maddysan Kareken & Kate Black

The Measurement of Agent-based Systems Thinking

Emily Keaton

"Men of the Hills": Examining Past Philanthropic Organizing in Central Kentucky and Its Portrayal of Appalachia

Amy Keith

"Distinctive and Unique People": Healthcare Students' Discomfort in Defining Diversity

Katie Land

Ovulation Is Inhibited by Exposure to an Environmentally Relevant Phthalate Mixture via Disrupted Progesterone Production in Mouse Antral Follicles In Vitro.

Breona Link & India Smith

Barriers and Facilitators to Physical Activity Among African American Women Living in Public Housing

Paige Maffett

Company Interventions to Combat Intimate Partner Violence Adverse Affects on the Workplace



Courtney Martin

Investigating Cancer in Appalachia Through Content Analysis of Oral History Interviews

Olivia Morris-Bush

Crossways: The Intersection Between Racialized Railroads and Racial Equity in the Workplace

Janki Naidugari

Temperature Dependence on the Passive Effects of K^+ on Membrane Potential of Skeletal Muscle: Educational Module

William Russell

The Effects of Riluzole on Sensory and Motor Nerve Function

Frances Salisbury & Lindsay Beechem

The Effect of Sleep Fragmentation on Alzheimer's Disease

Blake Sampson & Keziah Jenkins

Analyzing Preservice Elementary Teachers' Scientific Explanations of the "Storm in a Glass" Phenomenon

William Sanders

Defining Metabolic Perturbations in Glycogen Storage Diseases

Sydney Schuerman

The Experience of Physical Inactivity During Inpatient Bone Marrow Transplantation

Claire Scott

*Effects of SUV39H1 and SUV420H1/H2 on Programmed Genome Rearrangement in *Petromyzon marinus**

Aaron Shrout

Lexington and Louisville: A Tale of Two Cities' Growth

Peyton Skaggs

Reverse Effects: The Connection Between Brain Stimulation and Impulsivity

Sarah Sprigg & Courtney Martin

Endosomal Localization Mechanism of Insulin-Degrading Enzyme

Madeline Williams

Loneliness During Mass Social Distancing: an Exploratory Qualitative Study of Loneliness in College Students During the COVID-19 Pandemic

Kat Wright

Correlates of Hopelessness About the Future Among Low-Income Parents with a Disruptive Child

Caitlyn Yost & Abigail Fowler

Envisioning an Equity-Based Conceptual Framework for STEM Literacy

Gabija Ziemyte

Analysis of Gamma Ray Detector Data for the NDTGamma Experiment

ANIMAL & FOOD SCIENCES

**** WHAT'S THE BEEF? IMPACT OF PERSONALITY ON FEEDING BEHAVIOR IN CALVES**

Authors: Sofia Bonilla, Emily Campbell, Cassie Dossett, Robin Howie, Tanner Keener, Amira McKee, Sophia Montes, Tori Simpson, Maxwell Zakeri

Faculty Mentor(s): Joao Costa, Melissa Cantor, Anika Yadav,

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23922>

Personality traits are associated with feeding behavior differences in dairy calves. The aim of this experiment was to determine if personality traits were associated with feeding behaviors (number of grain meals, feeding time and total grain consumption) in crossbred calves. This study was conducted using Holstein-Angus bull calves (n=7), fed 7 L/d milk replacer and free choice grain. Personality traits were categorized based on a novel object test, a startle test, and a novel person test (post-weaning). Feeding behavior was recorded for 15 consecutive hours after feeding on the final preweaning day. Calves were observed using one minute scan sampling (trail camera). Meals bouts were defined when 15 minutes elapsed without another feeding event (presence of the calf at the starter bucket). Novel object, startle tests and novel person test were analyzed with continuous sampling (GoPro). The novel object and startle test included initial latency to approach a remote-controlled car, and latency to re-approach the car after it was moved (low latency= “exploratory”) and attentiveness (high attentiveness= “cautious”). The novel person test included latency to initially approach the person and duration spent contacting the person (low latency= “social”), and attentiveness (high attentiveness= “fearful”). Calves were then ranked into personality traits as “social, fearful, exploratory, or cautious” and correlations were calculated. We observed a moderate correlation with duration spent contacting the person with feeding time ($r = 0.31$) and meals ($r = 0.40$), suggesting “social” calves may have higher grain related behaviors than fearful calves. Moreover, we observed negative correlations with latency to re-approach the car with grain intake (strong, $r = -0.83$), and meals (moderate, $r = -0.55$) and feeding time (moderate, $r = -0.33$), suggesting “exploratory” calves may consume more grain than cautious calves. This work suggests that social and exploratory personality traits are associated with more grain consumption than fearful and cautious calves.

BEHAVIORAL SCIENCE

OPIOID PRESCRIBING PRACTICES VS. GUIDELINES IN RURAL VS. URBAN AREAS OF KENTUCKY

Author(s): Molly Armstrong

Chellgren Fellow

Faculty Mentor(s): Sharon Walsh

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23951>

Background: An early factor leading to opioid overdose deaths in rural Kentucky was risky prescribing practices. Although prescription opioids are not the leading cause of opioid overdose deaths currently, risky prescribing practices are gateways to addiction. Kentucky All Schedule Prescription Electronic Reporting (KASPER) monitors prescribing practices. Legislation requires all practitioners to use KASPER.

Objective: The goal of this project is to analyze the difference in prescribing practices between rural and urban areas in Kentucky and response to policy.

Methods: This study compared prescribing practices between rural and urban communities (n=8) in Kentucky. These groupings were designated by the HEALing Communities Study (HCS); counties were anonymized. Rate of opioid prescriptions per 100 people was a primary outcome, and risky prescribing indicators such as percent of initial opioid prescriptions over a 3 days' supply and high dosage prescriptions (MME) were compared to legislative guidelines. These data were obtained from KASPER records for 2019 and excluded dentist prescriptions.

Results: The rate of opioid prescriptions per 100 people in rural Kentucky was 137.2 and 77.5 in urban areas. The proportion of patients receiving more than 90 MME for more than a 30 days' supply to patients receiving any opioid analgesic for more than 30 days was 2.1% in rural areas and 3.6% in urban areas. The percent of initial opioid prescriptions over a 3 days' supply was 59.5% in rural areas and 51.8% in urban areas. Additional indicators of risky prescribing will be presented.

Conclusion: There are meaningful differences in the rate of opioid prescriptions with much higher rates in rural compared to urban counties, but other initial indicators did not reveal geographic differences. However, in both areas there is a gap between legislative guidelines and implemented practices. Further analysis of factors playing into this gap will be presented.

BIOLOGY

SEX, HABITAT, AND RELATIVE HUMIDITY INFLUENCES GERMINATION OF ASEXUAL OFFSPRING IN A TROPICAL PLANT

Authors: Ayanna Adaniel

Faculty Mentor(s): Dr. Nicholas McLetchie

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23660>

Water is essential for all life but while most studies focus on liquid water, few studies focus on gaseous water. The amount of gaseous water is informative of the habitat and can provide insight on the favorableness of a habitat. In the liverwort *Marchantia inflexa*, water stress responses differ by the sex of the plant and vary across habitats differing in moisture levels. Germination responses are critical for successful colonization and establishment of populations, yet females have higher germination levels than males. In a high liquid water environment, relative humidity (RH) of the air was varied to test if germination can vary between the sexes in plants collected across habitats. Eighteen female and male *M. inflexa* plants from two locations (East Turure (high moisture) and North Oropuche (low moisture)) in Trinidad and Tobago were used in this study. Offspring were collected and allowed to germinate at two different humidities, 65% and 100% RH, while floating on liquid water. Relative humidity was controlled by using a salt solution for the low RH (65%) and pure water for the high RH (100%). Germination was measured after two days. Three trials were completed. Germination was higher in high RH compared to low RH, lower in males compared to females, and higher in plants from the drier, more exposed habitat (North Oropuche) compared to plants from the less exposed, moist habitat (East Turure). Despite floating on liquid, the lower RH reflects less optimum moisture conditions. Higher germination in plants from the less mesic relative to more mesic habitats suggest a selection for quicker germination responses when conditions are favorable. Higher germination in females relative to males might reflect an association with the higher growth rates of female.

BIOLOGY

****THE IMPACT OF CLIMATE CHANGE ON BUTTERFLY WING COLOR**

Authors: Faris Allahham, Rafael Cerritos, Lexie Jeffries, Jennifer Lamson, Carly McKenna, Ryan Planck, Gabe Russel, Maggie Schlosser

NSF Graduate Research Fellow 2021

Faculty Mentor(s): Catherine Linnen, Rae Cascio

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23665>

Over the last century, the climate has changed dramatically. Increases in both temperature and UV intensity pose challenges for many species, which must adapt or perish. The purpose of our project was to determine whether the traits of species have changed over time in response to climate change. We focused on butterfly wing coloration because color—specifically, the pigment melanin—is thought to be important for warmth (thermal melanism) and UV protection and can be observed in preserved historical samples. To track change over time, we quantified color in three species of butterfly from digital images of museum specimens dating as far back as 1891. We found that the color of two species (monarchs and spring azures) changed over time, but the pattern depended on location: northern populations decreased in melanin over time (consistent with the thermal melanism hypothesis) and southern populations increased over time (consistent with the UV protection hypothesis). A third species (tiger swallowtail) did not show any change over time. Overall, our data demonstrate that while the traits of some species may change in response to climate change, the pattern of change can vary depending on species and location. Characterizing these variable responses will help us to better understand how different organisms evolve in response to a rapidly changing environment. This information is essential to conservation efforts.

BIOLOGY

****USING NONINVASIVE TECHNIQUES TO DETECT BOBCATS AT RAVEN RUN NATURE SANCTUARY**

Authors: Megan Ansert, Tripp Conway, Jarrod Fulkerson, Sammi Howard, Julie Leggett, Ryson Neeley, Kennedy Park

Honors Program

Faculty Mentor(s): Emily Croteau, Edmund Chua

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23671>

Environmental DNA (eDNA) is DNA collected from samples such as water, air or soil. In addition to eDNA, trail cameras were set up to use noninvasive techniques to find the density of different organismal populations in a given area. For this experiment, our class traveled to Raven Run Nature Sanctuary located in Lexington, Kentucky to collect our eDNA samples. We hypothesized that if bobcat DNA is derived from the filtered creek water at Raven Run Nature Sanctuary, then the presence of bobcats in that area can be assumed. Trail cameras will hopefully confirm this. At the sanctuary, we hiked to the closest body of water, a creek located at the base of the mountain. Every 100 meters, we would stop to collect samples from the water and eDNA was extracted from the water sample by filtering the water with a vacuum pump and a flask. The eDNA was captured by the filter paper when the water was filtered through the cup. We also set up four different trail cameras to capture pictures of bobcats or any other wildlife in the area. Once back in the lab, we extracted the eDNA from the filters of the water samples and ran the sample DNA through a gel electrophoresis. With the 12 samples that were collected, the gel electrophoresis produced somewhat inconclusive results. However, the standards and one well, well 7, produced bands of DNA to be analyzed. Further analysis will be performed using real-time PCR.

BIOLOGY

**** BEHAVIORAL ANALYSIS OF SOCIAL AGGRESSION BETWEEN AUSTRALIAN CRAYFISH (CHERAX QUADRICARINATUS) AND NATIVE VIRILE CRAYFISH (FAXONIUS VIRILIS)**

Authors: Magdalen Barnes, Sarah Foster

Faculty Mentor(s): Robin Cooper, Oscar Istas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24031>

Australian redclaw crayfish are now commercially grown in North America, and in Europe for food and pet trade. Considering that this crayfish is a hardy species, it is likely that their populations may become established in the wild, like the case of Burmese python in Florida and Lionfish in the Chesapeake Bay. To assess the ecological impact of invasion by the Australian crayfish on native crayfish species, we studied species interactions between the Australian and native virile crayfish. Specifically, competitive interactions between the native and exotic species with regard to availability of shelter. We conducted experimental trials in which pairs of large, medium, and small crayfish of both species were forced to compete for a shelter. Crayfish interactions were video recorded and scored for dominance behavior. Generally, small Australian crayfish were more aggressive than their larger conspecifics. Medium sized Australian crayfish and similar sized virile crayfish were equally aggressive to each other. We are continuing these observations to study survival in the mixed species social environments.

BIOLOGY

****ANALYSIS OF VARIANCE IN GENE EXPRESSION IN DROSOPHILA MELANOGASTER TESTIS**

Authors: Paige Bittenbender, Destiny Anderson, Kaylan Brewer, Alex Lajewski, Olivia Logsdon, Miniya McNair, Haley Shaver, Rachel Thoma, Adelaide Thomas

First Generation

Faculty Mentor(s): Douglas Harrison, Sepideh Dadkhah, Grace Markowski

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23859>

The observed variability in gene expression among biological replicates, made us interested in analyzing the source and reason of this variability. We are interested in understanding if genes with higher variability (less constraint) are similar in different RNAseq experiments. If so, do the highly variable genes have certain biological roles that can determine cellular development? We are also interested in identifying biological and technical sources of this variability. To identify common genes with extreme and low variance, we are conducting a collaborative meta-analysis study consisting of identifying and downloading publicly available RNA-seq data, measuring expression values, and calculating coefficient of variation.

Publicly available data was downloaded from Gene Expression Omnibus (GEO), a database repository of high throughput gene expression data. For identifying datasets, we have targeted experiments with at least three replicates from adult fly testis obtained from high throughput RNA-Sequencing analysis. The University of Kentucky's Lipscomb Compute Cluster "supercomputer" was used to analyze gene expression from 3 biological replicates from 4 different data sets. The coefficient of variation (CV) was calculated by dividing the standard deviation of the expression value of a gene across three replicates by their mean. We determined lowly constrained genes as those falling above the upper 10th percentile of genome-wide CV distribution. Analysis of data is ongoing and will be presented. From this study we expect to identify common genes that show high variance. These genes will be further analyzed to identify source of variability (technical or biological) or potential biological roles.

BIOLOGY

****EVIDENCE OF HYBRIDIZATION IN MADAGASCAR'S LEMURS**

Authors: Isha Chauhan, Bansi Patel, Ross Shumard, Grace Jones, Madeline Lewis, Ava Musarra, Jamoson Green, Emma Christen

Honors Program

Faculty Mentor(s): Kathryn Everson, Sydney Speed

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23898>

For centuries, hybridization between different species (for example, the hybridization between a horse and a donkey to create a mule) was assumed to be an evolutionary dead-end. However, it is now understood that hybridization is common in the tree of life and can actually promote speciation. On Madagascar, hybridization has likely led to the exceptional biodiversity on the island, and may also reduce the risk of extinction by introducing new genetic diversity to populations that have undergone bottlenecks. The goal of this project is to understand how hybridization has played a role in the evolutionary history of Madagascar's lemurs, a group of primates that is on the verge of extinction. To do this, we estimated phylogenetic trees using mitochondrial DNA and nuclear DNA and revealed differences between the two which suggest a history of hybridization. Additionally, SplitsTree was used to create a more in-depth network view. This information helps us better understand the relationship between hybridization and speciation among lemurs, and lends support to the idea that hybridization has played an important role in the evolution of primates.

BIOLOGY

**** THE EFFECTS OF MANGANESE ON BEHAVIOR OF DROSOPHILA**

Authors: Carlie Cryer, Christopher John Di Girolamo, Christine Haddad, Matthew Lanning, Mason Miller, Devan Neeley, Reece Wilson

Faculty Mentor(s): Robin Cooper, BreAnna Whittinghill

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23772>

Hypermanganesemia, a disorder in which excess manganese accumulates in the body, can be toxic in mammals and is associated with neurological issues mimicking Parkinson's disease (PD). In fact, the neural injury has been shown to affect the same locations known to be dysfunctional in PD and is shown to accumulate in these areas. This has led in part to suggesting that Mn^{2+} targets dopaminergic neurons resulting in their degeneration. However, the effect of Mn^{2+} on neurons synapsed upon by other types of neurotransmitters and how exactly Mn^{2+} is offsetting the dopaminergic neural circuit in the mammalian brain is poorly understood. Larval *Drosophila melanogaster* have a relatively simple neural circuit to analyze the effects of metal toxicity as similarly presented in humans. The effects on larvae behaviors such as body wall crawling, and mouth hook movements can be addressed by depressing or exciting the dopaminergic system in order to understand if Mn^{2+} affects these circuits. Locomotion and eating are relatively easy to observe to assess the effects of dietary Mn^{2+} . We have shown that acute 24-hour dietary supplement of $MnCl_2$ had depressed body wall and mouth hook movements. However, at higher concentrations, there was no demonstrated difference from controls for body wall movements and no difference from the lower concentration for mouth hook movements. We have also shown that acute 24-hour dietary supplement of $MnSO_4$ had depressed body wall and mouth hook movements but to less of a degree at higher concentrations. In future studies, the sensitivity to exogenously applied Mn^{2+} directly on and in situ exposure evoked sensory–central nervous system (CNS)–motor circuits can be compared to the behavior of animals fed Mn^{2+} .

BIOLOGY

CAN RECOVERY FROM REPEATED HEAT STRESS EVENTS VARY BY SEX AND HABITAT?

Authors: Xiaoriya De, Grace DuPlessis

Faculty Mentor(s): Nicholas McLetchie

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23973>

Plants require moisture, light and temperature to be within an optimum range for the best growth and reproduction. Any plant experiencing high temperatures that fall outside this range can result in stress, inhibiting the growth of the plants, and damaging plant structures. Temperature stress is more likely to occur with global warming. Fortunately, plants have the ability to recover from small damages caused by heat and initial heat events might also prime the plants to improve recovery for future heat events. This study uses *Marchantia inflexa* to test if priming has genetic components by testing for sex and habitat differences to recovery for first vs. second heat stress events. Heat stress was applied to *Marchantia inflexa* plants consisting of 20 different genotypes (10 male and 10 female plants from two different habitats). Plants were cloned and one group was heat stressed (55°C for 40 minutes) allowed to recover and heat stressed again. Another group was only heat stressed once. After heat stress was applied, the efficiency of photosystem II (Fv/Fm) was measured as an indicator of recovery. Plants that were primed recovered better after the second heat stress compared to the plants that were not primed. Additionally, female plants with previous heat exposures developed a primed response faster and survived better than male plants. Female plants have higher recovery to heat stress due to priming and survive better outside the optimum temperature range and thus might increase in number relative to males as global warming occurs. Additionally, genetic differences in plants can influence recovery after heat stress, and this difference can be used to help modify crops to improve yield.

BIOLOGY

****THE EFFECTS OF MANGANESE ON SURVIVAL AND BEHAVIOR OF DROSOPHILA**

Authors: Christopher John Di Girolamo, Carlie Cryer, Christine Haddad, Matthew Lanning, Mason Miller, Devan Neely, Reece Wilson

Faculty Mentor(s): Robin Cooper, BreAnna Whittinghill

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23883>

The element manganese (Mn^{2+}) acts as a cofactor and holds an important role in aiding in the function of various essential enzymes (i.e., superoxide dismutase) and cellular processes. Hypermanganesemia in mammals can be toxic and is associated with neurological issues mimicking Parkinson's disease (PD). The notion is that Mn^{2+} exposure results in oxidative stress and altered mitochondrial function, which may lead to significantly altered levels of neurological functioning in dopaminergic pathways and decreases proper motor functioning in an affected individual (such as body wall movements observed in the *Drosophila* model). Such cellular alterations may occur in all cells of an organism. The effect of Mn^{2+} on other types of cells and whole animal development is lacking. We use the *Drosophila* model to address the effect of larval development and survival of larvae and adults with Mn^{2+} exposure. There is information present in literature that suggests depending on the Mn^{2+} compound used for studies, such as $MnCl_2$ as compared to $MnSO_4$, there are different sensitivities in survival. We are addressing the differences in the effects of exposure to $MnCl_2$ and $MnSO_4$ on development and survival of larvae and adults of the *Drosophila* model. We initially exposed larvae to $MnCl_2$ and $MnSO_4$ at concentrations of 1 mM and 10 mM in the food given to them in their respective vials. It was found that these concentrations did not cause any death in the developing larvae. This suggests the need for higher concentrations (potentially into the molar level) of these Mn^{2+} salts to be used in future testing. This study is part of a larger study in addressing the effect of Mn^{2+} on physiological functions in *Drosophila* and other arthropods (crustaceans) for comparative studies.

BIOLOGY

THE EFFECT OF MELATONIN ON THE MORPHOLOGY AND BIOFILM FORMATION OF KLEBSIELLA AEROGENES THROUGHOUT ITS LIFE CYCLE

Author(s): Katelyn Fields

Honors Program

Faculty Mentor(s): Vincent Cassone

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22985>

Melatonin, the hormone most widely known for its effects on the control of the sleep-wake cycle, has also been shown to be released into the lumen of the human gastrointestinal tract, which is home to thousands of microbial species. *Klebsiella aerogenes*, a gram-negative, rod-shaped bacterium, makes up part of the human gut microbiome. Interestingly, this bacterial species has been shown to be sensitive to melatonin. Therefore, the purpose of this experiment is to further explore the effects of melatonin on *K. aerogenes*, specifically in terms of its morphology and biofilm formation.

The morphology of *K. aerogenes* was studied during its exponential and stationary growth phases in the presence of 0nM or 1nM melatonin. The growth phase of the bacterial cultures was determined by optical density measurements. Gram staining was performed to visualize and photograph the bacteria, and Fiji imaging software was used to quantify the lengths of the stained bacteria. *K. aerogenes* in the presence of melatonin exhibited significantly lower average bacterial lengths during stationary growth compared to *K. aerogenes* in the absence of melatonin. Furthermore, in both the presence and absence of melatonin, the average length of *K. aerogenes* was significantly higher in exponential growth compared to stationary growth.

The biofilm formation of *K. aerogenes* was evaluated using a crystal violet biofilm assay. Wild type bacteria (WT) and two mutant strains were incubated in a 96-well plate for 48 hours. The plate was then stained, and the optical density of each well was measured. Data analysis revealed that the WT bacteria treated with melatonin produce a significantly higher amount of biofilm than the WT bacteria not exposed to melatonin. Furthermore, both mutant strains produced significantly less biofilm compared to WT, and their biofilm formation was not affected by melatonin.

BIOLOGY

DUCKS TOUCH, DUCKS DIVE, WHAT HELPS THEM DECIDE: QUANTIFICATION OF CORPUSCLES IN DUCK BILL SKIN

Author(s): Jason Flynn

Honors Program

Faculty Mentor(s): Eve Schneider

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24084>

The sense of touch is an important tool that allows many organisms to interact with and understand the physical environment. Touch sensations are detected in the skin by corpuscles, or cellular assemblies, and are associated with sensory neurons that send appropriate signals to the brain for interpretation. Meissner and Pacinian corpuscles, the prominent corpuscles found in human fingertips and other mammals, contribute to touch sensation by detecting force. Homologous structures to these mammalian corpuscles are found in birds, like ducks. Large quantities of these corpuscles, along with other neuronal structures, are found in duck bill skin. Duck species that act as tactile foragers and rely on touch to find food potentially differ anatomically, as it relates to touch, from non-tactile species. Our objective is to quantify the number and density of the homologous Meissner and Pacinian corpuscles and other related structures, such as free nerve endings, at various locations in embryonic and adult duck bill skin. While data has not yet been compiled, it will shed light on potential explanations of foraging behavior differences in various duck species. Immunohistochemistry was performed on tissues samples, followed by randomized sampling techniques to quantify corpuscles. These methods and findings can assist with other ongoing projects that require corpuscle quantification.

BIOLOGY

****THE EFFECTS OF TALAROZOLE AND RETINOIC ACID ON AXOLOTL EMBRYO DEVELOPMENT AND TAIL REGENERATION**

Authors: Joscelin Gallegos, Elizabeth Oyler, Eleanor Scripps, Kayla Wayne, Joshua Young, Dolan Whittle, Rachel Moscona, Kennedy Dotson, Sarah Baird, Joshua Griffith, Gretchen Ruschman, Ethan Addison

Honors Program

Faculty Mentor(s): S. Randal Voss, Madison Webb, Rachael Snyder

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23758>

Precise regulation of retinoic acid (RA) is essential for normal development and regeneration. RA directly activates transcription through interactions with nuclear receptors that bind to RA-response elements in the promoter regions of target genes. Regulation of RA levels within cells reflects a balance between the actions of RA synthesizing and metabolizing enzymes. Cyp26 enzymes metabolize RA and thus play important roles in establishing RA signaling gradients and regulating RA-mediated transcription. In this study, we tested a potent inhibitor of Cyp26 enzyme activity (talarazole - TAL) for effects on axolotl (*Ambystoma mexicanum*) embryo development and tail regeneration. The distal tail tips of developmental stage 42 embryos were amputated and then embryos were reared in a range of TAL concentrations (0-15 mM) for 6 days post-amputation (DPA). TAL treatments > 5 mM completely inhibited tail regeneration but also caused developmental abnormalities; embryos presented enlarged heads with facial fluid filled sacs (edema) and sporadic internal bleeding, both consistent with circulatory defects. Subsequent experiments showed that the effects of TAL on regeneration and development were dependent upon concentration and treatment duration. We next evaluated the effect of RA on embryo development and regeneration to determine if the phenotypic effects of TAL were associated with increased RA. TAL and RA treatments for 2 DPA significantly inhibited tail regeneration and 5 mM RA caused the same developmental abnormalities observed for TAL-treated embryos. Additionally, TAL and RA treatments similarly affected transcription of known, RA-responsive genes. The dramatic upregulation of *cyp26a1* implicates high transcription response sensitivity to RA levels and indeed we identified a cluster of predicted RA-response elements in the *cyp26a1* promoter. Our results suggest that Cyp26 enzyme activity and *cyp26a1* transcriptional regulation are coupled to regulate RA levels for normal axolotl embryo development and tail regeneration.

BIOLOGY

**** THE EFFECTS OF MN²⁺ CARDIAC FUNCTION IN A DROSOPHILA MODEL**

Authors: Christine Haddad, Carlie Cryer, Christopher John Di Girolamo, Matthew Lanning, Mason Miller, Devan Neely, Reece Wilson

First Generation, Honors Program

Faculty Mentor(s): Robin Cooper, BreAnna Whittinghill

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23802>

In rodent models, manganese exposure (1-8 mM) inhibited myocardial contraction and electrical function. The toxicity appears to cause mitochondrial damage and possible blockage of calcium channels, thus leading to permanent neurological disorders. To investigate the acute actions of Mn²⁺ further, the effect on heart rate in larval *Drosophila* was used as model. The *Drosophila* model is increasingly becoming a model to address cardiac function. Since the larval heart tube is not innervated until the transition from larvae to pupa, the direct action on heart can be addressed in larval *Drosophila*. The heart rate in larval *Drosophila* is very sensitive to extracellular Ca²⁺ levels, pH and modulators such as dopamine. Toxicity studies, which includes the feeding of MnCl₂ or MnSO₄ to larval *Drosophila*, have been used to investigate the effects of exposure to Mn²⁺; however, Mn²⁺ concentrations can be applied directly on tissues to more precisely assess the concentration dependent effects of the function of the tissues. In this study, larvae were dissected to directly expose the heart to the bathing saline with known concentrations of Mn. Acute exposure of MnSO₄ at 0.1 M or 0.0025 M rapidly decreased the heart rate during in situ larval preparations. The exposure to 0.1 M was difficult to reverse with fresh saline; however, heart rate was able to be recovered after exposure to 0.0025M. More studies are underway with MnCl₂ and to control for osmolarity with sucrose exposure. We plan to address how the electrical pacing will be able to overcome the effects of depressed function by Mn²⁺ exposure.

BIOLOGY

FORAGING DECISIONS OF PARENT HOUSE SPARROWS IN THE FACE OF UNCERTAINTY

Author(s): Natalie Hahs

Faculty Mentor(s): David Westneat

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23857>

Foraging presents itself as a challenge for many organisms as they must overcome a variety of obstacles, one of which is uncertainty in the quantity and location of a food source. Incomplete information may be risky, and for parents foraging for dependent offspring, can also impact offspring development. We investigated how parents manage uncertainty (unpredictable variation) using captive parent house sparrows, *Passer domesticus*. We asked if there were conditions when parents were, either variance-prone or variance-averse and if they can associate color cues with the level of variance when foraging to feed their brood. Repeat measurements were collected from videos taken of trained sparrow pairs with three food boards that differed in the level of unpredictable variance in offspring food (crickets) at either adequate or temporarily reduced food abundance. We extracted metrics of foraging preference and asked if exposure, sex of the parent, or offspring age or condition influenced preference for foraging site.

BIOLOGY

VARIATION IN THE FACTORS DRIVING GUT MICROEUKARYOTIC AND PROKARYOTIC DIVERSITY IN WILD LEMURS

Authors: Zoe Hert, Carly Karrick

Nationally Competitive Awards Winner, Chellgren Fellow, Honors Program

Faculty Mentor(s): David Weisrock, Mariah Donohue

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23960>

Identifying the ecological and evolutionary factors shaping host gut microbiomes enhances our understanding of complex, obligate symbioses between endogenous microbes and animal hosts. Although the primate gut microbiome comprises both prokaryotes and microeukaryotes, most previous work in this field has focused on studying prokaryotic diversity. As a result, it remains unclear whether similar factors drive the assembly and maintenance of both gastrointestinal prokaryotic (GP) and microeukaryotic (GME) diversity. Here, we sequenced hypervariable regions of the 16S and 18S rRNA genes isolated from fecal DNA to compare the relative effects of host evolution, diet, and habitat on GP and GME community diversity in 11 species of wild lemur. We found that while host taxonomy—a proxy for evolutionary history—was the main driver of GP community composition, neither evolution nor ecology had significant effects on GME diversity. This difference may reflect a disparity in the nature of symbiotic relationships between hosts, GPs, and GMEs; while many GPs are known to benefit host health and fitness and can be passed from parent to offspring, most GMEs have inconsequential or negative effects on the host. As such, most GMEs are not retained by ecological filtering and, therefore, may generally be considered transient or contaminant members of the lemur gut microbiome.

BIOLOGY

****THE EFFECTS OF AGING AND SERF-FAMILY GENES ON MOBILITY IN DROSOPHILA MELANOGASTER**

Authors: Sam Hillman, Logan Turner, Delaney Upton

Honors Program

Faculty Mentor(s): Douglas Harrison, Brian Rymond, Alandrea Harris

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23875>

As organisms age or in certain genetic disorders, neuromuscular capabilities decline and mobility decreases. The Serf family of genes are conserved through evolution and implicated in neuromuscular disorders in humans. These genes are also hypothesized to impact aging through regulation of protein homeostasis.

In our study, we investigated the role of Serf and the Serf-like gene CG15715 in neuromuscular function using a simple climbing assay. We compared activity of wild-type Canton-S, a full deletion of the Serf gene (Serf Δ 10a), and a partial deletion of the Serf-like CG15715 gene (CG1571515-64a) for adult male flies at approximately 1, 2, and 4 weeks of age. The climbing assays were carried out by placing flies of a single genotype and age-range into a graduated cylinder and we measured both the time it took for 50% of the flies to reach a designated position as well as the number of flies that passed that position within a 120-second time interval. Consistent with our expectations, two-tailed T-tests showed that the climbing ability of each genotype decreased with age. In addition, flies with Serf Δ 10a performed less well than the wild-type and CG1571515-64a mutant. Unexpectedly, it appears that the mutant performs better than the wild-type Canton-S. The data suggest that Serf gene activity is important for neuromuscular function.

A correlation exists between efficient neuromuscular function and effective protein homeostasis. We investigated protein homeostasis in these genotypes using the fluorescent stain LysoTracker to monitor the protein turnover process of autophagy in fed and starved *Drosophila* larvae. While there were technical challenges, we identified the lysosomal vesicles characteristic of autophagy. We are in the process of analyzing this data further in attempts to determine if there are differences in autophagic response between genotypes.

BIOLOGY

****RECONSTRUCTING THE ANCESTRAL DIET AND HABITAT OF MADAGASCAR'S LEMURS**

Authors: Riele Holbrook, Jamie Wilkerson, Ashley Grospitch, Slayde Sizemore, Noor Piracha, Jordan Henley, Sophia Price, Elisabeth Williams

Faculty Mentor(s): Kathryn Everson, Genevieve Papagna

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24053>

Knowing the diets and habitats of current lemur species in Madagascar can provide valuable insight into the lives of past lemurs, and how environmental pressures caused their dietary and ecological habits to change over time. In the presence of pressures like climate change and mass deforestation, it is important to recognize the long-term impacts that Madagascar's changing habitats and food availability might have on lemurs. In this study, we use previous scientific findings about the habitats and diets of Madagascar's lemurs, combining this knowledge with phylogenetic data to extrapolate ideas about the diets of past species of lemurs. The results may reflect that as deforestation has occurred, lemur diets have become more general and less specific over time. This would enable lemurs to survive even if their primary food resources are not available. This could give insight on the effects of deforestation on animal diets and habitats and prompt efforts to prevent deforestation. Additionally, a greater understanding of lemur lineage could enable future researchers to make connections with the behaviors of other species on Madagascar for a greater understanding of the environment as a whole.

BIOLOGY

THE EFFECT OF CARBONATION ON DEHYDRATION-INDUCED FLUID INTAKE IN FEMALE RATS

Author(s): Sahana Holla

Honors Program

Faculty Mentor(s): Jessica Santollo

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23208>

Despite being a popular beverage type, the physiological effects of carbonated fluid consumption are not well understood, especially with respect to maintaining whole body fluid balance. Recent research, however, has begun to uncover links between carbonation, weight gain, and satiation. Specifically, ingestion of carbonated beverages has been shown to increase body weight and ghrelin levels. Ghrelin is a hormone, released from the stomach into the bloodstream, that interacts with the hypothalamus to increase hunger, and, therefore, can lead to weight gain. Ghrelin has been found to interact with other regions of the brain that are known to regulate fluid homeostasis, suggesting that carbonated fluid consumption could influence water balance. Additionally, CO₂ (present in carbonated beverages) stimulates oral receptors that are sensitive to cold water and associated with increased satiation. This again suggests that carbonated fluids may influence fluid intake and water balance. Unfortunately, no studies have directly tested the effects of carbonated beverages on intake during hydration challenges. We, therefore, tested the hypothesis that carbonated fluids are more satiating than non-carbonated fluids during thirst challenges. Animals were exposed to three dipsogenic stimuli: (1) 24-hr water deprivation, (2) injection of hypertonic saline, or (3) injection of isoproterenol. Each animal had access to either carbonated or non-carbonated water following the manipulation, and fluid intake was measured. Three to five days after the first test, animals underwent the same manipulation but were given access to the other fluid. All animals drank significantly in response to the manipulations; however, the results showed no significant difference between carbonated and non-carbonated water consumption. Despite a null finding, a more refined analysis of drinking microstructure may reveal more subtle differences in intake. Future studies are needed to investigate the satiety value of carbonated beverages, and how consumption interacts with both pre-ingestive and post-ingestive mechanisms.

BIOLOGY

THE EFFECT OF TWO-WEEK TREATMENT WITH A HEMP EXTRACT (NCMB-1) ON LUNG TISSUE IN CARIBBEAN VERVETS WITH INDUCED PULMONARY FIBROSIS

Author(s): Cameron Howell

Honors Program

Faculty Mentor(s): Jeffrey Osborn

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24112>

Previous studies in mice have demonstrated the anti-inflammatory properties of cannabinoids derived from hemp and their potential as a therapeutic agent for inflammatory diseases, especially those of the lungs like allergic asthma, acute lung injury (ALI), and acute respiratory distress syndrome (ARDS). A recent in vitro study in human small airways epithelial cells reported a hemp extract NCMB-1 decreased expression of proinflammatory genes and increased expression of anti-inflammatory genes relevant to chronic obstructive pulmonary disease (COPD). Chemical analysis of NCMB-1 indicates that the extract is a mixture of different cannabinoids including cannabidiol (CBD). As a follow-up, an in vivo study was completed to determine the effect of NCMB-1 on lung function in Caribbean vervets (*Chlorocebus aethiops sabaeus*) with previously induced pulmonary fibrosis. The lungs of these old-world monkeys exhibit significant homology with those in humans. Male vervets (n=16) were evenly distributed into four groups, denoting the treatment received twice daily for two weeks in banana slices: vehicle (corn oil), undiluted NCMB-1, a 5X dilution, and a 25X dilution. After a two-week treatment with 5X diluted NCMB-1, lung inspiratory function increased, and airway resistance decreased approximately 200 – 300% without adverse effects. Following the study, complete necropsies were performed, and lung tissue was stored. The goal of our research was to perform a histological assessment of this lung tissue. We hypothesized that two-week treatment with NCMB-1 would enhance expression of cannabinoid receptor type 1 (CB1) and/or cannabinoid receptor type 2 (CB2) in lung tissue. To address this, lung tissue from control and treatment groups was dissected, stained, and blindly evaluated for tissue integrity and/or damage. Additionally, immunohistochemistry was performed to indicate the presence of CB1 and/or CB2 receptors within various lung conducting segments. Our results indicated that CB1/CB2 receptor stimulation increases lung function significantly without altering the histological integrity of lung tissue.

BIOLOGY

****HOST SPIDER SIZE AND HOST USE BY THE RUSTY SPIDER WASP TACHYPOMPILUS FERRUGINEUS**

Author(s): Courtney Hutchins

Faculty Mentor(s): Jeremy Davis, Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24074>

The Rusty Spider Wasp (*Tachypompilus ferrugineus*) is a species of wasp that preys on spiders for the purpose of implantation of its eggs in the prey. Rusty Spider Wasps are known to use a variety of spider species as hosts, but notably the family of large wolf spiders Lycosidae. While previous research has described the host breadth of this species and inferred that size of spiders in Lycosidae is important, no study has shown a correlation between spider size and host use. Here, I used data from iNaturalist to ask if there is a positive correlation between the distribution of Rusty Spider Wasps and prevalence of large-bodied spider species and found a positive correlation between distribution of Rusty Spider Wasps and prevalence of large-sized spiders.

BIOLOGY

SOCIAL INTERACTIONS OF INTRASPECIES PAIRS OF AUSTRALIAN CRAYFISH (CHERAX QUADRICARINATUS) AND INTERSPECIES PAIRS OF NATIVE CRAYFISH: INVASIVE SPECIES ALERT

Author(s): Grace Jacobs

Honors Program

Faculty Mentor(s): Dr. Robin Cooper, Kausalya Shenoy, Madhu Srinivasan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24098>

The Australian crayfish (*Cherax quadricarinatus*) has become increasingly common in the aquaculture industry due to its larger size and tolerance of environmental conditions such as temperature, hypoxia, and water quality. There is a high risk of the species being introduced into the wild, as aquaculture ponds are commonly in association with natural streams and ponds. Likewise, public use, and disposal, of crustaceans is known to not be tightly controlled which could lead to competitive interactions with other widespread native species. Therefore, this study is interested in examining the behavioral nature of *C. quadricarinatus* in the intraspecies pairing as well as interspecies pairing with a well-established model of an aggressive native crayfish (*F. virilis*). To accomplish this, crayfish were isolated for 2 weeks and then paired for 20 min with video monitoring. Similar sized *C. quadricarinatus* were used for pairing from small (4-5 cm body length) to large (~15 cm). Only large *C. quadricarinatus* and large *F. virilis* were paired. Thus far, small *C. quadricarinatus* are more aggressive in their intraspecies pairings than either the large *C. quadricarinatus* or the *F. virilis*. The results of this ongoing investigation will establish the social nature of the previously unstudied *C. quadricarinatus*.

BIOLOGY

****RELATIONSHIP BETWEEN SERF-LIKE GENES AND NEUROMUSCULAR FUNCTION IN DROSOPHILA**

Authors: Alana Kassis, Lauren Depa, Michael Morgan, Caroline Youdes
Honors Program, Presidential Scholar

Faculty Mentor(s): Douglas Harrison, Brian Rymond, Alandrea Harris

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23871>

Neuromuscular function, influenced by genetic factors, declines with aging. Maintenance of the neuromuscular function depends on proteostasis, a cellular process that removes older, non-functional proteins and organelles. One proteostatic mechanism is autophagy, which is an intracellular process that degrades and recycles these waste products. SERF (small EDRK-rich factor), a highly evolutionarily conserved protein with unknown function, has been shown to increase autophagy and lengthen lifespan in fruit flies, *Drosophila melanogaster*. The goal of our research was to analyze the neuromuscular function of two mutations that alter the protein-coding sequence of a SERF-like gene, CG18081. The neuromuscular function of *Drosophila* with the CG18081²⁰, CG18081^{43b}, and SERF^{10a} mutations were compared against the “wild-type” control, CantonS strain. It was hypothesized that *Drosophila* containing CG18081²⁰, CG18081^{43b}, SERF^{10a} mutations would have less climbing efficiency than CantonS, exacerbated by aging. Neuromuscular function, directly correlated to climbing efficiency, was evaluated with climbing assays, which measured time taken for one, two, and four-week-old *Drosophila* to climb a fixed distance in a tube. Using T-tests, a significant difference was found in climbing capabilities. As expected, the SERF^{10a} mutations showed decreased climbing ability at all ages. Surprisingly, the CG18081²⁰ and CG18081^{43b} mutations showed increased climbing ability compared to the wild-type control at all ages. While the results imply that the CG18081 mutations are beneficial in increasing an organism’s neuromuscular function, it cannot be absolutely concluded because the CantonS genetic background is not identical to the mutant strains. The connections of SERF and SERF-like proteins to neuromuscular function are likely to be applicable to other species, including humans.

BIOLOGY

THE IMPACT OF TRAFFIC RELATED AIR POLLUTION ON THE PHYSIOLOGY OF VERTEBRATES, SPECIFICALLY, THE BRAIN AND NERVOUS SYSTEM

Author(s): Bahar Katan Baf Nasab

Faculty Mentor(s): Kay Shenoy

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23982>

This research explores the effect of contaminants on vertebrate brain and nervous system. It focuses on the physiological effects of traffic-related air pollution, especially lead and carbon monoxide (CO), on the nervous system of mice and other vertebrates that are closely related to humans. It is important to understand the possible ways that contamination affects human and vertebrate physiology in an effort to combat their negative impact. This paper is based on findings from peer reviewed primary research articles and meta-analyses by searching databases such as Google scholar, Web of Science, and PubMed. Both CO and lead can affect vertebrate physiology by passing through the Blood-Brain Barrier (BBB); however, they alter the function of the brain through two different physiological processes. CO decreases the oxygen-carrying capacity in the bloodstream, decreasing the production of ATP, and damaging cells and tissues by generating superoxide. Therefore, humans can experience headaches, fatigue, and nausea when exposed to a high amount of CO. Moreover, lead passes through the BBB by substituting for calcium ions; hence, fluid can assemble and lead to cerebral edema, which later results in encephalopathy and irreversible brain damage. Lead can also destroy myelin sheaths and reduce the number of neurons and neurotransmission activities. As a result, vertebrates would experience extra sensitivity to external stimuli, slowed movement, and limb weaknesses. By knowing these two processes, specific drugs can be made to control the poisonous effect of lead and CO contaminants and limit the damages that will be caused when humans and other vertebrates are exposed to them. One of the main questions that still remains unanswered is how exposure to more than one of these contaminants simultaneously can affect vertebrate physiology. This is important because there can be more than one traffic-related air pollution in the environment at any given time.

BIOLOGY

EFFECT OF TEMPERATURE ON HEART RATE FOR PHAENICIA SERICATA AND DROSOPHILA MELANOGASTER WITH ALTERED EXPRESSION OF THE TRPA1 RECEPTORS

Author(s): Nicole Marguerite

Honors Program

Faculty Mentor(s): Robin Cooper

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25667>

The transient receptor potential (TrpA—ankyrin) receptor has been linked to pathological conditions in cardiac function in mammals. To better understand the function of the TrpA1 in regulation of the heart, a *Drosophila melanogaster* model was used to express TrpA1 in heart and body wall muscles. Heartbeat of intact larvae as well as hearts in situ, devoid of hormonal and neural input, indicate that strong over-expression of TrpA1 in larvae at 30 or 37 °C stopped the heart from beating, but in a diastolic state. Cardiac function recovered upon cooling after short exposure to high temperature. Parental control larvae (UAS-TrpA1) increased heart rate transiently at 30 and 37 °C but slowed at 37 °C within 3 min for in-situ preparations, while in-vivo larvae maintained a constant heart rate. The in-situ preparations maintained an elevated rate at 30 °C. The heartbeat in the TrpA1-expressing strains could not be revived at 37 °C with serotonin. Thus, TrpA1 activation may have allowed enough Ca²⁺ influx to activate K(Ca) channels into a form of diastolic stasis. TrpA1 activation in body wall muscle confirmed a depolarization of membrane. In contrast, blowfly *Phaenicia sericata* larvae increased heartbeat at 30 and 37 °C, demonstrating greater cardiac thermotolerance.

BIOLOGY

STRETCH ACTIVATED CHANNELS MAINTAIN HEART RATE IN LARVAL DROSOPHILA

Author(s): Shelby McCubbin

OUR Summer Research Fellow (2020), Gaines Fellow, Honors Program

Faculty Mentor(s): Robin Cooper

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23706>

The mammalian heart has an amazing ability to self-regulate in physiological and pathological conditions through increasing contractility with stretching of the ventricles (i.e., Frank Starling principle). This is postulated to be caused by altered Ca^{2+} sensitivity due to stretching of the myofibrils. There are also cellular changes of the heart which occur in pathological conditions, such as an increased expression of transient receptor protein-ankyrin (TrpA) receptors in diseased heart models. It is not known if this increase in expression is a beneficial compensation, or whether it may contribute to the pathology. As a proof of concept, TrpA1 receptors were over expressed in *Drosophila* larval hearts to examine if activation of them by mechanical stimulation would help to maintain heart rate. In situ preparations are being examined with overexpression as well as controls with supra perfusion which is strong enough to result in a pulsatile deformation of the heart. This tech was previously shown to maintain heart rate for prolonged times, but was not examined alongside overexpression of TrpA receptors. This study could help to illustrate that in the diseased state of mammalian hearts, the increased expression of TrpA is beneficial to some degree. This study is ongoing and the results to date will be presented.

BIOLOGY

THE DELETION OF SERF-LIKE GENES THROUGH CRISPR-CAS9 TECHNOLOGY: AN ONGOING ANALYSIS OF A DROSOPHILA MODEL OF SPINAL MUSCULAR ATROPHY

Author(s): Kaylee Meador

Faculty Mentor(s): Brian Rymond and Doug Harrison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23639>

Spinal Muscular Atrophy (SMA) is the leading genetic cause of infant mortality and results from diminished levels of the Survival Motor Neuron (SMN) protein. Correlative human genetic studies and previous work in our lab using a *Drosophila melanogaster* model of SMA supported that one member of a conserved gene family, *SERF*, can influence disease progression, likely through the stabilization of residual SMN protein. In addition to the *SERF* homolog, both the fly and human genomes contain structurally related *SERF*-like genes of unknown function. Our long term goal is to determine the role of this gene family with specific emphasis on the possible function in protein homeostasis. Given *SERF*'s hypothesized function as a chaperone protein for the SMN protein, it is exciting to speculate that the *SERF*-like genes may have comparable function and therefore be impactful in the diagnosis or treatment of SMA.

The *Drosophila* *SERF*-like proteins are encoded by a pair of highly similar and adjacent genes, CG15715 and CG18081. It is unknown whether these genes are functionally redundant of one another or with *SERF*. The possible role either CG15715 or CG18081 plays in cellular physiology or development, including possible interaction with the SMN protein-limiting phenotype of SMA, is yet to be determined. As a first step in our analysis, we used CRISPR-Cas9 technology and extensive animal husbandry to create loss of function mutations in both genes. Out of all the successful mutations, Fly CG15-52 is the optimal mutant for the CG15715 gene and Fly CG18-20 is the optimal mutant for the CG18081 gene. The CG15-52 and CG18-20 clonal lines will be analyzed extensively to characterize the function of CG15715 and CG18081 and their relation to SMA.

BIOLOGY

****CLIMATE CHANGE AND INCIDENCE OF WRONG-YEAR PERIODICAL CICADA EMERGENCE**

Author(s): Amber Mercer and Jordyn Estridge
First Generation

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24064>

Magicalicada are a genus of periodical cicadas who remain dormant for many years only to emerge after 13 or 17 years in the billions, with the year varying by location in well documented “Broods”. Recently, there have been several trends of observations of smaller groups emerging several years early. For instance, in 2017, thousands of Magicalicada were observed in “Brood X” states four years earlier than when they were expected to emerge—coinciding with a particularly hot summer. Because cicada emergence is triggered by temperature changes in the soil, these periodicals could be sensitive to global temperature fluctuations. Here, we use data from iNaturalist to ask if climate fluctuation affects wrong-year emergence of periodical cicada broods.

BIOLOGY

****EXAMINING THE EFFECTS OF DIFFERING LIGHT REGIMES ON PHYSIOLOGICAL RESPONSES WITHIN BEGONIA LEAVES**

Author(s): Carlos Montalvo, Elizabeth Jessie, Weston Sizemore, Laura Pallay, Sara Twine, Jake Hanna, and Lillian Kimmel

Faculty Mentor(s): Nicholas McLetchie and Tanner Durst

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23762>

This study aimed to determine the effects of differing qualities and quantities of light on the leaf physiology of shade plants, in order to better understand a shade plant's acclimation abilities when exposed to varying light patterns. The results of the study may also have the potential to explain how begonias can react in a changing climate. In this study, different light filters were placed over selected leaves of begonia plants to simulate changing light regimes. The efficiency of the leaf's photosystem (Fv/Fm) as well as its chlorophyll A/B ratios were measured at each filter site. After one week of treatment, the photosystem efficiency values were again measured at each filter site, and after two weeks of treatment, chlorophyll levels at filter sites were measured. There was no significant difference regarding photosystem efficiency in the presence or absence of filters. However, there was a difference in A/B chlorophyll levels among leaves exposed to the filter treatment. No similarities were found between intermediate and high-light conditions; although, there were similarities between the intermediate conditions and one low light condition, suggesting no significant relationship between the efficiency of the photosystems and the quality/quantity of light. However, analysis indicated a difference in chlorophyll A/B ratios in response to light variation. Due to design limitations, the filters were unstable and too far from the leaves' surfaces. This made it possible for non-filtered light to reach treatment areas. Some filters also fell from their placement, resulting in inconclusive data. Therefore, filter placement and design should be carefully reconsidered regarding future experimentation. Ultimately, this research provides us a unique opportunity to observe short-term results that will allow the scientific community to predict how individual leaves may react to changing environments and how these plants can be utilized in the maintenance of a stable climate.

BIOLOGY

****COMPETITIVE SUCCESS OF THE INVASIVE RED IMPORTED FIRE ANT SOLENOPSIS INVICTA**

Author(s): Ashyah Morman

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24070>

Invasive species are species that are brought to a different/non-native area where their population expands beyond control while other native species' populations are dwindling due to the invasive species overpopulating, invading their habitats, and eating all their food sources. Red Imported Fire Ants (*Solenopsis invicta*), are one of the most common and well-known examples of a successful invasive species in the southern United States. Previous research in this organism has shown that Fire Ants may be so successful as invasives due to their wide use of food sources and rapid life-cycle, outcompeting or preying on native species. Here, I used observation data from iNaturalist of Fire Ants and other common species from Southern US states to evaluate patterns of growth and competition that may contribute to the success of this invasive.

BIOLOGY

****COMPETITIVE EXCLUSION BETWEEN NATIVE AND INTRODUCED MANTISES OF THE UNITED STATES**

Author(s): Charles Newton

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24057>

There are three predominant species of the order Mantodea in the United States, the native Carolina Mantis (*Stagmomantis carolina*) and two species introduced in the last 150 years: the Chinese Mantis (*Tenodora sinensis*) and the European Mantis (*Mantis religiosa*). While all three species maintain a broad range across the US and North America, much of these ranges are patchy and only partially overlapping. Given the similarity in ecological role of these three species, competitive exclusion is expected to influence the prevalence of these species, often to the detriment of the native species. Here, I use observation data from iNaturalist to ask if there is evidence of competitive exclusion between these three native and introduced Mantis species across different regions of the US.

BIOLOGY

HOW AND WHY DOES REPRODUCTIVE ISOLATION VARY ACROSS SPACE?

Author(s): Gavin Norman

Faculty Mentor(s): Catherine Linnen

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/21463>

The purpose of this project was to determine if there is assortative mating in two sympatric populations of sawflies of different species. To do this, the number of male attempts to mate, the outcome of each attempt, and in the event of a successful attempt, the duration of the mating was scored for multiple sets of recordings of adult sawfly mating pairs of the same or different species. The reason we were interested in sawfly mating behavior is because we wanted to determine the roles of male interest and female receptivity in determining mating outcomes between species. It was believed that these observations may provide insight into how these behaviors may be strengthening or weakening the reproductive barriers between species. The hypothesis was that mating pairs consisting of different species will result in significantly fewer mating attempts by the male and overall, very low mating success. Whereas mating pairs of the same species will result in a larger number of attempts to mate by the male and higher rates of successful matings. The consequences of choosing an incorrect male in the case of a pine sawfly means that your offspring or their offspring will have low survival in nature, potentially ending your genetic lineage. Thus, the behaviors that keep two species from mating and “wasting” their genetic material are very important in keeping the species separate and will also continue to strengthen and further diverge the species from each other. In the end, it was found that there is assortative mating by sawflies, however, the method by which they sort themselves is still unknown and is the topic of a future research project.

BIOLOGY

DEVELOPING AN ACURE TO INVESTIGATE THE EFFECTS OF MANGANESE ON PHYSIOLOGICAL PROCESSES

Author(s): Cecilia Pankau

Honors Program

Faculty Mentor(s): Dr. Robin Cooper

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24102>

To engage freshman college students in research and STEM, we have utilized an authentic course-based undergraduate research experience (ACURE) approach through a focused research project. Involving students in the design and implementation of an experimental paradigm exposes students to the process of scientific research and encourages their creativity. For this class project, we studied the effects of manganese on behavior, neural function and cardiovascular physiology of *Drosophila melanogaster* larvae and blue crab (*Callinectes sapidus*) models. Research has repeatedly demonstrated that overexposure to manganese can lead to acute cardiovascular disorders and Parkinson's disease-like symptoms. We designed the class in order to gain a multifaceted understanding of these effects. The students first examined larval *D. melanogaster* development and behavior when exposed to a maximum non-lethal dose of manganese. Then, students studied the effect of manganese on *D. melanogaster* heart rate because literature has indicated that manganese can cause heart arrhythmias. Finally, students studied the effect of manganese on sensory neural activity of *C. sapidus*. The prolonged timeline of the study provided time for reflection and the flexibility to alter the procedure in order to address student research questions as they emerged. Guided by student curiosity, the effects of MnSO_4 and MnCl_2 were compared and other potential avenues for expansion of research, such as optogenetics, were also discussed. Through the duration of the course, our student-driven research approach has promoted student engagement and fostered a deeper understanding of the scientific process while also widening the breadth of knowledge had by the research field.

BIOLOGY

****SURVIVAL AND BEHAVIORAL RESPONSES OF THE AUSTRALIAN CRAYFISH (CHERAX QUADRICARINATUS) TO ACUTE AND LONG-TERM EXPOSURE TO COLD: LIMITATION ON POTENTIAL INVASIVENESS**

Author(s): Nyla Parker, Sheridan Oldham

Faculty Mentor(s): Robin Cooper, Oscar Istas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24021>

Investigation of the Australian Crayfish (*Cherax quadricarinatus*) and its interaction with other North American Crayfish is very important for noting their potential invasiveness. There have been investigations concluding that this species can be carriers for pathogens; including viruses, bacteria, fungi, protozoan and metazoan parasites that could spread to native crayfishes and shrimps. So the potential invasiveness is of a potential concern for affecting other organisms in North America. One vital part of this research is testing the Australian Crayfish's survival in cold temperatures. Reports have concluded that this species can survive in warmer temperatures (15 C to 30 C). However, except as hatchlings there is a lack in studies, on the behavior of these Australian crayfish in cold environments (10 C) at different developmental stages. Knowing this information would aid in understanding the limitations in the Australian crayfish invasiveness. In this study isolated crayfish were exposed to water temperature for one week (15 C) and they are then moved to a water temperature of 10 C. Results from this research have shown that juvenile crayfish (1 year old) can survive for three weeks at 10 C after being held at 15 C for 1 week. Ongoing research will examine this effect on older juveniles and adults after being held at 15 C for 1 week and then moved to a 10 C.

BIOLOGY

****NATURAL SELECTION ON THE MITOCHONDRIAL GENOME IN MADAGASCAR'S LEMURS**

Author(s): Deep Patel, Brenden Hughes, Nicholas Wilson, Olivia Swanbeck, Ashley Hamlet, Tesslyn Hutchinson, and Vasav Rachan

First Generation

Faculty Mentor(s): Kathryn Everson and Genevieve Papagna

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24042>

Natural selection is a powerful force that can shape the genome (or the DNA) of living organisms. As new mutations arise, natural selection can either purge these new mutations or cause them to become fixed. In eukaryotes, mitochondria (an organelle known as the powerhouse of the cell) have their own genomes which can undergo natural selection. Our research analyzes the changes present in the mitochondrial DNA of lemurs (primates endemic to Madagascar). By investigating the presence of synonymous (dS) and non-synonymous (dN) mutations in different lemur species, we can infer if natural selection has acted on mitochondrial genes. We expect that many mitochondrial genes will show a dN/dS ratio greater than one, which suggests that natural selection has selected for beneficial mutations. Through this research, we will determine the relationship between mitochondrial DNA and natural selection in Madagascar's lemurs, which will shed light on the evolutionary history of primates.

BIOLOGY

RACIAL AND ETHNIC DISPARITIES IN MATERNAL MORBIDITY AND MORTALITY

Author(s): Pooja Patel

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25434>

It has become apparent that racial and ethnic minorities experience a greater number of barriers when it comes to seeking access to healthcare and are more likely to experience negative health outcomes. Maternal mortality has proven to be an example of this as black women are more likely to die due to pregnancy-related complications than white women, according to the Centers for Disease Control and Prevention (CDC) and research from their Pregnancy Mortality Surveillance System (PMSS). Not only are black, American Indian/Alaska Native, Asian/Pacific Islander, and Hispanic women more prone to complications, they are often the victims of preventable deaths during and/or after labor. There are a multitude of reasons why racial and ethnic minorities suffer more complications but a few of the main causes of pregnancy-related mortality are cardiovascular conditions, infections, and pre-existing medical conditions. Aside from health-related conditions, minority groups are also less likely to have access to health facilities that would ensure they are healthy preconception, during pregnancy, and during postpartum. Being able to understand the racial and ethnic differences in maternal health and recognize the inequities that exist in the healthcare system and in care provided are steps that need to be taken in order to address this growing issue. It is also crucial for those working in the healthcare field to be educated about conscious and unconscious racism which could effect the level of care they are providing. By no means will this be an issue that can be resolved quickly but progress needs to be made in order to provide health equity to all.

BIOLOGY

THE ROLE OF G PROTEIN-COUPLED ESTROGEN RECEPTOR 1 IN REGULATING CIRCADIAN RHYTHMS IN FEMALE MICE FED HIGH-FAT DIET

Author(s): Cameron Rostron

Honors Program

Faculty Mentor(s): Julie Pendergast and Oluwabukola Omotola

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24188>

Over 40% of U.S. adults are obese. In women, the loss of circulating estrogen at menopause is associated with weight gain and the development of diseases comorbid with obesity. Our lab recently showed that a novel function of estrogens is to regulate circadian rhythms underlying obesity. In male C57BL/6J mice, high-fat feeding causes obesity and disruption of daily eating rhythms. In contrast, estradiol protects female C57BL/6J mice from diet-induced obesity and circadian disruption. The estrogen signaling mechanism is unknown. Here, we sought to determine whether G Protein-coupled Estrogen Receptor 1 (GPER1) is necessary to protect circadian rhythms from disruption by high-fat diet feeding in female mice. We compared female *Gper1* knockout (*Gper1* KO) mice and wild type (WT) littermates. Mice were fed 10% kcal/fat diet (LFD) for 1 week, followed by 45% kcal/fat diet (HFD) for 6 weeks. We measured body weight, food intake, and daily eating behavior and locomotor activity rhythms. At the end of the experiment, we measured fasting blood glucose and body composition. Female *Gper1* KO mice gained more weight and consumed more food than WT mice. Both *Gper1* KO and WT female mice had robust eating behavior and locomotor activity rhythms during LFD and HFD feeding. These preliminary results suggest that GPER1 is not necessary to protect circadian rhythms from disruption by HFD in female mice.

BIOLOGY

**** COLD/SENSORY STIMULI AND CARDIAC FUNCTION IN AUSTRALIAN CRAYFISH**

Author(s): Jawad Saleem

Honors Program

Faculty Mentor(s): Robin Cooper, Oscar Iltas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24015>

Many physiological and behavioral jobs are needed for environmental conformers (i.e., many invertebrates) to live in severe conditions. Facing a predator attack, the fear, flight, or fight response is an integral basis of an organism's environment awareness. Invertebrates have shown a sympathetic-like reaction to external stimuli based on previous data, serving as an indicator for its internal state. Precisely, analysis of heart rates in different temperatures and after telson taps are viable methods. Specifically, Australian crayfish (*Cherax quadricarinatus*) were studied, which have well-characterized and established behaviors to inspect stress behaviors.

BIOLOGY

AN EXPLORATION OF SLEEP FRAGMENTATION AND SLEEP ENHANCEMENT ON ALZHEIMER'S DISEASE

Author(s): Frances Salisbury

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter (2020-21), OUR Research Ambassador (2020-21), and Honors Program

Faculty Mentor(s): Bruce O'Hara

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24131>

Alzheimer's Disease (AD) is a neurodegenerative disease that is can be defined by amyloid beta (A β) plaques, neurofibrillary tangles, and neuronal death, all of which cause neuroinflammation. AD patients have characteristically fragmented sleep, with frequent nighttime awakenings and daytime naps. Decreased clearance of A β from disrupted sleep may be a contributing factor in the progression of AD. This study investigated how sleep fragmentation effected the progression of AD in 3xTgAD mice. Results showed that sleep fragmented mice had significantly more A β build-up in the hippocampus and thus greater progression of AD when compared to control mice. Improving sleep may be one way to reduce the harmful impact of this disorder. The second goal of this project was to determine if sleep can be improved using mechanical slow rocking. One male and one female C57/BL6 mice were used as the test subjects. One mouse was recorded at a time using a Piezo Sleep cage (Signal Solutions LLC) on a MouseQuake (MQ) platform (Signal Solutions LLC), with water and standard mouse chow ad libitum. The protocol was four days total. The first day was an acclimation, with no data analyzed. Baseline sleep was recorded for 24 hours in the piezo cage on day 2. After baseline, the MQ rocking platform rocked the cage at 1 Hz frequency from lights on to lights off (6:00-18:00) for a total of 12 hours during day 3. A recovery day (day 4) was recorded after a full day of rocking. Sleep data was analyzed to see if rocking using MQ platform altered total sleep time, sleep latency, and sleep bouts. Results did not show significant sleep enhancement while using the rocker. Additional trials are currently being conducted in order to strengthen the findings of this experiment. If future investigations show that improving sleep improves the symptoms of AD, then slight rocking to improve sleep could be used as a therapeutic treatment method.

BIOLOGY

EFFECTS OF HISTONE METHYLTRANSFERASES ON PROGRAMMED GENOME REARRANGEMENT IN SEA LAMPREY

Author(s): Claire Scott

National Conference on Undergraduate Research (NCUR) Presenter (2020-21) and Honors Program

Faculty Mentor(s): Jeramiah Smith

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23834>

The sea lamprey (*Petromyzon marinus*) diverged from the vertebrate lineage roughly 550 million years ago, therefore, they provide a comparative perspective that can be used to study the evolution of differences in genome regulation including programmed genome rearrangement (PGR). PGR is a regulatory mechanism in which specific genes are effectively turned off by the elimination of their sequences from the genome. About 21% of genes in lamprey are regulated in this manner, but all genes are retained in the reproductive cells. This mechanism is not yet fully understood, so individual genes are investigated to determine their significance to this regulation. Within the suppressor of variegation family of genes, it was hypothesized that SUV39H1, SUV420H1, SUV420H1A and SUV420H1/2 genes would have an effect on the process of PGR. All of these genes encode for a methyltransferase for significant markers in gene suppression through methylation which is thought to have a role in PGR. It is suspected that the embryos with CRISPR-mediated knockouts of these genes will alter levels of PGR. Results from immunohistochemistry and light-sheet microscopy demonstrate that these genes significantly affect levels of PGR. This indicates that more gene candidates within the methylation pathway and SUV family should be further investigated for potential contributions to PGR. Additionally, real-time PCR was used to screen for differences in somatic and germline expression in these genes. Moving forward this technique will be used to identify chemicals and genes that also affect PGR.

BIOLOGY

CLIMATE CHANGE AND EFFECTS ON EMERGENCE OF THE EPHEMERAL GIANT MAYFLY *HEXAGENIA LIMBATE*

Author(s): Afeef Shaik

STEMCats and Honors Program

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24068>

Global climate change has had drastic consequences for the abundance and life histories of many organisms—in particular insects which have seen worrying declines in recent years due to sensitivity to environmental changes. Mayflies (order: Ephemeroptera), are winged insects with incredibly short-lived adults that emerge in the billions during a short period each year. Due to their ephemeral nature and aquatic larval stages, these species are very sensitive to changes in environment, and yet little is known about the effects of climate change on mayflies. Here, I use observation data from iNaturalist to evaluate the impacts of temperature fluctuations in the past 20 years on the emergence date of the giant mayfly (*Hexagenia limbata*).

BIOLOGY

****INVESTIGATING THE DECLINE OF THE AMERICAN BURYING BEETLE (NICROPHORUS AMERICANUS) AND THE LINK TO MID-SIZED CARRION**

Emily Slone

Honors Program

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24076>

The American Burying Beetle (*Nicrophorus americanus*) is a beetle native to North America that is currently facing extinction. Although they once inhabited 35 states, the District of Columbia, and a few Canadian provinces, this species can now only be found in four states: Rhode Island, Nebraska, Oklahoma, and Arkansas. Scientists are not certain of all the factors that have contributed to the decline of the American Burying Beetle, but a prominent theory is that other species may be outcompeting the beetles for the mid-sized carrion they need to reproduce and feed their young in the early stages of the life cycle. Here, I use iNaturalist to track the confirmed sightings of the American Burying Beetle in the states the species currently survives in, as well as the density of mid-sized carrion in the same states using a representative species. In addition, I used iNaturalist to track known predators of avian carrion species to determine if the four states listed have common species that may contribute to a lack of carrion available for the beetles to utilize for reproduction.

BIOLOGY

****RECONSTRUCTING LIFE HISTORY TRAITS IN MADAGASCAR'S ANCESTRAL LEMURS**

Author(s): Madeleine Spencer, Anastasia Glaser, Maggie Balmes, Daryn Seals, Caitlynn Hill, Aiden Shifflett and Chloe Shamel

Faculty Mentor(s): Kathryn Everson and Sydney Speed

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23894>

Life history traits are interconnected heritable factors that are affected by natural selection. By studying life history traits, scientists can better understand the evolutionary history of a species. This study evaluates and reconstructs the life history traits of lemurs, primates endemic to Madagascar. Specifically, we use a phylogenetic tree and data on life history traits such as body size, sociality, and reproduction, in an analysis called ancestral character state reconstruction. In doing so, we discover how the changing environment on Madagascar has caused life history traits to shift over evolutionary time. This study sheds light on the life history traits that allowed lemurs to colonize and to become established on the island of Madagascar, and traits that may enable lemurs to survive current and future habitat destruction.

BIOLOGY

**** THE EFFECT OF ACUTE COLD EXPOSURE ON PROPRIOCEPTIVE FUNCTION IN AUSTRALIAN CRAYFISH (CHERAX QUADRICARINATUS)**

Author(s): Elizabeth Steele

Honors Program

Faculty Mentor(s): Robin Cooper, Oscar Iltas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24039>

Since the Australian crayfish (*Cherax quadricarinatus*) is now being introduced into North America via aquaculture and as ornamental aquarium pets, there is a potential for them to be released into the environment. The potential impact of this species as an invasive species is only recently being considered due to this. Australian crayfish live in relatively warm temperatures, and the hatchlings of this species have been reported to die in colder temperatures (~10 C) over a few weeks. This realization has led to an interest in how acute cold affects the animal as well as chronic cold. In this study, we addressed how primary sensory nerves that are associated with proprioception or body movement respond to cold temperatures. The neural activity of the muscle receptive organ before, during, and after acute cold exposure is being examined as a bioindex of sensory function. In addition, the sensory reception of touch on the cuticle is planned to be assessed in similar conditions. Studies are currently underway and will be reported on. These studies help to address the potential ability of this species to thrive in colder climates outside their warmer native range.

BIOLOGY

****COMPARISON IN HABITUATION RATES OF TAIL FLIPPING AMONG RED SWAMP CRAYFISH (PROCAMBARUS CLARKII) OF NORTH AMERICA AND AUSTRALIAN CRAYFISH (CHERAX QUADRICARINATUS)**

Author(s): Slane Steen, Lacey Gordon
Honors Program

Faculty Mentor(s): Robin Cooper, Oscar Istas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24027>

The Australian crayfish is an invasive species in the United States. In contrast, the red Swamp Crayfish is a US native. Several tail touch tests were conducted to observe habituation patterns in both the Australian crayfish and Red Swamp crayfish. These tests help us to better understand why the Australian crayfish is considered invasive. Two forms of the test were carried out: one with room temperature water and one with 15- $^{\circ}$ C water. Each test involved tapping the crayfish on their lower abdomen every thirty seconds. If the crayfish tail flipped, they were given a score of 1. If they did not tail flip, they were given a score of 0. The crayfish were considered to be habituated when they received a score of 0 ten times in a row. The results revealed that the large Australian crayfish and the large Red Swamp crayfish habituated faster than the small Australian crayfish. Furthermore, the large Australian crayfish habituated faster than the large Red Swamp crayfish. In cold temperatures, the small crayfish habituated faster than in room temperatures. With time, though, they began to respond and the tail flip reaction returned. In this case, one might assume that they may not be as invasive because they could not respond to threats. These different responses likely contribute to the invasiveness of the Australian crayfish. Further testing in an ecological arena could provide more insight into how these habituation patterns influence invasiveness.

BIOLOGY

BRIDGING OPTOGENETICS, METABOLISM, AND ANIMAL BEHAVIOR FOR STUDENT-DRIVEN INQUIRY

Author(s): Vaaragie Subramaniam
Honors Program

Faculty Mentor(s): Robin Cooper

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23780>

It is known that increasing temperature increases the metabolic rate. The goal of this experiment is to identify the effects of temperature on the development of *Drosophila melanogaster* through metabolism. To accomplish this goal, four groups of *Drosophila* were grown at different temperatures which were room temperature (20C), 24C, 27C and one cold at 15C. Each group of flies used in the experiment expressed a light sensitive ion channel channelrhodopsin-2 (ChR2) in different types of neurons. These neurons include motor and sensory neurons and body wall muscles. The amount of ChR2 expressed by each group of flies in different temperatures should change because the ChR-2 will be expressed due to the temperature dependent GAL4/UAS. To examine the effect of temperature on development, the amount of time it takes for the larvae and the adults appear in the vial was recorded. The behavior of the flies was quantified by direct visual observation, and the production of CO₂ was measured to determine metabolic rates in the flies. The flies were also tested for sensitivity to blue light to activate ChR2. By studying these different factors, the optimal temperature for the GAL4/UAS system will be determined and the relationship between temperature and development will be explained. After conducting the experiment, the protocol will be made into a module that can be used to teach advanced high school and college students about the effects of temperature on metabolism and development.

BIOLOGY

IDENTIFYING GENETIC LOCI IN THE AFRICAN GREEN MONKEY THAT ASSOCIATE WITH HYPERTENSION IN A PURPOSE-BRED F2 GENERATION OFFSPRING

Author(s): Alexis Taylor

OUR Summer Research Fellow (2020) and Honors Program

Faculty Mentor(s): Jeffrey Osborn

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23749>

Hypertension (HT) and other cardiovascular diseases remain the leading cause of death nationwide. The African Green Monkey (AGM; *Chlorocebus aethiops sabaeus*) is a non-human primate that is an invasive species on the island of St. Kitts & Nevis. Genome sequencing a purpose-bred F2 generation of AGMs would determine genetic quantitative trait loci (QTL) that may correlate to human essential HT. By tracking blood pressure, heart rate, and sex of both parent and offspring animals; genome sequencing can be completed to look for a hypertension coding gene so that AGM can be a worldwide animal model for future studies about hypertension and other cardiovascular disorders. In group housed AGMs, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate, fasting blood glucose, weight, and sex were measured on 165 offspring from purpose-bred monkeys with a known parental SBP phenotype. From these phenotypes, breeding groups were developed to track mating patterns and determine expected genotypes and phenotypes of F1 generation offspring. After measuring blood pressures, four breeding groups were developed with both HT male and HT female AGMs. Offspring from HT/HT matings have been born in the years 2016-2020. An F2 generation can now be developed with sexually mature HT male and HT female offspring from the years 2016 and 2017. Current genome wide association studies (GWAS) are ongoing in this select population of purpose bred AGMs that will identify loci of physiological and pharmacological interest in the development of HT. Since the AGM and human primates share significant genome overlap (97%) this purpose bred approach should focus molecular genetic regions for the treatment of human essential hypertension. These genome loci will allow pharmacogenetics to target new treatments for patients that now exhibit drug resistant hypertension.

BIOLOGY

USING *S. MEDITERRANEAN* TO STUDY GENE REGULATION IN CANCER

Author(s): Rachel von Ebers

Chellgren Fellow and Honors Program

Faculty Mentor(s): Elizabeth Duncan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24158>

Schmidtea mediterranea is a species of planarian worms that possesses extraordinary regeneration abilities, however, the functions of many genes are still relatively unknown. Despite their ability to regrow and replace new tissues after loss or damage, a process requiring many cancer-like processes such as proliferation and migration, these animals show few signs of cancer. One hypothesis is that planarians use epigenetic regulation to maintain expression of genes that protect against tumorigenesis. The correlation between epigenetically regulated genes in the planarian species *S. mediterranea* and human cancers was examined. Databases of human patient information, such as cBio Portal and the Kentucky Cancer Registry, were examined and specifically searched for connections to cancers with a higher incidence in Kentucky. The Appalachian cancer hypothesis states that certain cancers are more common in this region because of environmental actors, perhaps due to the coal mining and fracking in Kentucky. Recent studies have shown that a mutation results in a gain of function in PPM1D, an oncogene involved in the DNA Damage Response pathway, and causes an inactivation of p53.

BIOLOGY

****TO TREE OR NOT TO TREE: A STUDY ON DIVERSITY OF STICK INSECTS (PHASMATODEA)**

Author(s): Sherrel Walker

First Generation

Faculty Mentor(s): Jeremy Davis and Bethany Ison

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24063>

Insects are the most diverse group of organisms on the planet, yet the breadth of this diversity as well as its origins remain poorly understood, despite the value to our understanding of biodiversity on earth. This is particularly true of stick insects (Order: Phasmatodea) who rely on local plant growth for crypsis. Diversity in stick insects has been shown to be highest in the tropics, where plant diversity is also highest, and given the close relationship between stick insects on the plants that provide them crypsis, it is expected that there is a relationship between plant and stick insect diversity. Here, I used observation data from iNaturalist to evaluate if diversity in plant life is correlated with stick insect species richness in the United States, where I found a modest but positive correlation.

BIOLOGY

INCREASED PULMONARY FUNCTION FOLLOWING ADMINISTRATION OF A CBD-CONTAINING COMPOUND NCMB-1 IN FIBROTIC LUNGS OF AFRICAN GREEN MONKEYS

Author(s): Madison Webb

Honors Program

Faculty Mentor(s): Jeffrey Osborn

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23931>

Cannabidiol (CBD) is a modulator of cannabinoid (CB) receptor action both in the central nervous system and in the periphery. CB receptors are involved in inflammatory responses in peripheral organs, but little is understood regarding the relationship between pulmonary disease and CBD modulation of general CB receptors *in vivo*. The African Green Monkey (*Chlorocebus aethiops sabaeus*; AGM) has bronchiolar tissue and tracheal branching similar to that in human lungs, therefore making it a translational model for the study of CBD treatment on pulmonary fibrosis-related lung dysfunction. We hypothesize that administration of NCMB-1, a hemp extract with CBD, will increase the tidal volume, inspiratory flow rate, and respiration rate of animals with previously induced pulmonary fibrosis. Baseline tidal volume, inspiration flow rate, and respiration rate of 16 male AGM with induced lung fibrosis were measured. Animals were divided into a vehicle and 3 treatment groups: 50 μ L of undiluted, 5X dilution, and 25X dilution NCMB-1 administered orally twice daily via banana sections for two weeks. Compared to control ($n=4$, 206.6 ± 36.4 mL), 5X NCMB-1 increased tidal volume ($n=4$, 484.0 ± 54.6 mL; $p<0.05$) at two weeks of treatment. Inspiratory flow rate also increased in 5X treated animals ($n=4$, 412.0 ± 49.9 mL/s; $p<0.05$) compared to vehicle ($n=4$, 212.3 ± 50.7 mL/s). Respiration rates increased in 1X treated animals ($n=4$, 33.0 ± 4.5 breaths/min) and 5X treated animals ($n=4$, 30.8 ± 3.9 breaths/min) compared to control ($n=4$, 28.5 ± 4.1 breaths/min; $p<0.05$). These results indicate CBD as a potential modulator of CB receptors and suggest a therapeutic value of CBD in the treatment of restrictive pulmonary disease. Future directions include immunohistochemistry of CB receptors in the hypothalamus of these AGM. CBD crossing the blood brain barrier in animals treated with NCMB-1 may alert regulation of CB receptors, positively impacting lung function.

BIOLOGY

****EFFECTS OF Mn^{2+} ON SENSORY NEURONS IN CRUSTACEANS**

Author(s): Reece Wilson, Carlie Cryer, Christopher John Di Girolamo, Christin Haddad, Matthew Lanning, Mason Miller, and Devan Neely

First Generation

Faculty Mentor(s): Robin Cooper and BreAnna Whittinghill

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23893>

Manganese is an essential element for animals but also possesses harmful effects at high concentrations. Miners exposed to high concentration have a myriad of neurological effects which are not fully understood. The effects of Mn^{2+} on sensory biology have not been well investigated. The situ proprioceptive chordotonal organ of the Blue crab (*Callinectes sapidus*) is used to examine the effect of acute exposure to Mn^{2+} on neural activity. This organ is found in the most distal joint of the walking leg of the Blue crab. The exposure to saline solution with $MnSO_4$ (1 M and 1 mM) was examined as well as sucrose at 1 M solution as an osmolarity control. This was accomplished with a suction electrode to monitor nerve activity, amplifier, and lab chart computer software system. The joint housing the chordotonal organ was moved while monitoring the neural activity before, during and after exposure to Mn^{2+} . The acute high concentration (1 M) decreased neural activity but the 1mM concentration did not. The effect of 1M $MnSO_4$ was not due to osmotic differences as 1M sucrose did not alter the neural activity. How manganese alters neural activity in primary sensory nerves remains to be investigated. Is it affecting the stretch activated ion channels in the sensory endings or is it blocking ion channels which are responsible for producing the action potential? The effect of lower concentrations for prolonged times remains to be examined. This research contributes to the advancements being made in the study of the effects of Mn^{2+} on living organisms.

BUSINESS & ECONOMICS

THE INFLUENCE OF VERTICAL ORIENTATION ON INTERTEMPORAL CHOICE DISCOUNT FUNCTIONS AND VISUAL ATTENTION

Author(s): Madison Boosveld

Chellgren Fellow, Honors Program, Psychology Scholar

Faculty Mentor(s): Adam Craig

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23760>

Is it worth waiting until your favorite department store sends you a 20% off coupon, or should you go ahead and buy those shoes you have been eyeballing now when they are only discounted by 5%? Consumers regularly face decisions such as this one that require a tradeoff between time and money. Although these decisions seem relatively simple and straightforward, a variety of factors can impact a consumer's bias toward choosing an immediate, smaller reward or a delayed, larger one. One such factor is the spatial arrangement of time. English speakers tend to conceptualize time as occurring on a horizontal axis as opposed to a vertical axis; for example, most timelines depict the earliest events to the left and later ones further to the right. Thus, Craig seeks to illustrate that vertical presentations of intertemporal choices will cause consumers to devote less attention to the temporal aspect of decisions, as this spatial arrangement of time is incongruent with consumers' innate horizontal comprehension of it. Incongruent arrangements are difficult to process. Furthermore, they hypothesize that this decreased attention to time will increase consumer's likelihood to choose a larger monetary benefit at the expense of having to wait more time to receive it. In other words, if a consumer is less aware of the amount of time they will have to wait to receive a larger reward, they are more likely to choose the larger reward. Furthermore, the researchers use eye-tracking to compare the amount of attention that consumers allocate toward the difference in monetary amount versus the difference in time delay between the immediate and future options.

BUSINESS & ECONOMICS

TRENDS IN THE EMPLOYMENT-TO-POPULATION RATIO ACROSS THE UNITED STATES

Author(s): Jennifer Rodriguez

Chellgren Fellow, William C. Parker Scholar

Faculty Mentor(s): Carlos Lamarche

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23868>

It has been recently documented that the employment-to-population ratio in the United States is declining. Abraham and Kearney (2020) show that the employment-to-population ratio has decreased from roughly 64% in 1999 to 60% in 2018. This study will investigate state-specific trends in the employment-to-population ratio, and document how they differ from the national trends, how states' behavior differs from each other, and how the same state can differ over time. Using data from the Bureau of Labor Statistics and the University of Kentucky Center for Poverty Research, significant heterogeneity across time and states are found. For instance, the District of Columbia's employment-to-population ratio has increased during 1999-2018 by 3%, while during this same time, Alaska's ratio dropped by 8%. The investigation also focuses on how different states recovered from the significant decline in the employment-to-population ratio after the Great Recession of 2007-2009. For those aged 16-24 in Indiana, they experienced a 33% decline in the employment-to-population ratio during 1999-2009 but experienced a 40% increase from 2009-2018. Other states did not make a recovery. For instance, Illinois's employment-to-population ratio for the age group 16-24 dropped 27% from 1999-2009 and only increased by 10% from 2009-2018. Moreover, it is found that the employment-to-population ratio trends vary by age group. Americans 16-24 have experienced the largest decline in the employment-to-population ratio while Americans 65+ have experienced the largest increase in the ratio. Lastly, the determinants of the changes in the employment-to-population ratio are investigated using regression analysis.

Keywords: employment-to-population ratio, state trends, national trends

CHEMISTRY

**** VISUALIZING DNA VIA BLUE-LIGHT FLUORESCENCE: A POTENTIAL CONTINUATION OF THE STRAWBERRY DNA EXPERIMENT**

Author(s): Sai Boyareddygar, Hadley Carmichael, Katie Flynn, Zachary Leach, Molly McCormick, Madison Mitchell, Bryce Siegle, Abby Weddington

Faculty Mentor(s): Steven Testa, Reilly Cochran

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24093>

A common experiment in early elementary science education is the extraction of DNA from strawberries. This experiment is a powerful educational tool because students get to perform simple chemical procedures, which result in the visualization of a reaction product: strawberry DNA. In reality, the strawberry DNA being visualized is a globular mass consisting of DNA, RNA, proteins, sugars, and other biological polymers.

One of the drawbacks of the well-utilized DNA extraction experiment is that there are no reports in literature (or online) of any follow-up educational experiments. Once the DNA mass is extracted, the experiment is over. In an educational sense, this is unfortunate, as DNA is a biopolymer with interesting and useful chemical properties. As scientists, we seldom isolate DNA for its own sake; DNA is an experimental reactant, subject to a whole host of chemical and biological procedures.

One visually exciting and chemically important property of DNA is that, in a controlled experiment, we can physically see it undergoing fluorescence. Showing DNA fluorescence after extraction would be a useful 'next step' in a broader strawberry DNA project, especially to teach that DNA is a chemical that undergoes reactions. Unfortunately, the fluorophores that must bind to DNA to allow it to fluoresce are blocked because the strawberry DNA extracted is too impure.

In this project, we attempted to purify the strawberry DNA that was extracted from a typical strawberry DNA experiment. Four different methods of purification were tested. We also, separately, tested whether we could develop a simple procedure where DNA would fluoresce using blue light from a readily available and harmless flashlight as the input energy source. In this presentation, we describe the methods that were pursued; the results that were obtained, both successes and failures; and the potential for adopting these methods in an elementary education setting.

CHEMISTRY

**** QuCHERS EXTRACTION OF TPP IN HONEY**

Author(s): Amina Gaines, Justine Crowell, Tristan Harbold, Abbie Martin, Ashley McGraw, Shelby Moseley, Noah Salyers, Leah Simpson, Colton Smith, Shelby Smith

First Generation

Faculty Mentor(s): David Atwood, Laura Cox, Lexie Sims

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23918>

Colony collapse disorder and the decline of the bee population has been a growing problem in North America and other parts of the world. Bees take part in a significant proportion of pollination and it is important to understand why they are declining and how to prevent it. Pesticides are the leading suspect in the decline of bees, not because they are killing them, but they are impairing bees' behavior. Neonicotinoids such as imidacloprid are often found in pesticides and act as neurotoxins, altering the behavior of the bees. Because bees rely on each other, these toxins cause a decrease in colony success. In this experiment, the extraction procedure called "QuECHERS" was tested to see its efficiency in extracting pesticides from a sample of honey. The experiment notably uses MeCN as the solvent and TPP as the model pesticide because many pesticides contain phosphorus and are soluble in MeCN. In the experiment, five samples containing 0.2 grams of TPP and 10 grams of honey were used during the extraction process. After the first extraction, three out of five samples needed a second extraction to end up with the isolated pale, white solid of recovered TPP. Ultimately, the recovery of TPP from the honey was 82% with a standard deviation of 3%. This was found to be a reasonable extraction percentage but not very efficient given the need to extract a second time. Based on our findings, steps need to be taken to develop a better process to identify and extract pesticides from honey. Finding an accurate composition of honey is one of the first steps to find out how pesticides affect bees and provide a better understanding of how it is linked to their decline.

CHEMISTRY

NOVEL SMALL MOLECULE INHIBITORS OF ARID4B

Author(s): Wyatt Ringo

Honors Program, Patterson Scholar, National Hispanic Scholar

Faculty Mentor(s): Samuel Awuah

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23765>

AT-rich interactive domain 4B (ARID4B) is a member of the ARID family. Its upregulation has been shown to promote primary breast tumor growth and metastasis. ARD150, a small molecule that targets the chromo-barrel domain of ARID4B, has been developed by Awuah lab. ARD150 consists of two key structural frameworks, a 3,4-alkoxy substituted aromatic head and a solubilizing tail. This CHE395 project will seek to develop more potent analogs of ARD 150. The design of the new, improved class of ARD-150-like inhibitors - as informed by detailed in-silico studies of the interactions between ARD 150 and key amino acids within the chromo-barrel domain of ARID4B – will seek to modify these two structural parts of ARD150, so to improve therapeutic inhibition of ARID4B. This project will involve rapid optimization and chemical diversification of the lead compound, ARD150 through organic synthesis. This will result in >20 ARD-150-like inhibitors through the variation and testing of different aromatic heads and solubilizing tails. Using ARD 150 as a scaffold allows for quickly predicting similar compounds without requiring unique in silico design. These modified compounds aim to preserve the target affinity and specificity of ARD 150 while increasing potency.

CHEMISTRY

DEVELOPING A NEURAL NETWORKS FOR DIHEDRAL DEPENDENT ENERGIES

Author(s): Andrew Smith

Honors Program

Faculty Mentor(s): Chad Risko

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/16001>

Computational methods are essential for enhancing the speed of materials development. While these methods are still faster than traditional experimentation many calculations are incredibly time-consuming. Taking, for example, the computational derivation of optical properties interesting in solar cells. To determine these properties, one might use molecular dynamics however this generally requires a dihedral angle vs potential energy surface which must be parametrized using density functional theory (DFT). This is problematic as density functional theory typically runs on an n^3 timescale. Thus, leading to calculations of a single conformation taking hours to days for some large molecules. However, some have worked to remedy this by using neural networks such as the ANI model developed at Los Alamos by Smith et. al. in 2016. While this model excels at many simple molecules it struggles with properties key to many organic photovoltaics. In this work, we attempt to expand on the work of Smith et. al. to increase the accuracy of ANI on particularly on molecules with extended pi conjugation and generally larger molecules (greater than 50 atoms). This was done by using active learning as well as in-house generated DFT calculation. Although work is ongoing thus far the accuracy has been improved from an error of ~ 80 kcal/mol to ~ 32 kcal/mol for such molecules.

DENTISTRY

EVALUATION OF ANTI-MICROBIAL AND ANTI-INFLAMMATORY PROPERTIES OF MESOPOROUS SILICA NANOPARTICLES

Author(s): Sydney Gordon

Faculty Mentor(s): Octavio Gonzalez, Stephen Rankin, Barbara Knutson

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24099>

Efficient local drug delivery systems are needed to treat/prevent periodontitis. The purpose of our study is to synthesize mesoporous silica nanoparticles conjugated with FITC or loaded with metronidazole and flavonoids to test cellular uptake, along with their anti-bacterial and anti-inflammatory properties in human oral epithelial cells. Positive outcomes will allow future studies testing their effectiveness in human oral mucosa organotypic cultures and animal models of periodontal disease.

DIETETICS AND HUMAN NUTRITION

ASSESSING HEALTH BEHAVIORS AND STRESS AMONG COLLEGE STUDENTS BEFORE AND SINCE THE COVID-19 PANDEMIC

Author(s): Anisah Arain, Lauren Ginter
Honors Program

Faculty Mentor(s): Kendra Oo

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24079>

The COVID-19 pandemic resulted in an economic recession and impacted the health and livelihoods of many individuals. Virtual learning environments and social distancing recommendations were particularly challenging for college students. However, there is little evidence on how the pandemic affects students' health behaviors and perceived stress or how virtual learning and social distancing impact students' learning and social experiences. The purpose of this cross-sectional survey research is to assess behaviors and health measures of a convenient sample of college students involved in a service organization that focuses on health and well-being. An online anonymous survey housed in Qualtrics was provided to 40 students in February 2021. Results show that, compared to before COVID-19, the average time spent participating in moderate and vigorous physical activity each day decreased by 28.2 and 26.4 minutes, respectively, while the average time spent sitting each day increased by 96.9 minutes. A 10-item perceived stress scale showed that the percentage of people with perceived high stress increased from 4% to 22%. Results also showed that virtual learning harmed more than helped their health and well-being. Preliminary findings from this study suggest that students are experiencing challenges that may impact their overall health and wellness. There is a need for more research with less self-reported data and more innovative programming on student health and success during the pandemic.

DIETETICS AND HUMAN NUTRITION

WEIGHT FLUCTUATION AND DIETARY HABITS OF PROGRESSING COLLEGE STUDENTS

Author(s): Alyssa Bickett

Honors Program

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24034>

Background:

Students are subjected to numerous changes in their lifestyle habits including, but not limited to, eating practices, physical exercise, and stress factors when transitioning into college. The commonly used “Freshman 15” is a saying that indicates during one’s freshman year, it is normal to gain upwards of 15 pounds. It was hypothesized the longer the student progressed in their college career, their weight would plateau or slowly decline to the individual’s conventional weight and or adiposity level.

Methods:

98 students at the University of Kentucky participated in an online survey inquiring about eating habits, weight gain timelines, and body style transformations. The study included multiple-choice questions using a Likert scale as well as two open-ended questions in which students could describe habit and eating changes during their college experience.

Results:

It was concluded that the year the college student was in accounted for nearly 80% of weight variance. The research in the following study indicates that during the first year and partially the second year of college, students do gain weight but very rarely is the full 15 pound gain achieved. There is a strong correlation between weight gained and when weight was increased. While this is true, there is not enough significant evidence to indicate that weight gain will plateau or stop as the individual ages.

Conclusion:

More research should be conducted to identify how students entering college can manage their weight more effectively, as well as a further look into the significant factors that are contributing to the initial weight gain.

DIETETICS AND HUMAN NUTRITION

CHARACTERIZATION OF THE ALTERNATIVE RENIN ANGIOTENSIN SYSTEM (ACE2 AND NEP) IN PREGNANCY

Author(s): Patrick Bidros

Honors Program, University Scholars Program

Faculty Mentor(s): Robin Shoemaker

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23904>

Background: Pregnancy causes dynamic change within the cardiovascular system. Preeclampsia, PE, is an unpredictable condition of sudden hypertension at 20-weeks gestation. The renin-angiotensin system (RAS), crucial for regulation of blood pressure, is activated during healthy pregnancy and dysregulated in PE. Angiotensin converting enzyme 2 (ACE2) and neprilysin, NEP, are enzymes that regulate the 'alternative' arm of the RAS, the alt-RAS. The role of the alt-RAS, which has protective effects on blood pressure in preclinical studies, is not yet fully understood in pregnancy and PE.

Methods: Data were derived from patients in an observational cohort study and concurrent randomized trial. The cohort recruited women at low risk for PE by USPSTF criteria. In the randomized trial, patients defined as high risk for PE were randomized to 81mg versus 162mg of aspirin for prophylactic prevention of PE prior to 16 weeks gestation. Serum samples were obtained at early (11-16 weeks) and late (28-32 weeks) gestation. Serum ACE2 and NEP activity were assessed using substrate conversion assays, then using liquid chromatography with tandem mass spectrometry (LC-MS/MS) for quantification of angiotensin peptide products. Analyses were completed with paired t-tests, 2-way ANOVA with pairwise analysis, and correlation analyses.

Results: The concentrations of serum ACE2 and NEP were significantly higher at late versus early gestation ($p < .0001$). Early NEP and ACE2 were positively associated with BMI ($p < 0.05$) but NEP was more strongly associated with BMI. Larger elevations in ACE2, between early and late gestational time points, were associated with PE ($p < 0.01$, $n=7$).

Conclusion: ACE2 was associated with PE. Early NEP concentrations were greater in patients with BMI > 30 . Both enzymes showed a significant increase at late gestation. Further research into the significance of these levels could point to a potential biomarker, ACE2, for women at higher risk of developing PE.

DIETETICS AND HUMAN NUTRITION

EFFECTS OF JUUL E-CIGARETTE ON MEMORY AND ATTENTION AMONG COLLEGE STUDENTS

Author(s): George Butros

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23901>

Background:

It is hypothesized that there will be a positive correlation between nicotine use and its effects on memory, attention, and grade point average among college students. However, current research varies on nicotine and its cognitive effects. This study aims to analyze the effects of JUUL e-cigarette use on memory, attention, and GPA among college students, by distributing an online survey to University of Kentucky students.

Methods:

Data was collected from 100 college students enrolled at the University of Kentucky (57 males and 43 females). Self-reporting surveys were distributed to students via various social media outlets. The survey recorded e-cigarette usage and history, current GPA, memory interpretation, and attention span. ANOVA tests were conducted.

Results:

30.7% of participants self-classified as daily users, 28.7% as occasional users, and 40.6% as non-users or have never tried. Males (37.5%) were more likely to be classified as occasional users than females (19.0%), and females (59.5%) were more likely to be classified as non-users than males (26.8%). ANOVA tests were conducted, and no statistical significance was found between user classification and GPA ($p=0.1$), user classification and memory T-score ($p=0.314$), or user classification and attention T-score ($p=0.571$).

Conclusion:

The results suggest that JUUL e-cigarette use does not affect memory, attention, or GPA among college students. However, due to the varying results in nicotine's cognitive effects, further research should be conducted using similar demographics, due to high popularity amongst this group, and explore the male gender significance within user classification.

DIETETICS AND HUMAN NUTRITION

CREATINE RESPONSE WITH VARYING LEVELS OF PROTEIN INTAKE: A CROSS-SECTIONAL DESIGN

Author(s): Sam Cundiff

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23725>

The response of creatine monohydrate supplementation produces drastically different results among users. There has been limited research conducted aiming to identify if there is a relationship between certain nutritional behaviors and creatine response. This research aimed to determine if there is a relationship between the amount of protein intake and creatine response in students at the University of Kentucky. It was hypothesized that greater protein intake would lead to a broader creatine response in students at the University of Kentucky. This research employed a cross-sectional survey that was administered in university-wide group messages, in which only UK students were eligible to participate. The survey asked questions regarding whether or not participants were consuming creatine, their response to the supplement (increased strength, increased muscular endurance, quickened recovery), and whether or not they were consuming at least 1.5g/kg bodyweight protein per day. If participants consumed 1.5 g/kg bodyweight protein or more, they were placed into the “satisfied” protein category. Anyone consuming less was placed into the “unsatisfied” category. Over 130 responses were collected, but only 13 individuals met the inclusion criteria of consuming at least 5 g of creatine per day for at least 2 weeks. Results were determined using three Fisher’s tests based upon response to creatine and amount of protein intake. 77% of individuals who met the inclusion criteria consumed 1.5 g/kg bodyweight of protein or higher. However, all three Fisher’s tests reported a p-value=1.0. Because the tests produced a p-value of 1.0, the null hypothesis was not rejected. There was no relationship between the amount of protein consumed and creatine response. Additional research, with a larger sample size, should be conducted to further investigate this phenomenon.

DIETETICS AND HUMAN NUTRITION

THE USE OF DIETARY SUPPLEMENTS IN RELATION TO BMI IN COLLEGE STUDENTS

Author(s): Jessica Durbin

Honors Program

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22620>

Many college students choose to take dietary supplements, such as multivitamins, protein supplements, and immune support supplements for a variety of reasons. However, there are still many questions regarding the impacts and associations of dietary supplementation and BMI in college students. With BMI trending upward, this study aims to analyze the relationship between dietary supplementation and BMI, using a cross-sectional survey for students at the University of Kentucky. Data was collected from 57 students, aged 19-21 years. These self-reported surveys collected information about types, frequency, and reason for using three categories of dietary supplement: multivitamin/multimineral, protein, and immune support. Multiple t-tests and Pearson correlation tests were conducted for analysis. The category showing highest regular use was multivitamin/multimineral, with 35.7% of participants using this category of supplement at least five days per week. Immune support supplements showed 37.5% of participants using sporadically or regularly, and protein had the lowest use rate, with 71.9% of participants not using protein supplements at all. T-tests were conducted for each category of supplements, but only multivitamin/multimineral supplements showed a statistically significant p-value, at 0.02116. The p-values for protein and immune support supplements did not reach the threshold to be considered statistically significant. The Pearson correlation values indicated that a lower BMI was weakly associated with increased use of multivitamin/multimineral and immune support supplements (-0.3335 and -0.2437, respectively). The correlation value for protein supplements, however, was 0.2419, which indicates a weak correlation between protein supplement consumption and increased BMI. These results suggest that multivitamin/multimineral supplements may be correlated with a lower BMI. Further research is necessary to make conclusions regarding BMI and other types of supplements, and even specific combinations of nutrients to better the health of this specific population.

DIETETICS AND HUMAN NUTRITION

THE EFFECT OF GLUTEN-FREE CONSUMPTION ON BMI IN COLLEGE STUDENTS

Author(s): Kotryna Dzekcioriute

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23829>

Background: The gluten-free diet has recently gained popularity by being consumed by those who do not have celiac disease. One of the greatest motives for consuming a gluten-free diet is in hopes of lowering total body weight. There is currently little research known about the association of BMI and gluten in college students. It is hypothesized that consumption of a gluten-free diet will lead to an increase in BMI in college students. This study aims to investigate the relationship between gluten-free consumption and BMI in college students by distributing a cross-sectional survey to University of Kentucky undergraduate students.

Methods: The electronic cross-sectional survey was distributed via various club group messages and social media outlets linked with the University of Kentucky. Data was collected from a total 56 undergraduate students (64% female and 36% male). The survey recorded the age, height, weight, and reasoning for consumption of gluten or gluten-free products of the respondents.

Results: A t-test was conducted for further data analysis and indicated that the correlation between BMI and gluten-free consumption is not statistically significant ($p\text{-value} = 0.349$). Approximately 18% of participants reported that they consume a gluten-free diet. 70% of gluten-free consumers fell into the normal BMI category, while 30% were categorized as obese.

Conclusion: The results of this study suggest that there is no correlation between following a gluten-free diet and BMI of undergraduate college students. It is likely that the results are statistically insignificant due to the very small sample size of the study. A recommendation for future research would be to conduct this study with a larger and more diverse sample size.

DIETETICS AND HUMAN NUTRITION

RELATIONSHIP BETWEEN FITNESS TRACKING DEVICES AND COMPULSIVE EXERCISE BEHAVIORS AMONG COLLEGE STUDENTS

Author(s): Susanna Goggans

Honors Program

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23853>

Background

As fitness trackers gain popularity, it is important to examine their effect on mental health, particularly compulsive exercise behaviors (continual rigid and extreme urges to exercise)[1]. Currently, there is little research on this topic, specifically concerning college students who are more susceptible to mental illness. This study aims to investigate the relationship between fitness trackers and compulsive exercise behaviors among college students by distributing a cross-sectional survey to undergraduate students. It is hypothesized that those who use fitness trackers will display more compulsive exercise behaviors.

Methods

Data was collected from 123 college students (64.23% female, 34.15% male, 1.63% non-binary). Cross-sectional surveys were distributed on social media platforms and to major clubs at the University of Kentucky. The survey recorded fitness tracker use, motivations to exercise, and included the Compulsive Exercise Test (CET) to gain an understanding of their compulsive exercise behaviors.

Results

60% of participants used a fitness tracker while 40% of participants did not. The range of CET scores among participants was 13-84 with a mean of 53.15 ± 12.99 . A t-test indicated that participants who use fitness trackers had higher CET scores (55.19 ± 12.62) than those that do not use fitness trackers (50.06 ± 13.06) ($p < 0.0331$). A t-test also showed that males averaged a lower CET score (50.12 ± 12.56) than females (54.92 ± 13.10) ($p < 0.052$). A fisher's exact test showed that males are less likely to use a fitness tracker than females ($p < 0.00608$).

Discussion

The results suggest that college students who wear a fitness tracker have a higher CET score than those that do not with gender being a potential confounding variable. However, the mean of the scores differed only by 5.13 points on a 120-point scale, limiting the clinical impact. Future studies should investigate the relationship of CET scores and gender and the impact of a high CET score on one's quality of life.

DIETETICS AND HUMAN NUTRITION

DAILY ADDED SUGAR AND ORAL HEALTH IN UNDERGRADUATE COLLEGE STUDENTS

Author(s): Ava Gray

Honors Program

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24065>

Background

As a young adult begins college, their diet begins to include more daily added sugar which can have an effect on oral health, specifically development of dental caries or gingivitis. More research is needed on this topic specifically targeting the college student population. The aim of this study was to determine the relationship between daily added sugar and risk of dental caries/gingivitis. It was hypothesized that college students who have higher intake of daily added sugar will have a higher rate of dental caries/gingivitis compared to those who have lower intake of daily added sugar.

Methods

The study sample included 108 University of Kentucky undergraduate students, with 68.2% being female, and 31.8% being male. A cross-sectional electronic self-report survey was distributed among social media outlets, specifically being distributed to different organizations/clubs at the University of Kentucky.

Results

A correlation test indicated no relationship between daily added sugar intake and risk of dental caries/gingivitis. The p-value was calculated to be 0.024. The mean value for total added sugar intake was calculated to be 4.5 sugar containing foods or beverages a day, with more sugar containing foods being consumed compared to beverages. The mean value score for risk of dental caries/gingivitis was calculated to be 1.8. Around 68.5% of the participants see their dentist on a regular basis (every 6 months) and over 60% brush and floss their teeth 1-2 times per day.

Conclusions

The results of this study show that there is no significant correlation between amount of daily added sugar intake and risk/presence of dental caries or gingivitis. For future research, a larger study population is recommended in order to have stronger supporting results.

DIETETICS AND HUMAN NUTRITION

CONSUMPTION OF COCOA FLAVANOL AND RISK OF DEPRESSION IN COLLEGE STUDENTS

Author(s): Emily Hayes

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23983>

Background: It is hypothesized that consuming cocoa flavanols, especially dark chocolate, is a contributing factor to lowering the risk of depressive symptoms especially in college students. It is still unclear whether dark chocolate decreases the risk of depression among college students. The aim of the study was to determine the relationship between cocoa flavanols and occurrence of depressive symptoms among college students through a cross-sectional study.

Methods: Data was collected from 84 college and graduate students enrolled at the University of Kentucky (66.3% females and 31.3% males). Self-reported surveys were distributed to students via social media and QR codes. The survey recorded dark, milk, and white chocolate consumption, physical activity, alcohol consumption, and depressive symptoms in college. A cross-sectional survey and correlation test were conducted.

Results: A T-test indicated there wasn't a significant difference between students consuming dark chocolate and those who did not. ($p=0.45$). A correlation test indicated people that consumed less servings of dark chocolate reported higher depression scores between 5-10. The mean depression score was 3.77 which indicates the sample population scores were below the indication of depressive symptoms on the PHQ9 scoring system. More than 67% of the study population recorded exercising more than three times a week, and about 35% said they consumed alcohol once or more than three times a week.

Conclusion: The results suggest that consuming cocoa flavanols, especially dark chocolate, does affect depression rates of college students. However, more research should be conducted on why dark chocolate affects depression rates most significantly.

DIETETICS AND HUMAN NUTRITION

EVALUATING THE IMPACT OF CAMPUS KITCHEN AND FARM TO FORK AT THE UNIVERSITY OF KENTUCKY ON REDUCTION OF FOOD WASTE AND FOOD INSECURITY

Author(s): Jordan Hinton

National Conference on Undergraduate Research (NCUR) Presenter (2020-21), Chellgren Fellow

Faculty Mentor(s): Kendra OoNorasak, Makenzie Barr, Tammy Stephenson

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23181>

This research examines Campus Kitchen (CK) operations involving food recovery, preparation, and distribution, and analyzes behavioral perceptions of college students utilizing the Farm-to-Fork (F2F) free meal program at the University of Kentucky. From August 2018 to December 2019, CK food recovery and meal data was collected and a F2F cross-sectional student survey (n=284) was administered twice. CK students volunteered 4,890 hours, recovered 14,990 pounds of food, and served 8,839 meals. Those utilizing F2F more frequently had significantly ($p < 0.05$) more positive perceptions of the impact of F2F on health, academic behaviors, and overall food security. CK's economically and environmentally sustainable practices should be built upon to improve diversion of food waste to food insecure populations.

DIETETICS AND HUMAN NUTRITION

MENTAL HEALTH AND ALCOHOL CONSUMPTION IN COLLEGE AGE STUDENTS

Author(s): Laney Hudson

National Conference on Undergraduate Research (NCUR) Presenter (2020-21)

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24092>

It has been hypothesized that alcohol consumption has a negative impact on the mental health in college age students. From the impacts of COVID-19, separation and social distancing has made it difficult for interactions. Mental health is a major factor in an individual's quality of life, therefore the purpose of this study is to assess alcohol consumption in direct relation to mental health by using a survey. The first part of the survey consisted of 8 questions assessing alcohol consumption as well as the PHQ-9 questionnaire, which consisted of 9 questions assessing mental health status. The survey was distributed to multiple social media platforms, 70 participants were involved in the study, with 24 participants fully completing the survey in its entirety. When analyzing the results, data that was collected from the survey was exported into Microsoft Excel where a Pearson's correlation was completed. Out of the participants, the ones who have consumed alcohol and completed the PHQ-9 were evaluated. This group had a coefficient of -0.11, T statistic of 0.50, and a p-value of 0.31. These two variables were not correlated. The relationship between consuming alcohol and mental health were not associated. More studies need to be conducted to further show the effects of mental health from alcohol consumption.

DIETETICS AND HUMAN NUTRITION

HPV VACCINATION AND GENDER

Author(s): Emily Huff

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23912>

Abstract

Vaccination has become a popular and controversial topic, even more so now since the COVID-19 pandemic. HPV vaccination is critical in preventing cancer, the spread of other diseases, and long-term health effects, especially in young adults.

The goal of this study aims to define the relationship between HPV vaccination and gender in college age students utilizing a cross-sectional study. This hypothesis of this study is that HPV vaccination rates will be higher in college-aged females than in college-aged males. A survey was distributed electronically to various groups of students at the University of Kentucky, with 96 students responding. Of these 96 students, there were 88 females and 8 males. The survey consisted of twelve questions, which asked for information regarding gender, race, age, and a series of questions regarding HPV vaccination. A chi square test was utilized to determine the p-value for the relationship between gender and HPV vaccination. The results of this test were shown to be significant, with the p-value being less than 0.05 at 0.01835. With this being said, the null hypothesis is rejected which means there is a difference between the groups. The null and alternative hypothesis are listed as follows:

Ho: HPV vaccination in college-aged females = HPV vaccination in college-aged males

Ha: HPV vaccination in college-aged females > HPV vaccination in college-aged males

Overall, future research should be conducted not only to see if an increase in vaccination rates occurs over the next decade, specifically in males.

Keywords: HPV vaccination, gender, vaccination, disease prevention

DIETETICS AND HUMAN NUTRITION

ORAL AND TOPICAL VITAMIN C IN COLLEGE-AGE FEMALE STUDENTS COMPLEXION

Author(s): Chloe Johnston

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24078>

One aspect that changes for most people in their college-age years is their skin. The changes in a person's skin can be due to a variety of factors including stress, alcohol, dairy consumption, and food intake. It is hypothesized that increasing vitamin C in your diet will lead to better skin complexion in college-aged girls than those who apply it topically. Throughout this review, the dietary implications of vitamin C on skin health will be discussed and compared to topical use. A link to an electronic survey was distributed to college aged girls around the University of Kentucky by word of mouth, and a total of 109 females completed it. The survey included questions about the participants demographic information, dietary consumption of vitamin C, topical use of vitamin C, and other confounding factors such as alcohol, dairy, and fast food intake. Results showed that 91.7% of the participants consumed foods regularly that contain adequate amounts of vitamin C, and that 55.1% of participants do not apply vitamin C topically. This study also found that 51.4% of participants were content with the complexion of their skin, and at the end of the survey 80.1% said that they would consider adding more vitamin C in their diet if it could help with the complexion of their skin. The results of the confounding factors were 5 drinks consumed, 3.6 servings of dairy, and 2.2 visits to fast food restaurants per week respectively. The results of this study were not significant and show that there was not a positive relationship between dietary vitamin C and satisfaction of skin, compared to the topical use of vitamin C and satisfaction of skin. This study showed that dietary vitamin C did not have more of a positive impact on skin complexion than topical vitamin C on college-age females. It is recommended that future research be conducted to further support these results and add to the current research on vitamin C.

DIETETICS AND HUMAN NUTRITION

ANALYZING THE ASSOCIATION BETWEEN THE STANDARD AMERICAN DIET AND ALTERNATIVE DIETS ON JOINT HEALTH IN COLLEGE STUDENTS

Author(s): Haley Jones

William C. Parker Scholar

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/26283>

In a society full of fad diet trends, cultural eating patterns, and “one day diet” quick fixes, we are all looking for the best diet to sustain our short and long-term health goals. Amongst the various studies that show a connection between diet and different health components, there was a research gap in the topic of joint health. The hypothesis states that the Standard American Diet will have a negative effect on joint health in comparison to Alternative Diets. Furthermore, this study aims to show, analyze, and discuss the possible relationship between these two variables amongst college students, undergraduate and graduate.

A cross-sectional, electronic survey link was distributed to college students around the country totaling to 104 responses. The researcher wanted variation in participants because dietary patterns and choices vary not only with age and gender, but geographical location and social environment. The survey asked demographic information, diet classification, physical activity level, measuring pain of certain joint locations, and personal questions about whether they would change their diet to preserve joint health.

The results of this study were not significant between hip and toe joint pain but were significant for participants following the Standard American Diet having higher knee, ankle, wrist, and fingers/ hands joint pain. Also, the results showed a p-value of 0.00314 for participants who followed an Alternative Diet believed that diet would preserve joint pain over time more than the American Diet participants. In conclusion, this study showed a positive correlation in more restrictive/ alternative diets having less joint pain than those on the American/ omnivore diet amongst college students. Recommendations for future research would be to use a larger, more diverse group of participants, specifically focusing on a wider age range because age is a very important factor as it relates to joint health.

DIETETICS AND HUMAN NUTRITION

CONSUMPTION OF DIET DRINKS AND WEIGHT STATUS: A CROSS-SECTIONAL STUDY

Author(s): Margo Lawson

William C. Parker Scholar

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23937>

The world of weight management is full of fad diets, quick fixes, and products with unfounded promises; one common product in diet culture is diet soda. However, there is a gap in research on the effects of consumption of diet drinks and weight outcomes. This study aimed to determine if there is an association between the consumption of diet drinks and weight change (gain, loss, management) in the college student population via a cross sectional study conducted at the university of Kentucky. It was hypothesized that diet drink consumption in college students would have an association with weight status in college students. Data was collected via self-report survey from 19 students at the University of Kentucky, with most participants identifying as white females between 18-21 years old. A t test was conducted there was a p value of 0.862932, meaning that no correlation was found. Of the participants, 31% reported consuming diet drinks. Of those participants who consumed diet drinks, 33% reported they consumed diet drinks to lose weight. Overall, there was no significant correlation found between consumption of diet drinks and weight status in college students. However, due to the small population size in this study further research could be needed. In future research a larger population size, greater variation in demographics, and clinical supervision could be useful in gathering results and representing the population at large.

DIETETICS AND HUMAN NUTRITION

THE EFFECTS OF DAIRY CONSUMPTION ON ACNE PREVALENCE

Author(s): Lillian Maxwell

William C. Parker Scholar

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23936>

Does drinking milk increase the presence and severity of acne in young adults? There is currently little research on if milk, or certain types of milk, can increase the severity of acne that young adults experience. This study aims to answer this question by distributing a cross-sectional survey to undergraduate students at the University of Kentucky. Data was collected from 100 students at the university and the final sample size was 76 students. The survey asked questions regarding dairy consumption and acne severity, and the results were compiled to determine each student's dairy consumption over a one-month period as well as their acne severity during that time. A Pearson correlation test and a t-test were done on this data. The results showed that there was no correlation between total dairy consumption in one month on the severity of acne, but there was a significant relationship between type of milk and acne severity. When a t-test relating the type of milk drank with acne severity, it was shown that whole milk was a statistically significant driver for this relationship, with a p-value of 0.0478. However, it was shown that 50% of participants who drank 2% milk used an acne treatment, and 75% of participants who drank skim milk used an acne treatment. This could have affected the participant's self-reported acne severity. These results suggest that dairy consumption does not affect acne severity in young adults. However, due to many limitations, there is still a chance that this relationship could be significant. Future studies should include a larger sample size, should limit self-reporting, and should have participants refrain from using acne treatments during the study.

DIETETICS AND HUMAN NUTRITION

HOW CAN GINGIVITIS EFFECT SOMEONE'S HEALTH AND HOW CAN SOMEONE PREVENT IT?

Author(s): Mariah Meyers

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24037>

BACKGROUND

Gingivitis is a mild form of gum disease that causes irritation, bleeding, redness and swelling. Most healthy gums are normally coral pink but can be naturally darker with melanin pigment. The exploration of the way those with gingivitis are treated entails reversing the situation by brushing teeth twice a day for two minutes and flossing every night (or once a day), as well as regular cleaning by a hygienist, this can prevent having or getting gingivitis and causing it to get worse, such as. developing bone loss called periodontal disease, losing teeth, or even developing health issue in the future (e.g., heart disease, oral cancer, etc.).

METHODS

The study sample consisted of 49 College/University students (Both genders, men & female). The data collected from a survey on Qualtrics that was distributed on different social media websites. A cross-sectional survey was done and followed by a Fischer's test.

RESULTS

This study aims to focus on gingivitis and how to prevent it. The p-value 0.119721 for how many participants gum bleed during or after brushing their teeth. The statistical significance was measured along with satisfaction rates. A total of 80% reported they don't have gingivitis and 8% reported they do. According to the total of people reporting that they bleed after or during brushing or flossing 49% reported that they do and 39% reported they don't. almost half of my participants reported that they bleed after or during brushing or flossing which indicates that they have gingivitis. So, yes's averages out to 6 more than no's 4.75 in the people bleeding while brushing or flossing (t-test $p > 0.5$).

CONCLUSION

The results of this research, majority of participants 49% reported that they bleed while brushing or flossing, which is a sign of gingivitis. In conclusion it is important to maintain the healthy teeth, prevent plaque from appearing or forming on the teeth/gums that would cause gingivitis or periodontitis, gingivitis is a reversible disease. For future study, this should have included a larger sample size, should limit any self-reporting, and provide more talk about the bleeding what it means with photographs included.

DIETETICS AND HUMAN NUTRITION

THE EFFICACY OF VARIOUS BIRTH CONTROLS ON HORMONAL ACNE

Author(s): Carrie Morrison

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24005>

Background

It is hypothesized that birth control is associated with a reduction in acne lesions. However, birth control has varying levels of estrogen and progestin in the formulas leading to systemic or local effects. This topic needs to be explored to further understand the systemic impact birth control has on acne, and the gap in the research is defining the difference in local and systemic effects in various types of birth control. The hypothesis aims to measure the amount of lesions and the different methods of birth control to see how the levels of estrogen and progestin work together with hormonal acne.

Methods

The study sample consisted of 97 University of Kentucky Undergraduate females. The data was collected from a survey on Qualtrics that was distributed in various social media outlets. A cross-sectional survey was done and followed by a Fischer's test.

Results

The p-value was 0.00443. The statistical significance was measured along with satisfaction rates, outside stressors, and other acne treatments. 64.6% of birth control users described a reduction in acne lesions since being on birth control.

Conclusion

The results suggest that majority of acne lesions decreased from birth control use, and the varying levels of estrogen and progestin play similar roles in the management of acne. Hormonal birth control methods have systemic effects in the body. For future studies, various IUD's and oral pills need to be compared individually to measure dosage of estrogen and progestin to measure systemic effects more effectively.

DIETETICS AND HUMAN NUTRITION

COLLEGE STUDENTS: ASSESSING FOOD INSECURITY, PERCEIVED STRESS, EMPLOYMENT, AND BUDGETING HABITS BEFORE AND SINCE THE COVID-19 PANDEMIC

Author(s): Micaila Oberle, Samantha Udarbe

Faculty Mentor(s): Kendra OoNorasak, Makenzie Barr, Tammy Stephenson

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23759>

Introduction: Since March 2020, the COVID-19 pandemic has changed the lives of many in the United States through nationwide lockdowns and restrictions. College students have been impacted by the pandemic as well, being forced to relocate from university campuses and continue classes online. This has the potential to influence health and well-being in various ways.

Purpose: The purpose of this study is to identify the impacts of the COVID-19 pandemic on stress, dietary behaviors, food insecurity and well-being on college students.

Methods: An online anonymous survey was distributed to 897 student attendees and leaders of a student-led weekly free meal program from June 2020 to August 2020 and \$10 e-gift cards were provided to all survey respondents. The survey response rate was 26% (n=235).

Results: Of the participants who indicated that they were not working for pay, 37.8% were laid off or temporarily furloughed. The Perceived Stress Scale (PSS) was found to be significantly higher in food insecure college students than food secure students, both before ($p=.0038$) and since the pandemic ($p=.0459$). Also, those with high stress scores since the pandemic were more likely to experience high levels of stress before the pandemic ($p<.0001$).

Discussion: Based on these preliminary findings, the pandemic appears to have a significant impact on the stress and food security of college students; however, there is still a need for further research to determine other health parameters influenced by the pandemic. This research also indicates the potential for implementing a multidisciplinary relief for students facing these challenges.

DIETETICS AND HUMAN NUTRITION

THE EFFECT OF COVID-19 ON TASTE AND SMELL OF YOUNG ADULTS

Author(s): Thomas Payne

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24123>

Background: It is hypothesized that young adults aged 18 to 22 years old who test positive for COVID-19 would be the most frequent population to lose their sense of taste and smell as a symptom. However, there is little information and studies that have been conducted on this topic. The aim of this study is to analyze and provide more information to further study adults aged 18 to 22 who have tested positive for COVID-19 and may have lost their sense of taste and smell as a result.

Methods: Data was collected from adults of any age over 18 years old. Self-reporting surveys were digitally distributed through various social media forms. The survey through Qualtrics asked participants to state their age, gender, location of where they tested positive for COVID-19, what their symptoms were and how long their symptoms lasted. A T-Test was conducted once the results were in.

Results: 21.79% of participants had loss of taste and smell as a symptom of COVID-19. 61.7% of the participants of the survey were females. The majority of participants had symptoms that lasted between 4 and 14 days at 46.67%. A T-Test indicated that the hypothesis should be rejected as null. An error found for this survey would have been that since it was self-reporting at a time possibly far from the positive test date, participants may have had a difficult time recalling exact symptoms and time periods.

Conclusion: The results of the study suggested that there were many adults aged 18-22 that lost their sense of taste and smell as a symptom of COVID-19 but even more adults over the age of 22 had this symptom. This means that the hypothesis that almost all positive tests that lost their taste and smell were aged between 18 and 22 was an incorrect hypothesis.

DIETETICS AND HUMAN NUTRITION

THE EFFECT OF ACADEMIC STRESS ON ADDED SUGAR INTAKE IN UNDERGRADUATE STUDENTS

Author(s): Ellie Ransdell

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23644>

Background: Recent research has established a relationship between impulsivity and processed food intake within college campuses. What is unknown, however, is the extent to which college students may utilize added sugar as a coping mechanism for academic stress. This study aims to explore the relationship between academic stress and added sugar intake via a cross-sectional survey to undergraduate students at the University of Kentucky.

Methods: Data was collected from 159 undergraduate students enrolled at the University of Kentucky (70% female, 30% male respondents). Self-reporting surveys were distributed via social media outlets and QR code scanning. The survey recorded students' perceived stress (PSS) and weekly subjective stress, student attitudes, and the amount of sugary foods consumed each week. The PSS score with total sugar intake was analyzed with a ranked ANOVA test, and the subjective stress scores with weekly sugar intake were analyzed with ranked correlations.

Results: A strong positive relationship between overall PSS score and total added sugar intake was demonstrated (p value <0.00001, effect size 0.6). Low Stress students consumed the least sugar, increasing with Moderate and High Stress. A strong positive correlation was depicted between subjective stress and added sugar intake during test week (p value 0.012, effect size 0.232, R squared 0.0588) and after test week (p value 0.0005, effect size 0.33, R squared 0.09). Low Stress students had the greatest percent change in added sugar due to stress (46.1% reduction seen before test week to after test week), followed by Moderate Stress students (37.3%), High Stress (31.3%).

Conclusion: The results suggest that undergraduate students at the University of Kentucky consume more added sugar as academic stress increases. Higher stressed students consumed the most added sugar but demonstrated the smallest percent change. More research is needed to evaluate consequences of added sugar intake in stressful environments.

DIETETICS AND HUMAN NUTRITION

EXAMINING THE EFFECTS OF DAILY FLUID INTAKE ON SLEEP QUALITY IN ADULTS

Author(s): Shaylla Shelton

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23956>

Background: It is hypothesized that an adult's daily fluid intake has an effect on sleep quality. However, there is little known about the relationship between daily fluid intake and sleep quality. This study aims to examine the effects of adequate fluid intake and inadequate fluid intake on sleep quality in adults.

Methods: Data was collected from 125 adults aged 18 years or older (72% female, 97% white, non-Hispanic). Surveys were distributed to participants through social media. The survey recorded self-reported measures of daily fluid intakes of water, caffeine, alcohol, other fluids (e.g., tea, smoothies). The Pittsburgh Sleep Quality Index (PSQI) was also administered in the survey, where participants responded to questions about their sleeping habits over a month. A chi-square test was conducted to evaluate the relationship between hydration and sleep quality. Scatterplots were also examined to compare caffeine consumption to PSQI global score and total fluid consumption to sleep duration.

Results: Results of the chi-square test ($p=0.55$) showed that there was not a significant difference in sleep quality in those who consume an adequate amount of fluid compared to those who do not. A R-squared value of 0.002 showed no correlation between caffeine consumption and sleep quality. Similarly, total fluid consumption and sleep duration also showed no correlation with a R-squared value of 0.02.

Conclusion: There is no difference in sleep quality between adults with an adequate intake of fluids and those who do not. No relationship was seen between caffeine consumption and sleep quality in adults. Total fluid intake did not appear to have a relationship with sleep duration in adults. However, the sample population is not representative of the target population, so results may not be generalizable. More research is needed to assess fluid intake levels and sleep quality to provide accurate results.

DIETETICS AND HUMAN NUTRITION

MIGRAINE SEVERITY AND CONSUMPTION OF COMMON TRIGGER FOODS

Author(s): Lucinda Smith

Faculty Mentor(s): Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23958>

Background

Millions of Americans struggle with frequent headaches and migraines. It is important research explores the role of nutrition in migraine status, so the triggers can be identified and controlled. It is hypothesized that foods such as alcohol, dairy, and chocolate often lead to headaches and migraines. This study focuses on the role of dietary triggers in migraine status.

Methods

Data was collected from 198 adult participants (150 females and 48 males). Self-reporting surveys were distributed on Facebook, Instagram, and other social media outlets. The survey recorded demographic data, presence of headaches and migraines, severity of migraines, recognition of trigger foods, and food-frequency of chocolate, alcohol, and dairy. Pearson's correlation measured the relationship between the migraine severity score and the frequency of trigger food consumption.

Results

Of the 148 participants that suffered from headaches, 53.38% reported migraines. When asked about identification of trigger food, chocolate was the most common with alcohol and dairy following. Pearson's correlation revealed chocolate consumption was most strongly related to migraine severity with a coefficient of -0.32 which is considered a medium negative relationship. This suggests participants who suffer from severe migraines limit their chocolate consumption.

Conclusion

While the results show a relationship exists between migraine severity and chocolate consumption, a weak relationship exists between migraine severity and reported consumption of alcohol and dairy. However, due to the lack of reliability associated with self-reporting, the food-frequency is likely inaccurate. Future research should focus on incorporating a broader target audience to make the results more generalizable.

DIETETICS AND HUMAN NUTRITION

ASSESSING THE VALIDITY AND RELIABILITY OF 24-HOUR DIETARY RECALLS BETWEEN RESEARCHERS OF VARYING EXPERIENCE LEVELS

Author(s): Samantha Udarbe

Honors Program

Faculty Mentor(s): Julie Plasencia, Jessica Houlihan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23823>

Background: An initial study evaluated the relationship between cultural values and dietary patterns among Hispanic Kentuckians using the USDA Multiple Pass Method to collect 24-hour dietary recalls. Noticeable differences in the dietary recalls appeared between researchers of different experience levels, which is an occurrence that is not well studied. This study examines the validity and reliability of the 24-hour recalls and differences in dietary assessment skills of different researchers.

Methods: Twenty-four hour recalls of Hispanic participants were collected at three community clinics as part of the Cultural Values and Diet Study. In addition to the recalls, demographics were also extracted for the current study. The 24-hour recalls were analyzed for differences between researchers who collected the data using ANOVA, Chi-square and Bonferroni tests.

Results: The 24-hour recalls of 197 participants were analyzed. There were significant differences in the total calories ($p=.0294$) and dietary fiber ($p=0.0035$) recorded between all researchers. Specifically, there were significant differences in the total calories and dietary fiber intakes between the research dietitian and undergraduate student researcher. There were no significant differences in the percentage of carbohydrates, protein and fat recorded between the different researchers.

Discussion: These results indicate that the differences in experience levels can potentially lead to inaccurate measurements of dietary intakes. Valid and reliable 24-hour recalls are essential to correctly indicate the dietary behaviors of patients. The findings of this study provide implications for training on the correct use of the standardized 24-hour recalls via the USDA Multiple Pass Method with researchers of varying levels of expertise on dietary assessment.

EDUCATION

FEELING DISSATISFIED WITH PERFORMANCE DURING A PANDEMIC? UNDERGRADUATES EXPLAIN WHY

Author(s): Olivia Huffman, Lucy Hargis

5-Minute Fast Track Competition Finalist (Fall 2020)

Faculty Mentor(s): Ellen Usher, Calah J. Ford, Jaeyun Han

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23793>

Although researchers have found that students' self-efficacy increases when they feel successful, less is known about the factors that influence these perceptions of success. This study considers students' satisfaction with their course performance as a proxy for measuring their perceptions of success. Students who reported being extremely dissatisfied with their performance ($n = 297$) answered an open-ended item of, "What makes you feel extremely dissatisfied with your performance?" These responses were analyzed for themes, and a codelist was developed based on those themes. Codes included students' personal factors like self-regulation, mental health, and perceived difficulty. For example, a student said, "I have too much on my plate and I'm not able to devote time to study for this course. I'm just getting by." Other codes focused on students' behavioral responses about performance and effort. For example, a student referenced both personal and behavioral factors when they said, "I am irritated with myself for not doing well on exams and quizzes. Despite working really hard, I don't feel like I can get the scores I want." Finally, some codes related to students' environmental factors like course modality or challenging life situations. For example, a student said, "I couldn't do the homework for five weeks because I couldn't spare the money to pay for where we turned in assignments, so I fell behind then just gave up." Most responses were complex, requiring multiple codes across personal, environmental, and behavioral factors. Findings from this study provide insight into the factors learners consider when determining their level of satisfaction with their performance in a course, and uncover some of the struggles that students are facing during the COVID-19 pandemic.

ENGINEERING

AI BASED SHORT-TERM ELECTRIC LOAD FORECASTS FOR EXPERIMENTAL SMART HOMES INCLUDING HVAC, EWH, AND PV COMPONENTS

Author(s): Rosemary Alden

University Scholars Program

Faculty Mentor(s): Dan Ionel

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24000>

Individual residence load profiles are the most difficult to predict due to high variability of appliances and randomness introduced by human behavior. In previous literature, investigations have been made into both individual and aggregated residential data to improve performance of machine learning models at predicting future energy use for demand response schemes such as load shifting and use with energy storage or distributed energy resources (DER). These investigations, however, are limited by the available public data and its quality including missing data points, clear labeling, and descriptions. Within this poster, the SHINES residential public data set from the field demonstration site in Pensacola, FL managed by the Electric Power Research Institute will be used to compare two homes and the performance of the same deep learning Recurrent Neural Network LSTM model on predicting the total energy usage of the home, the HVAC, the WH, and solar generation of each home. This comparison will highlight the influence of the owners and appliance type on demand profile and the challenges with using machine learning to predict the main loads and generation of the future Smart Homes. The value of these predictions lies in their use with HEMs to reduce energy usage, peak load stress on utilities, and cost to the user.

ENGINEERING

COMPETITIVE PROGRAMMING AND ITS ROLE IN IMPROVING RESEARCH SKILLS

Author(s): Chase Ballard, Brendon Bultman

First Generation, Honors Program

Faculty Mentor(s): Jerzy Jaromczyk

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24114>

Members of the UKY Competitive Programming team discuss their experiences from past competitions hosted by the International Collegiate Programming Contest, and how these experiences pertain to improving research skills.

We show relevant problems from past competitions and discuss how these problems pertain to improving research skills. Additionally, we discuss the breadth of knowledge required to compete in competitive programming, and how this knowledge applies to research ability. Likewise, we discuss REUs and other research positions that students obtained through their participation and success on the programming team, as well as courses related to competitive programming that improve problem-solving skills that translate to efficient research capabilities.

Last, we discuss the wide range of majors of team members, ranging from Computer Science to Mathematics to Chemistry to Physics, and how competitive programming aids in success in non-computer science related research.

ENGINEERING

SIMULATING EFFECTIVE PERMEABILITY OF CARBON COMPOSITE HEAT SHIELDS

Author(s): Cameron Brewer

Chellgren Fellow,

Faculty Mentor(s): Savio Poovathingal

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23891>

The aerospace industry requires the use of permeable, high operating temperature materials for heat shields in the reentry stage for spacecraft. The best suited material is a carbon composite network. The permeability of this material in a heat shield creates important properties for the dispersion of heat and gas molecules. Experimental tests to observe gas density, temperature, velocity, pressure and much more demand extensive time and financial resources. Using direct simulation Monte Carlo (DSMC) technique, these variables can be determined accurately in a rapid and cost effective manner. This method observes all desired properties in a generated three dimensional mesh over a given change in time. Simulated gas particles advance from an initial position depending on their velocity and potential collisions. Collisions can occur either with other gas particles or the surface of the digital carbon fiber network. The results are shown to be most effective at low temperatures and high pressures. An addition of a second order term to the Klinkenberg Equation for effective permeability can potentially allow accuracy over a wider range of conditions. The mesh alone must not only be observed, but due to the hypersonic speed of the spacecraft, the properties along the shockwave must also be recorded. As atmospheric oxygen collides with the carbon at high speeds, carbon monoxide and carbon dioxide can be formed. This accumulation directly affects the volume and permeability of the network. Aggregating the output calculations of DSMC allows visualization software to plot the results. Future research will provide more accurate results over a vast range of temperatures and pressures in addition to enabling observance of the change in volume of the mesh during the simulation.

ENGINEERING

FUNCTIONALIZATION OF CELLULOSE ACETATE MEMBRANES WITH SILVER NANOPARTICLES TO SUPPRESS VIRAL ACTIVITY

Author(s): Lillian Banks, Taegeon Oh

Honors Program

Faculty Mentor(s): Isabel Escobar

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23946>

Aerosols containing pathogenic bacteria and viruses has always been a cause of concern for humanity, as can be seen with recent events of Sars-Cov-2. Air filters have been used extensively in face masks to remove these microbes and make the air breathable. Most filters used today are effective only for a short period due to inadequate and laborious cleaning techniques required for microbial deactivation on filter surfaces. This work attempts to make an antimicrobial air filter by immobilizing AgNPs, which could suppress bacterial and viral activity, on a cellulose acetate (CA) membrane. Attaching the AgNP's directly to CA when making the membrane is not very effective because AgNP's leaches very fast from CA at room temperature. A polymerized low-cost epoxy, glycidyl methacrylate (GMA), was attached to CA, allowing for more functionalization of the CA/GMA complex. Cysteamine was then combined with the CA/GMA complex, providing thiol groups that immobilized AgNP's on the membrane surface. FTIR analysis confirmed the successful polymerization of polymerized GMA, while electron microscopy was used to verify the presence of silver on the CA membrane surface.

ENGINEERING

EVALUATION OF APPLIED POTENTIAL EFFECTS ON A SYNTHESIZED SULFONATED POLY ETHER ETHER KETONE MEMBRANE [S-PEEK]

Author(s): Laura Brady, Marin Bennett

Faculty Mentor(s): Isabel Escobar

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24138>

As the human population continues to grow, the quality of water has seen a decline. Because of this, research into bioremediation has gained popularity. The purpose of this project is to investigate certain properties within nanocomposite membranes that could enhance water treatment processes, specifically using the polymer sulfonated poly (ether ether ketone) (SPEEK) . This experimental utilized a control membrane with the composition of 79% n-methyl pyrrolidone and 21% poly sulfone and an experimental membrane with the composition of 79% n-methyl pyrrolidone and 21% polymer (95% poly sulfone and 5% SPEEK). To execute the methods of the experiment a salt solution (1 mMol & 5 mMol) was filtered through the membrane using a crossflow cell. The flow rate of the filter solution was held constant at 5.00 mL per minute. The flux and permeability of the membranes were determined mathematically to ascertain if a relationship existed within the membrane and applied voltage. Expectations for the concluded experiment include a confirmed direct relationship between applied voltage and flux, the superiority of the SPEEK membrane in separating the salts, and the reversal of all salt build-up upon flipping the membrane to confirm the reusability of the SPEEK membranes. Results support the expected trends. Future work includes testing other salt solutions, varying amount of SPEEK in the membranes, and expanding the number of voltages investigated.

ENGINEERING

TOWARDS PREDICTING FUTURE STRESS EVENTS IN A DRIVING SCENARIO

Author(s): Joseph Clark

Honors Program, University Scholars

Faculty Mentor(s): Himanshu Thapliyal

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24151>

This work presents a model for predicting whether a driver's stress level will be high up to one minute in advance. Successfully predicting future stress would allow stress mitigation to begin before the subject becomes stressed, reducing or possibly avoiding the performance penalties of stress. The proposed model takes features extracted from Galvanic Skin Response (GSR) signals on the foot and hand and Respiration and Electrocardiogram (ECG) signals from the chest of the driver. The data used to train the model was retrieved from an existing database and then processed to create statistical and frequency features. A total of 42 features were extracted from the data and then expanded into a total of 252 features by grouping the data and taking six statistical measurements of each group for each feature. A Random Forest Classifier was trained and evaluated using a leave-one-subject-out testing approach. The model achieved 94% average accuracy on the test data, and a test data F1-score of 0.94. Performance data indicates that the model performs well and could be used as part of a vehicle stress prevention system.

ENGINEERING

A PUF BASED CAN SECURITY FRAMEWORK

Author(s): Tyler Cultice

University Scholars Program

Faculty Mentor(s): Himanshu Thapliyal

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24090>

Implementing hardware security for existing standards present difficult challenges, as limitations on resources restrict the options available to provide security and reliability. In this work, a method is proposed to reliably and securely send messages over the Controller Area Network bus while adhering to the CAN standard ISO 11898-1. A reliable PUF response is used in asymmetric key generation to create a unique shared AES-256 key between each ECU, encrypting all network traffic. In addition, an HMAC and counter system are implemented to protect against replay and tampering attacks within the network. This lightweight cryptography framework maintains the speed and reliability of essential devices connected to the CAN bus without sacrificing the security of the network.

ENGINEERING

USING BIOINFORMATICS TO IMPROVE THE GENOME ASSEMBLIES OF MAGNAPORTHE ORYZAE STRAINS

Author(s): Chloe DeGiorgio

Honors Program

Faculty Mentor(s): Jerzy Jaromczyk, Mark Farman

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23833>

Magnaporthe oryzae is a pathogenic fungus responsible for rice blast disease. Understanding the mechanisms by which the fungus evades host defenses can lead to improved disease management. Recent findings report that the terminal ends of *M. oryzae* chromosomes are unstable which allows for frequent rearrangement of the genome—a property that may be useful for the fungus’s adaptation. High-quality genome assemblies are required to investigate this mechanism. The genomes of *M. oryzae* strains Guy11 and U233 were selected for improvement with the goal of producing chromosome-level assemblies.

Using MUMplot, the Guy11 and U233 contigs were aligned to two chromosome-level assemblies of *M. oryzae* strains (70-15 and LpKY97). The MUMplot data guided efforts to arrange and connect contigs, find mis-assemblies, and identify translocations. MinION raw reads of the Guy11 and U233 assemblies were used to verify MUMplot data. Raw read coverage was viewed in the Integrative Genomics Viewer, and BLAST reports gave information on connections. The subterminal regions of strain 70-15 were also used to guide the arrangement of Guy11 contigs, as these regions of 70-15 have been characterized, and 70-15 is a progeny strain of Guy11.

The final number of Guy11 contigs was reduced from 33 to 23, and the number of U233 contigs was reduced from 49 to 43. In both genomes, mis-assemblies were found and corrected, and *Escherichia coli* DNA contamination was discovered. U233 had seven translocations in its assembly, but none were present in Guy11. Identifying the telomere-containing contigs enables future study of the terminal and subterminal regions of the genomes. The refined genomes can be used for reference-based assembly using Illumina reads to further improve other genome sequences.

ENGINEERING

SEISMIC BEHAVIOR OF DIAGRID BUILDING STRUCTURES WITH HORIZONTAL IRREGULARITY

Author(s): Garrett Demaree

Chellgren Fellow

Faculty Mentor(s): Mariantonieta Gutierrez Soto

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23943>

As modern cities continue to grow, the demand for taller and more aesthetically pleasing buildings has given rise to the diagrid structural system. In the structural design of high-rise buildings, much attention is given to the weight and shear resisting capabilities of the building's central core, especially as cities continue to grow upwards. The diagrid structural system has become increasingly prevalent in modern design because of its ability to resist both lateral and gravity loads utilizing a repeating pattern of triangular bracing on the building's exterior. This system reduces the load on the central core, and therefore, the core's necessary size resulting in a reduction in weight, which provides, in addition, both cost and sustainable benefits. However, the increased rigidity of a diagrid structure also shortens the building's fundamental period making its seismic performance relatively unknown, especially in diagrid buildings with irregularities. In this study, buildings with various horizontal irregularities were modeled using SAP2000 and compared with conventional regular buildings of similar dimensions. Following ASCE 7-16 standard for seismic design, these structures were modeled and then analyzed to determine the effect of horizontal irregularities on the fundamental period of diagrid buildings. Understanding the fundamental period and seismic behavior of these irregular building structures is crucial for future construction of these buildings in regions near active fault lines.

ENGINEERING

EXAMINING SOUND ABSORPTION IN MODULAR 3D PRINTED SOUND ABSORBERS USING IMPEDANCE TUBE MEASUREMENTS AND SIDLAB SIMULATION SOFTWARE

Author(s): Burke Doud

Chellgren Fellow

Faculty Mentor(s): David Herrin

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24135>

Sound absorbers can integrate a number of different design components to absorb sounds across a number of octave bands. Depending on the application, the shape and form factor of an absorber can range from simple to incredibly complex. Additively manufactured sound absorbers present advantages over traditional sound absorbers as additive manufacturing methods allow for unique and complex shapes that often cannot be produced by conventional manufacturing methods. Additive manufacturing methods also allow for rapid prototyping that increases flexibility for different applications. This research involves developing and testing a number of 3D printed sound absorber designs to maximize sound absorption across a wide range of octave bands, primarily in the lower frequencies, for the purpose of exploring the strengths of additive manufacturing for sound absorber design. These absorbers are designed to fit in a modular system, where muffler components can be stacked and interchanged to absorb different octave bands or increase absorption in a particular octave band. This modular design allows the absorber to be adapted to changing conditions and multiple use cases. All absorbers are developed in 3D modeling software and printed out of PLA. The absorbers are placed in an impedance tube where impedance measurements are taken. These results are then compared to simulations in SIDLAB Simulation Software.

ENGINEERING

UNDERSTANDING HOW AMBIENT CONDITIONS AFFECT WORK FUNCTION OF TUNGSTEN CATHODES

Author(s): Madilyn Flandermeyer

Chellgren Fellow, First Generation, Honors Program

Faculty Mentor(s): Matthew Beck

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23987>

This research aims to compare the work function of porous tungsten cathodes — bare, B type, and M type — from within a vacuum chamber and in open atmosphere conditions. Data from within the vacuum chamber has been previously collected, but the main interest is to study how work function is affected by ambient conditions, open air and room temperature. Work function is the minimum amount of energy necessary to bring one electron to the outside surface of the material, and a low work function is desirable. Work function in this study is measured by a kelvin probe that is positively charged and oscillating close to the surface of the sample, creating a parallel plate capacitor. The system measures the contact potential difference (CPD) between the sample and the probe tip which is then used to calculate the work function. This research is important for applications involving electron emission, specifically cathodes which are electrical devices that current runs into from a polarized electrical device. It is hypothesized that the work function will be higher in the ambient conditions than the vacuum conditions.

ENGINEERING

NASA SPONSORED RESEARCH PROJECTS ON ELECTRIFICATION OF TRANSPORTATION

Author(s): Donovan Lewis

University Scholars Program, William C. Parker Scholar

Faculty Mentor(s): Dan Ionel

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23897>

Within the past year, I have undertaken two NASA Sponsored research projects related to the electrification of transportation. The first, a study of efficacy for mobile crane electrification given physical and fiscal constraints of gradual electrification. Targets for gradual electrification are separately analyzed and simulated with battery pack effectiveness being the main limiter in both systems. The second focuses on development of a method of EV system reliability, one of the biggest concerns in the design and creation of electric vehicles. Analysis of the reliability and redundancy of the UK Solar Car team's most recent car, Gato VI, was performed with future testing planned to confirm the validity or accuracy of our model. Failure rates for the car's systems of the car were derived from combinations of component failure rates defined within standards originating from empirically derived datasets. The resulting model is heavily dependent on several assumptions and approximations due to the significant evolution of motor, battery, and solar panel technologies since the latest update of these reliability standards.

ENGINEERING

DEVELOPMENT OF ENERGY EFFICIENT SMALL SATELLITES TO ADVANCE SPACE EXPLORATION

Author(s): Faith Makumbi

Chellgren Fellow, Honors Program, William C. Parker Scholar

Faculty Mentor(s): Jesse Hoagg

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23747>

The primary goal of this project is to create small satellites that would be able to orbit a specific area in a swarm to better improve space exploration. Commonly used observational satellites can be large and use up a significant amount of energy and material. In comparison to smaller satellites, they are more expensive and have a complex build. The satellites made would be more efficient and have renewable power sources. The current experiment is in the first phase in which the system and structure of the satellite is being developed. The task is to design and experiment with an EAS(Electromagnetic Actuation plus Sensing) system that would keep the satellites in position and close together to obtain the swarm effect in orbit. This will be tested together with the NAC(Noncommutative Attitude Control) system which would aid in maintaining the relative position of each individual satellite. Among other factors, the completed model will be tested in a flat-floor facility to act as a space simulation.

ENGINEERING

BUILDING AN ANCIENT GREEK MEDICAL DICTIONARY IN THE DIGITAL HUMANITIES

Author(s): Ian Metzgar

Chellgren Fellow, Honors Program

Faculty Mentor(s): James Brusuelas

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23845>

The goal of this research is to lay out the foundation for creating an online dictionary resource for medical terms in ancient Greek, as nothing currently exists that systematically documents these medical terms. My role as a researcher initially consisted of finding and processing relevant data that exists online, specifically digitized ancient papyrus fragments that often introduce “new words” into the ancient Greek lexicon. I sorted through the data and vetted it for specific information, mainly organizing the available texts into groups such as medical prescriptions or medical treatises. These qualifying conditions were chosen to isolate a “test” group of texts discussing a common topic; the data was organized based on the body part or organ that was referenced. Specifically, I focused on researching data that was centered around the human eye and eye diseases, as it was the most referenced organ among the ancient papyri available online and open source. I subsequently extracted the raw XML files from papyri.info to begin designing, with research developers on the team, what this online resource might look like and how it might function. Our next step is to parse out the XML, isolate the specific medical terms in these files, and create a basic dictionary. In prototyping this resource as a Python/Django application, we intend to help students and researchers interested in the history of medicine, eventually to include other ancient languages, and to include (via crowdsourcing) the help of modern medical professionals to define with better accuracy the terminology and medical contexts preserved.

ENGINEERING

SUSTAINABLE MATERIALS AND RECOVERY TECHNOLOGIES (SMART): NIMH BATTERY ASSAY

Author(s): Jake Patty

Chellgren Fellow, Honors Program

Faculty Mentor(s): Joshua Werner, Jack Groppo

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23828>

In recent years, batteries from early models of hybrid-electric vehicles have begun to reach end of their lives in energy storage. Since they are not considered hazardous waste, these nickel metal hydride batteries (NiMH) can be landfilled. However, there is economic incentive to recycling these batteries, assuming that a process is developed which extracts appropriate value. Toyota Prius NiMH batteries are an excellent case study in developing this sort of process, as they are currently the most abundant hybrid-electric batteries in use, and the number of “dead” or no longer usable Prius batteries is beginning to grow significantly with each passing year. Before a process can be developed to extract the value from these batteries, however, an in-depth analysis of their composition is necessary to direct further investigation and economic feasibility. To accomplish this, an Inductively Coupled Plasma- Mass Spectrometry or Optical Emissions Spectrometry (ICP-MS/OES) assay was completed on individual components of the battery cell in order to determine where the highest densities of valuable materials are concentrated. Utilizing this data, preliminary leaching experiments were conducted with the goal of ascertaining the feasibility of environmentally conscious hydrometallurgical recycling.

ENGINEERING

USING CLAY IN ENTEROSORBENTS FOR SORPTION PROPERTIES

Author(s): Maryrose Ramsey

Chellgren Fellow, Honors Program

Faculty Mentor(s): Zach Hilt

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24118>

Enterosorbents are a class of materials that pass through the GI Tract in its entirety without needing intervention for removal. The use of hydrogels as enterosorbents allows for the addition of specialized materials to provide additional selective chemical or physical properties. Clay is an absorbent material that is proven to bind to various pollutants and was added to the crosslinked polymer to increase the sorption property of the hydrogel. An acrylamide-based series of polymers using the cross-linker N,N'-methylene-bis-acrylamide (NNMBA) were synthesized with the help of APS and TEMED serving as the initiator and activator, respectively. The cross-linker percentage (NNMBA) was varied over the mass percentages of 0.1%, 1%, 10%, and 20%. The addition of clay impacts the polymerization reaction, and multiple recipes were tested to determine the optimal level of activator and initiator for the nanocomposite synthesis. Swelling studies were performed on both the neat (no clay additive) and the clay polymers. For the neat polymers, the swelling ratio was 8.22, 6.15, 2.75 and 2.65 respectively. For the clay polymers, the swelling ratio was 12.05, 7.11, 2.68 and 2.75 respectively. The clay polymers were made at a 2:1 water ratio while the neat polymers were 1:1. For both polymer systems, the swelling level was inversely proportional to the level of crosslinker in the polymer. As the NNMBA level increased, the polymer had a smaller swelling ratio for both clay and neat polymers. An absorbance test was also run on both polymers with the neat polymers showing an increase in absorbance quantity with a decrease in crosslinker density. The neat polymers were tested on their own as a standard to determine what the polymer was absorbing versus what the clay binds. The absorbance test for the clay polymers is ongoing.

ENGINEERING

AN APPROACH TO INTEGRATE GAS TURBINE WITH CONCENTRATED SOLAR CELLS

Author(s): Binit Singh

Faculty Mentor(s): Nelson Akafuah

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23779>

Gas turbines are extensively used in power generation around the world. Based on the data from the US Energy Information Administration, Natural gas takes 42% of US electricity generation. Even a small improvement in the efficiency of the gas turbine can save money and minimize greenhouse emissions. Current problems associated with gas turbines are high fuel consumption, sensitivity to ambient temperature, and quality heat being dumped to ambient. Scholar in past has been able to solve two of these problems at a time while deteriorating the third one. In this work team, the team presents an idea to solve all three problems together.

ENGINEERING

INVESTIGATION OF RHODIASOLV®POLARCLEAN AS A SOLVENT FOR THE FABRICATION OF POLYSULFONE MEMBRANES

Author(s): Alex Williams

Faculty Mentor(s): Isobel Escobar

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23832>

Due to the continuous improvements in polymeric membrane fabrication, the membrane market has grown significantly. However, this market is not sustainable as traditional solvents such as N-methyl-2-pyrrolidone (NMP) and dimethylacetamide (DMAc) that are used in the fabrication of polymeric membrane are known for their negative impacts on the environment and human health. Due to regulations on these solvents, membrane manufacturers are investigating eco-friendly solvents as feasible replacements. In this study, membranes are being made using polysulfone (PSf) and a PolarClean-gamma valerolactone (GVL) green co-solvent mixture via nonsolvent-induced phase separation (NIPS) in order to investigate PolarClean as a possible replacement for traditional solvents. Membranes prepared with PolarClean were investigated in terms of their water flux, rejection capabilities, and morphology. Membranes fabricated at an evaporation time of 15 seconds showed the best balance of high permeance and rejection, 417.6 LMH/bar and 70.13% respectively.

ENGINEERING

DETERMINATION OF NOVEL VIABILITY ASSAY FOR ISOLATED MITOCHONDRIA

Author(s): Sam Wyse

Chellgren Fellow, Honors Program

Faculty Mentor(s): Thomas Dziubla

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24139>

Live mitochondrial transplantation is a novel therapeutic approach that has proven highly successful in treating cardiac and pulmonary ischemic injuries. Due to this success, research is being done to design an effective means to transplant live mitochondria into spinal cords after injury to minimize neurological damage and long-term disability. One of the many challenges to this research is increasing mitochondria viability as mitochondria currently die very quickly outside of the cell. An important aspect of this work is the ability to measure in vitro mitochondria viability. The current gold standard for assessing mitochondrial function is the Seahorse XF Analyzer. However, the Seahorse XF Analyzer is both expensive and time consuming, limiting the ability to assess isolation conditions in a rapid and high throughput way. Thus, the focus of the research is to determine an alternate assay for mitochondria viability. One compound that is being studied is DCFH-DA. DCFH-DA is a compound that is oxidized by reactive oxygen species (ROS) to produce the fluorescent compound DCF. This is useful as live mitochondria produce ROS that will react with DCFH-DA to form DCF, the fluorescent intensity of which can be measured using a spectrophotometer. The goal of this assay is that a direct correlation between fluorescent intensity and mitochondria viability can be determined. Another compound that is being studied is rhodamine 123 which is a fluorescent compound that will accumulate in the mitochondrial membrane. When in the mitochondrial membrane, the fluorescent intensity of rhodamine 123 is suppressed, but when the mitochondria die the rhodamine 123 is released from the membrane causing the fluorescent intensity to spike. The goal of this assay is that a direct relationship can be developed between the time of decreased fluorescent intensity and mitochondria viability.

ENTOMOLOGY

ROLE OF GROOMING BEHAVIOR IN PESTICIDE RESISTANCE AND INFECTION IN HONEY BEES (*APIS MELLIFERA*)

Author(s): Anna Foose

National Conference on Undergraduate Research (NCUR) Presenter (2020-21), OUR Summer Research Fellow (2020), Chellgren Fellow, Honors Program

Faculty Mentor(s): Clare Rittschof

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23672>

The unintentional consequences of pesticide usage, including non-target species exposure and run-off, have attributed to declining numbers of pollinator species. Honey bees (*Apis mellifera*) possess a variety of social and behavioral traits that are beneficial to immune system function and advantageous when pesticide exposure or infection occurs. In this study, we investigate the benefits of grooming behaviors when honey bee immune systems were artificially activated by yeast and exposed to a commonly used pesticide, Tetradifon. We used data from previous research that found a positive correlation between aggression and allogrooming to design this study that compared survival rates of yeast-injected and/or Tetradifon treated honey bees in either a social setting or in isolation. We observed allogrooming, self-grooming, and survival rates after 1 hour and 24 hours. No correlations between allogrooming and survival rates were found, but self-grooming was discovered to be a large predictor of survival 24 hours after yeast and/or pesticide treatment. Here, we report the significant role of self-grooming on honey bee survival.

ENTOMOLOGY

IMPACT OF AGGRESSION PHEROMONE ON PARENTAL CARE BEHAVIORS OF NURSE BEES IN APIS MELLIFERA

Author(s): Bethany Ison

Chellgren Fellow, Honors Program

Faculty Mentor(s): Clare Rittschof

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24154>

Honey bees communicate by releasing odor signals called pheromones. Two of note are larval begging pheromone, which recruits caretaking nurse bees, and adult aggression pheromone, which recruits bees to defend the hive when a threat is detected. Adult bees show varying levels of aggression, and we believe this is partly due to differences in the parental care they received as larvae. How often nurse bees check on larvae may be influenced by the interplay between the begging pheromone and the aggression pheromone. Our hypothesis is that receiving the aggression pheromone alters how nurse bees perceive the begging pheromone, such as through inhibition or priming, which in turn affects the frequency of their caretaking visits. Last year, my mentor video-recorded nurse bees from high- and low-aggression hives that were exposed to aggression and begging pheromones as they performed brood care behaviors. I have been watching these videos while monitoring certain cells that received particular treatments, keeping count of when and how often nurse visits occur. This frequency and latency data will be analyzed to determine how the presence of the aggression pheromone impacts parental behaviors of nurse bees towards larvae, along with any differences that may arise between the responses of nurse bees from high- and low-aggression colonies.

ENTOMOLOGY

EFFECTS OF HONEY OR SUCROSE DIET ON THE AGGRESSION OF GUARD BEES TOWARD RETURNING FORAGERS IN APIS MELLIFERA

Author(s): Taylor Napier

OUR Summer Research Fellow (2020), Honors Program

Faculty Mentor(s): Clare Rittschof

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23902>

Robbing behavior is the opportunistic theft of honey of a weakened colony by a hardy colony. It most often occurs as a result of environmental pressures like nectar dearth, which limits the availability of traditional foraging resources. In previous studies, it was found that both robbing foragers and robbing guards showed an increase in aggression during robbing behavior. The exact cause of this behavioral shift is unknown; however, based on the parameters of previous experiments, it likely does not occur as a result of violent confrontation between robbing foragers and victim guards. This project investigated whether the act of foraging honey could be the cue that triggers this aggressive behavioral change. By tracking the generalized aggression of guards at the hive and the specific aggression of guards towards bees that were known to have visited a feeder containing honey or 50% sucrose-water solution, it was determined that while individual foragers who had visited the feeder were slightly (5%) more likely to experience an aggressive behavior re-entering the hive on honey days, guards were more generally aggressive on average toward returning foragers on sucrose days. Data analysis is still in progress at this time.

ENTOMOLOGY

COLD TOLERANCE AND RAPID COLD-HARDENING ACROSS EMBRYONIC DEVELOPMENT IN DROSOPHILA MELANOGASTER

Author(s): Rachael Snyder

Chellgren Fellow

Faculty Mentor(s): Nicholas Teets, Melise Lecheta

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24156>

Insects are ectotherms with a limited ability to regulate body temperature and thus rely primarily on the temperature of their surroundings. Insects have evolved multiple mechanisms for coping with the detrimental effects of low temperatures. One of these mechanisms is called rapid cold-hardening (RCH), which is a process by which ectotherms quickly enhance resistance to chill injury following a brief sublethal chilling (minutes to hours). Although this is an important process for insects living in climates that often vary, there are few studies examining the effects of RCH in the embryonic stage. Characterizing the effects of temperature change on embryos is important because thermal stress during embryonic development can have permanent consequences for many biological processes. Therefore, the objective of this study is to determine the precise stage at which the capacity for RCH develops in embryos of the insect model *Drosophila melanogaster*. All experiments are being conducted on a common laboratory strain of *D. melanogaster*, Canton-S. For the experiments, the lower lethal temperature for 4 hour-old embryos must be identified by exposing them to a 1 h cold shock at several temperatures (-12.5, -10, -7.5, -5, -2.5, and 0 °C). After 48 hours, survival is assessed by measuring egg hatch rate. To date, the survival of the embryos was assessed after exposing them to -10 °C. The average survival of the treatment group embryos was 23.98% after the cold shock treatment while the average of the control group embryos, which remained at 25 °C, was 84.63%. Next, the embryos will be cold-shocked at the additional low temperatures and at different stages of development. Once the cold shock survival curves are complete, more experiments will be conducted to determine when, and if, RCH improves the cold tolerance of *D. melanogaster* embryos.

HEALTH SCIENCES

PROGRAM PROPOSAL TO DECREASE HYPERTENSION IN AFRICAN AMERICAN WOMEN

Author(s): Kennedy Brown

Chellgren Fellow, Honors Program, William C. Parker Scholar

Faculty Mentor(s): Brandi White

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23724>

African American (AA) women are disadvantaged in several ways when it comes to their health. AA women suffer from hypertension (HTN) at a disproportionately higher rate than White and Hispanic women. 47% of AA women suffer from HTN compared to 27% of White women and 36% of Hispanic women. HTN is also referred to as high blood pressure. Although an individual's blood pressure changes throughout the day based on activities, a consistently high blood pressure is diagnosed as hypertension. Some of those determinants of health that contribute to the health gap between AA women and White and Hispanic women include quality of neighborhood, health literacy, and access to health care. When AA women are dealing with those barriers on a daily basis, this limits their ability to have satisfactory health. Trends show that as time progresses and as AA women are consistently dealing with the social determinants of health, this causes long term stress which increases cortisol into the blood. Over time high production of cortisol leads to hypertension, which in turn, can lead to chronic illnesses like heart disease, heart attack, stroke, and even death. In order to combat the health disparities that exist, more programs should exist to achieve health equity. A proposed program that can help reach this goal is the Women's Center for Success. This center should be a place where women can go for classes about how to take care of their health, gain resources about healthy food options, exercise, do yoga, and sign up for a shuttle to take them to produce stores if they do not have fresh produce in their neighborhood. This center is a proposal to decrease the health disparities and improve cardiovascular health for African American women.

HEALTH SCIENCES

INJURY HISTORY, SPORT PARTICIPATION, AND CURRENT PHYSICAL ACTIVITY
AMONG YOUNG ADULTS**Author(s):** Noah Gadd*Ribble Undergraduate Scholar***Faculty Mentor(s):** Deirdre Dlugonski**Symposium Project Link:**<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24069>

BACKGROUND: The purpose of this study is to examine the association between injury history and current physical activity (PA) among young adults. **METHODS:** Participants were recruited through ResearchMatch and university classes to complete online REDCap surveys. Eligible participants (N=273) were 18–25 years old, not currently injured, and reported no PA limitations. Participants (N=236) who completed the demographic, injury history, PA (Godin Leisure Time Exercise Questionnaire) surveys, and were not PA outliers were included. Participants were categorized by injury frequency (0; 1; 2+ previous injuries) and high school athlete status (competitive high school athlete; non-athlete/non-competitive athlete). Current moderate-to-vigorous physical activity (MVPA) was calculated using recommendations from Godin (2011). We conducted a two-way ANOVA (injury frequency x high school athlete status) to examine the interaction between injury history and high school athlete status on current MVPA. **RESULTS:** The sample was aged 22.2 ± 2.1 years, primarily female (77.5%), and white (81.8%). Among the overall sample, current MVPA was highest among individuals who reported 1 injury (52.0 ± 25.4), followed by 2+ (49.2 ± 22.7), and 0 (40.5 ± 28.6) injuries. Current MVPA for competitive high school athletes was 53.2 ± 27.7 compared to 36.0 ± 25.0 for non-high school athletes. There was a statistically significant interaction between injury history and high school athlete status on MVPA ($F(2, 230)=3.01, p=0.05$). Former competitive high school athletes reported less current MVPA as the frequency of previous injury increased whereas non-athletes reported greater levels of current MVPA as the frequency of previous injury increased. Among individuals who reported 0 or 1 injury, former competitive high school athletes had higher levels of current MVPA compared to non-athletes ($p<0.001, p=0.01$). Individuals who reported 2+ injuries had similar levels of current MVPA regardless of high school athlete status ($p=0.83$). **CONCLUSION:** At low levels of previous injury (0 or 1), former competitive high school athletes had higher current MVPA levels compared to non-athletes. However, individuals who reported 2+ injuries had similar levels of MVPA regardless of high school athlete status. Future studies should examine whether young adults who have experienced multiple injuries have unique PA barriers and facilitators.

HEALTH SCIENCES

QUALITY IMPROVEMENT: UNDERGRADUATE CONTRIBUTION TO IDENTIFY BARRIERS TO PATIENT DISCHARGE TIMELINESS

Author(s): Kelsey Gatton, Anamarie Black
Honors Program

Faculty Mentor(s): Karen Clancy

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23882>

The undergraduate quality improvement project goal was to determine the primary barriers to timely discharges through a clinical leadership practicum experience at an advanced tertiary care teaching hospital. Delays in discharges are associated in the literature with adverse health outcomes and diminished efficiency within organizations. The authors retrieved deidentified data in real-time from the health information system and interactions with patient care staff. The study's metrics included 1) discharge orders placed before 10 a.m, and 2) patients discharged before noon. The primary barriers found were ambulance transport delays and scheduled treatments after target discharge times. Early identification of patients planned to discharge aided in readiness and increased numbers of patients discharged before noon. The information collected by undergraduate students will help address the primary barriers and assist further quality improvement initiatives within the affinity group.

HEALTH SCIENCES

"DISTINCTIVE AND UNIQUE PEOPLE": HEALTHCARE STUDENTS' DISCOMFORT IN DEFINING DIVERSITY

Author(s): Amy Keith

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter (2020-21), Honors Program

Faculty Mentor(s): Randa Remer

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25873>

Students undergo many changes during college, including conceptualizing diversity for themselves. It is well-researched that White students have difficulty seeing themselves in diversity initiatives because they do not see themselves as diverse. The present study focuses on the discomfort individuals feel discussing diversity-related topics. At a large Southeastern University in the United States, a Cultural Competency course incorporated service-learning, small group discussions, and experiential activities to expand pre-healthcare students' understanding of diversity by exploring their social identities. Researchers gathered data from three assignments throughout the semester. Before the beginning of the course, participants reflected on how they contribute to diversity. In the midterm assignment, participants were asked to state two personal goals for the remainder of the course. At the end of the course, students reflected on the class and elaborated on their understanding of diversity. These responses were qualitatively analyzed using thematic analysis (Braun & Clarke, 2006), starting with initial coding, progressing to focus coding, then grouping codes into themes and subthemes. This project focuses on the theme of perceived discomfort students experienced and how this discomfort progressed throughout the course. The research was grounded in Social Identity Development and Transformational Learning theories. Discomfort was demonstrated in the ways students discussed race, privilege, oppression, and other diversity-related topics. Results indicate discomfort shifted from avoiding the topic of diversity to the discomfort of cultural competence as a lifelong process. Further research should address limitations of the data and delve into how students from previous years connect course content to their thoughts surrounding diversity-related topics in their personal and professional lives.

HEALTH SCIENCES

TASK EVOKED PUPILLARY RESPONSE AS A RELIABLE BIOMARKER OF COGNITIVE LOAD DIFFERENCES FOR ADULTS WITH HEARING LOSS AND/OR COGNITIVE IMPAIRMENT

Author(s): Reagan Parker

Chellgren Fellow, Honors Program

Faculty Mentor(s): Honey Hubbard

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24456>

Hearing loss and cognitive impairment are common chronic conditions in adults. Treatments and assessments, such as fMRI, for these conditions are often multidimensional and require significant expense and expertise. With continuous development of healthcare, more treatments and interventions are discovered to improve access and affordability; For example, in individuals with hearing loss and/or cognitive impairment, Task Evoked Responses of Pupil (TERP) has been used to measure cognitive effort in tasks (Carver, 1971; Kahneman, 1973; Ahern& Beatty, 1979). In order for these evaluations to be used effectively, the efficacy and reliability must be examined. Thus, in this study, pupillometry will be examined as a potential biomarker for speech-language and hearing treatment effects, through analyzing between groups and within subject/ across sessions for an evaluation of both sensitivity and reliability. TERP will be evaluated in individuals with or without hearing loss through a speech-in-noise task that simulates listening conditions of the real world. TERP will be collected in two separate sessions a week apart to analyze, assuming no confounding factors, the reliability of pupillometry as a measure of cognitive efforts. The results of this study will work to show the efficacy and reliability of TERP as a biomarker of cognitive change and give insight into how hearing can impact cognitive capacity.

HEALTH SCIENCES

COMPARISON OF FUNCTIONAL MEASURES IN ADOLESCENTS WITH AND WITHOUT ANKLE SPRAIN HISTORY

Author(s): Aly Peacock

Honors Program

Faculty Mentor(s): Katherine Bain, Phillip Gribble

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22846>

Abstract

Context: Lateral ankle sprain (LAS) is a highly prevalent injury that often leads to poor performance on clinician-measured outcomes and decreased self-reported scores on patient-reported outcomes (PROs). Despite the peak incidence rate for sustaining a LAS being between the ages of 15 to 19 years, the majority of literature surrounding LAS is focused on physically active young adults between the ages of 18-35. It is important to understand impairments and impact of LAS history in the adolescent population to justify treatment strategies. The purpose of this study was to compare weight-bearing dorsiflexion range of motion (DF-ROM), dynamic postural control, and both region-specific and global health-related quality of life (HRQL) PRO scores between adolescents with and without history of LAS.

Methods: A cross-sectional study design used to compare measures between adolescents with LAS (n=16, age: 13.81±1.56 years, height: 165.33±6.53 cm, mass: 59.22±11.97 kg) and adolescents without LAS (n=22, age: 12.82±2.61 years, height: 163.42±33.53 cm, mass: 67.53 ±27.95 kg). DF-ROM was assessed by averaging 3 trials of the weight-bearing lunge test (WBLT). Dynamic postural control was assessed utilizing the star-excursion balance test (SEBT). Participants performed 3 test trials and the average was calculated and normalized to leg length. Foot and Ankle Disability Index (FADI)-ADL and -Sport subscales were used to assess region-specific HRQL. The modified Disablement of the Physically Active (DPA) scale was used to assess global HRQL. Separate independent sample T-tests were performed to compare each outcome between injury groups.

Results: There was a significant difference between injury groups on the DPA (p=0.009), the FADI-ADL (p=0.017), and FADI-Sport (p=0.015). There were no significant differences between injury groups on the WBLT or SEBT.

Conclusion: Adolescents with history of LAS reported worse region-specific and global HRQL compared to healthy controls despite scoring similarly on clinician-based outcomes.

HEALTH SCIENCES

AGE-RELATED DIFFERENCES IN EXTRACELLULAR MATRIX FOLLOWING DISUSE SKELETAL MUSCLE ATROPHY AND RECOVERY

Author(s): Sarah Rose

Faculty Mentor(s): Esther Dupont

Oral Presentation [Presentation Date/Time]

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23841>

Muscle atrophy originating from disuse or injury can lead to complications. Recovery after atrophy varies among different populations, with elderly populations exhibiting a decreased ability to fully recover. Changes in the extracellular matrix (ECM) may contribute to differences between adult and aged muscle recovery from atrophy. The goal of this study was to investigate changes in collagen content in plantaris muscles of adult (10 months) and aged (30 months) rats during recovery from atrophy. Rats were hind limb suspended (HS) to induce atrophy for 2 weeks and were allowed free ambulation for 15 and 60 days. Plantaris muscle sections were stained using picrosirius red and photographed under polarized light. These pictures were processed to quantify the amount of birefringent collagen. The aged muscle's average total amount of collagen captured under polarized light progressively increased and was found to be 4.98%, 5.86%, 7.69%, and 10.21% in the control, HS, 15d, and 60d respectively. In contrast, the adult rats showed a decrease in percent collagen from 4.59% to 2.44% after hindlimb suspension, an increase to 6.14% after 15 days, and a slight decrease to 4.60% after 60 days. Overall, age appears to play a role in recovery from disuse atrophy, and aged rats continue to accumulate more collagen even at 60d, whereas adults recover closer to baseline levels.

This work was funded by a postdoctoral fellowship by the APS and NIH grant AT009268.

HEALTH SCIENCES

SKELETAL MUSCLE DYSFUNCTION AND RECOVERY FOLLOWING ANTERIOR CRUCIATE LIGAMENT (ACL) INJURY

Author(s): Cameron Scheitzach

Faculty Mentor(s): Christopher Fry, Brian Noehren

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24083>

Over 250,000 individuals suffer an ACL tear in the United States annually, with a lifetime cost of treatment of over \$10 billion. Following anterior cruciate ligament (ACL) injury and reconstruction, protracted quadriceps weakness is associated with diminished quality of life, increased injury risk and contributes to the premature development of osteoarthritis. Little progress has been made in identifying the underlying physiological mechanisms responsible for this loss of strength, limiting advancements in the field. Impairments in quadriceps muscle strength following ACL injury are associated with poor knee biomechanics and outcomes. Historical views have placed an emphasis on central nervous system deficits in the development of quadriceps weakness following ACL injury. However, recent research shows problems in muscle quality and morphology that promote strength deficits. The recent research has led to growing recognition that chronic quadriceps weakness is related to muscle changes. To better define muscle-specific changes after ACL injury, muscle biopsies (taken from the vastus lateralis, n=5) from human study participants were analyzed after they have undergone an ACL injury and surgical reconstruction. Specifically, indices of muscle size (single fiber volume μm^3), myonuclear domain (an index of cytosolic volume per myonucleus; μm^3 / myonucleus) and myonuclear number (per 100 μm of fiber length) were analyzed on a minimum of 10 fibers per limb (both ACL-reconstructed and healthy). In the ACL-reconstructed limb, fiber volume was significantly lower ($p < 0.05$). The myonuclear domain and myonuclear number were numerically lower in the ACL-reconstructed limb, but these differences did not reach statistical significance ($p > 0.05$). These results show sizeable atrophy on a single muscle fiber level that occurs rapidly after ACL injury. While not statistically significant, the early results from this study highlight potential differences in myonuclear content as well, suggesting a need for the development of regenerative rehabilitation strategies to offset these deficits.

My goal is to define the effect of the ACL injury on muscle fiber type, size and stem cell content. Muscle fibers exist as different 'types' (glycolytic vs oxidative) that confer different metabolic properties to the fiber. A larger muscle fiber is capable of producing more force (i.e. stronger). Muscle stem cells support muscle growth and are needed to repair damage to muscle fibers. All of these components are important in muscle growth and recovery, and little is known about how an ACL injury influences them.

HEALTH SCIENCES

INTRA-RATER RELIABILITY OF MANUALLY SEGMENTING T1P MR SEQUENCES OF THE TALAR CARTILAGE

Author(s): Mia Stefanelli

Faculty Mentor(s): Phillip Gribble, Kyle Kosik

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/19604>

Context: Approximately 75% of all osteoarthritic ankle patients suffer from post-traumatic osteoarthritis (PTOA). Identifying early degenerative changes within the talar cartilage may help future investigations develop new therapies to slow ankle PTOA progression. Early degenerative changes in the talar cartilage are marked by a loss of proteoglycan density, followed by increased water content and swelling capacity in the cartilage matrix. Compositional magnetic resonance imaging (MR) sequences (e.g., T1p or T2) are able to capture these early changes within the cartilage. However, limited information is available on the reliability and reproducibility of manual segmentation for the talar cartilage.

Objective: The purpose of this study was to determine the intra-rater reliability of manually segmenting the T1p MR sequences of the talar cartilage. **Methods:** Three college-aged adults volunteered to participate. A Siemens Magnetom TIM Prisma 3T scanner and an 8-channel large flex coil (516 mm × 224 mm, Siemens, Munich, Germany) acquired anatomical (PD space) and T1p MR images. MR was performed with the foot/ankle complex in neutral (90° to the shank) and the participant supine after a 30-minute unloading period prior to the scan. One investigator manually segmented the T1p MR sequences using ITK-SNAP software to calculate the T1p mean relaxation times and cartilage volumes. The investigator repeated the segmentation twice, with each segmentation separated by 1. The segmented talar cartilage was divided into four equally divided region of interests (ROIs): anteromedial, anterolateral, posteromedial, posterolateral. Volumes and mean T1p relaxation times were extracted for each ROI. Intra-rater reliability was determined using intraclass correlation coefficients (ICCs) with 95% confidence intervals.

Results: Intra-rater reliability of talar volumes ranged between ICC = 0.903 and 0.958. Intra-rater reliability of talar T1p relaxation times ranged between ICC = 0.843 and 0.965.

Conclusion: The results demonstrate that manual segmentation of the talar cartilage is reliable and repeatable.

HEALTH SCIENCES

EXECUTIVE FUNCTION IN DIVISION-I COLLEGIATE ATHLETES AND RECREATIONALLY ACTIVE COLLEGE STUDENTS

Author(s): Jenna Wilson

Faculty Mentor(s): Matt Hoch

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23969>

Purpose: High-level cognitive performance is important for navigating the complex environment of sport. The executive function domain may be of particular importance because it focuses on flexible thinking and self-control. It is unclear if high-level athletes exhibit similar executive function compared to recreational athletes. Therefore, the purpose of this study was to compare executive function between male and female Division-I collegiate athletes and recreationally active peers.

Method: Thirty-seven Division-I athletes (16 females, 21 males) and 30 recreationally active college students (19 females, 11 males) participated. Participants completed the Flanker Inhibitory Control and Attention Test (FICA) and Dimensional Change Card Sort Test (DCCS) from the National Institute of Health Toolbox Cognitive Battery on a tablet to assess cognitive flexibility and attention and inhibitory control, respectively. Demographically-corrected T-scores were used for analysis. Two-way ANOVAs compared cognitive performance based on group and sex ($p \leq 0.05$).

Results: There was a significant group-by-sex interaction for the FICA ($p=0.005$). Female recreational athletes (50.68 ± 10.18) demonstrated higher FICA scores compared to female Division-I athletes (40.88 ± 7.35 ; $p=0.003$, $ES=1.06$). Male Division-I athletes (48.67 ± 10.39) also exhibited greater scores compared to female Division-I athletes ($p=0.015$, $ES=0.83$). There was no significant group-by-sex interaction ($p=0.841$), group effect ($p=0.349$), or sex effect ($p=0.428$) for the DCCS.

Conclusions: Female Division-I athletes demonstrated poorer performance on the FICA compared male Division-I athletes and recreational female athletes which may indicate a decreased ability to suppress motor responses caused by internal or external distractions. The significance of these findings for mitigating injury risk and improving athletic performance should be explored.

HEALTH, SOCIETY AND POPULATIONS

SOCIOECONOMIC STATUS AND THE IMPACT ON EYE HEALTH WITHIN APPALACHIAN KENTUCKY

Author(s): Ty Divine

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25397>

This project addresses the relationship of socioeconomic status in relation to eye health and vision needs in rural communities with a focus being on Eastern Kentucky. The geographical area of Eastern Kentucky is well known for health and economic disparities. Eye care is a part of a person's full health and can lead to a lot of future conflicts both medically and socially if not taken good care of. The care or lack of care in the rural Eastern Kentucky area has led to generations of people who haven't had quality vision care leading to a consistent trend within that region. The goals of this project are to show the problem of just one of the health disparities (eye care) seen in the Appalachian region of Kentucky, help show ways of how our state already incorporates vision care within the region, and the challenges that still warrant action among vision care for the population. This project achieves reliable and accurate research to obtain enough information to inform the audience and bring light to this major problem within our state. The usage of personal accounts and semi-structured interviews allow this project to utilize actual residents of the Appalachian region and doctors of optometry within surrounding areas who have experienced first-hand what the disparities have brought to a sometimes forgotten population within our state. Based on the literature the people of Appalachian Kentucky believe that they are stuck without that quality of care based on where they live geographically, the financial status that they are engulfed in or a lack of knowledge on the importance of vision care.

HEALTH, SOCIETY AND POPULATIONS

STRESS MANAGEMENT PROGRAM DEVELOPMENT FOR NURSES WORKING DURING COVID-19

Author(s): Ana Flake

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23784>

This project provides a critical analysis of previous research on resilience and its application to stress management practices among nurses who have worked through COVID-19. The social relevance of the content in this project displays the necessity of action to help and support our nurses struggling through physical and mental illnesses while identifying the inclination of struggle with mental illnesses among this community. With exploratory research, the project categorically acknowledges the parallel to the physical and mental stressors that men and women in the military have experienced. It has become comparable to the nurses/healthcare workers' stressors in their workplace that they have similarly experienced during the pandemic that commenced last March. People in the military have experienced emotional trauma and major mental health issues as a result of their vocation. Stress training and programs have been applied to these groups to support and manage their stress and trauma. If we compare practices and programs already implemented for the military community and apply those concepts to nurses who are working in the current pandemic, we can design a program of certain practices that fit the vocations regarding healthcare that everyone can benefit from by looking at what has and has not worked for the military. It will be important to distinguish what can be done individually and as a team/community to decrement stress levels. If we find avenues of positive consistency and coping methods in these healthcare workers' lives, there is hope for a decline in stress levels, mental health issues, lower rates of burnout in the healthcare workplace, and a healthier workplace. The program will additionally probe for a way to discuss post-traumatic growth and burnout given its connection to resilience.

HEALTH, SOCIETY, AND POPULATIONS

THE COLLEGE MENTAL HEALTH BUBBLE AND THE EFFECTS OF COVID-19

Author(s): Sacha Brockmann

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23854>

This project addresses how college students struggle with mental health due to societal influences. Along with this focus investigating how as a society we are -or we are not-finding ways to aid individuals struggling with this issue. As a college student I understand how mental health truly affects this group, and specifically what issues causes this spike in illness. Some aspects contributing to this that I will research are pressures of academic stress, financial stress, pressure to decide on a career path, and social media influences. To conduct this research, I will focus on research literature as well as administering interviews with fellow college students about these issues and how it has affected their mental health. To go along with these topics, because of today's time, I want to also focus in on COVID and how that has influenced their mental health needs. Has COVID helped them when it comes to mental health or has it made it harder to seek help and deal with these issues. Finally, along with understanding the causes of mental health struggles within college it is also important to investigate if there are resources to help these individuals and if so, how successful they are. While researching for this project influences that will contribute the most will most likely be social media influences and academic stress but for upperclassmen most likely trying to find a career path. Along with that there will most likely be mixed results in how COVID has affected mental health because it is heavily influenced by personal experience during quarantine. Overall, by investigating these topics, it will give a better understanding with how college campuses are dealing with this persistent issue across the nation.

HEALTH, SOCIETY, AND POPULATIONS

THE ROLE OF OBESITY, PHYSICAL INACTIVITY, AND NUTRITIONAL INTAKE IN THE ETIOLOGY OF CANCER

Author(s): Jacob Miller

Learning Lab Intern

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/26273>

The cure for cancer had eluded researchers, though it is an epidemic that can be traced back to the ancient Egyptian empires. This is because there are many causes that lead to cancer development. While some of the causes cannot be prevented, i.e., family history, genetics, sex, there are causes that are preventable. Three of the preventable causes include obesity, physical activity, and nutritional intake. These three are linked to each other, as how much exercise one participates in and what one's dietary intake is will determine their level of obesity, and in turn, one's potential risk of developing cancer. Socially cancer affects the entire world and in 2020 it was the 2nd leading cause of death in the U.S. Obesity and proper nutrition affect the social climate in turns of health care expenses and the quality of food available in the region might predispose an individual to a lower quality of life.

The purpose of this project is to investigate the role of obesity, physical inactivity, and nutritional intake in the etiology of cancer. The means of research will involve critical analysis of scholarly articles and national databases, including but not limited to BRFSS and the FDA. Examples of recent scandals concerning the role of obesity and cancer will also be analyzed and how the public and administrative parties handled the situation will be investigated as well. The result will be an in-depth look at the link between the three causes and cancer, their socioeconomic impact, and potential preventative measures that could be implemented in the future.

HEALTH, SOCIETY, AND POPULATIONS

THE IMPACT OF CORONAVIRUS ON POVERTY AND UNEMPLOYMENT

Author(s): Deja Houseal

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24159>

Poverty is a state of being where an individual has a lack of income and they feel powerlessness. Poverty has affected many individuals during COVID 19 and many people who were not poor before are now. Although poverty can start at a young age, there are many causes of poverty, including lack of access to jobs (unemployment), low education, and insufficient health care access. The research that will be presented will systematically address how COVID-19 has affected individual's lives and how it is related to these causes of poverty. Implementing programs and resources throughout communities could potentially help people get back on their feet. A way to reduce the rates of poverty is to increase the employment rates and develop profitable economic growth programs. Those in poverty who could become involved in this program can reduce the rate of poverty and encourage others to join. The program would also help the children because they would have a better mental health, educational achievement, and of course lower health problems. Poorer communities have been at a higher risk of contracting COVID 19 because of the illness that have existed before were unable to be treated with no access to health care. The research done for this presentation will gather information through various statistical data and articles. The presentation will then go into options there are for unemployment and poverty and what could change. It will conclude with findings from research on how COVID-19 can have an impact on one's income and health.

HEALTH, SOCIETY, AND POPULATIONS

EPIDEMIC WITHIN A PANDEMIC: EVALUATING THE EFFECTS OF SYSTEMIC RACISM ON COVID-19 MORBIDITY AND MORTALITY

Author(s): Amy Keith

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter(2020-21), Honors Program

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25871>

The groundwork for many of our healthcare systems in the United States were built at the beginning of its formation, in the time of slavery. Over 200 years later, we still see the lingering effects of these systems on Black Americans. Health disparities refer to inequitable healthcare in terms of access, outcomes, and more. One of the largest factors of life expectancy is race, specifically whether an individual is Black or not. These disparities can be seen throughout the recent COVID-19 pandemic and through recent research published highlighting these inequities. Analysis of racial health disparities within the COVID-19 pandemic such as cases, deaths, and vaccinations at a national level through the geographic information software mapping tool ArcGIS in addition to statistical analysis will demonstrate the multitude of ways in which the systems in place across the United States are actively failing Black Americans and are leading to significantly worse health outcomes. This presentation will also include the recent life expectancy data and evaluate the downwards trends observed particularly for Black Americans. Discussion will include analysis of vaccination rates and possible ties to historical roots related to resistance in becoming vaccinated and other health-related issues that compound the effects of COVID-19.

HEALTH, SOCIETY, AND POPULATIONS

AIR POLLUTION AND ASTHMA RATES IN KENTUCKY

Author(s): Makayla Melson

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24009>

This research project will inquire if a statistically significant association can be found between local counties' air pollution rates and asthma rates. Asthma is a very common disease throughout the world. According to the Centers for Disease Control, "asthma is a disease that affects your lungs and causes repeated episodes of wheezing, breathlessness, chest tightness, and nighttime or early morning coughing. Asthma can be controlled with medication or removal of environmental triggers." In 2018, 11.5% of the people in the state of Kentucky have been diagnosed with Asthma. We believe that as a county's air pollution rate increases so will its asthma rate. We collected our data from 2 sources which are The Behavioral Factor Surveillance System (BRFSS) and the CDC's Environmental Public Health Tracking Network (EPHTN). The data being used from BRFSS was collected by a telephone survey that's asked participants about health-related risk behaviors, chronic health conditions and the use of preventive services. The data being used from EPHTN was collected in 2014 and comes from compiled data from national, state and city sources. We used this data to create a linear regression table, calculate the r value, R squared value and p-value to evaluate the relationship. The results from the study found a negative correlation between county air pollution rates and county asthma rates.

HEALTH, SOCIETY, AND POPULATIONS

POSTPARTUM DEPRESSION: CAN LOW SES AFFECT PREVALENCE RATES?

Author(s): Mansi Patel

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/26281>

Approximately 1 in 8 women in the United States have reported experiencing symptoms of postpartum depression. Postpartum depression prevalence rates can vary in women due to their socioeconomic status. Economic stress and maternity leave increase the risk of postpartum depression in women. The bridge between postpartum depression and socioeconomic status and maternity leave has been well understood. Past and current research studies have shown that social factors can play a critical role in the prevalence rates of postpartum depression. Studies have used quantitative and longitudinal measures to analyze the relationship between the three factors. In the studies, multiple women from different socioeconomic backgrounds volunteered or were recruited and given questionnaires and/or interviews. From the studies, it was concluded that women who came from a lower socioeconomic status had higher prevalence rates of postpartum depression. Moreover, women who received or took a shorter and unpaid maternity leave experienced symptoms of postpartum depression than those who took a longer and paid maternity leave. The analyses indicated that low income and lack of financial support were associated with symptoms of postpartum depression. It is critical for women, healthcare providers, and businesses to recognize that socioeconomic status and maternity leave play a role in postpartum depression symptoms. Moreover, social factors are just as important as biological factors.

HEALTH, SOCIETY, AND POPULATIONS

HEALTHCARE IN THE UNITED STATES

Author(s): Marra Evans

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25618>

This paper aims to discuss the issues within the United States healthcare system. The goal is to dive deeper into how the healthcare system came to be what it is today and to analyze the differences between other countries. A lot of people grew up in the United States and do not understand the full challenges that the U.S. healthcare system faces. There have been a lot of battles over the years to find the perfect system, but will it ever get there? The information used within this research has been gathered from many different sources ranging from documentaries to research articles. The entire system is complicated and not many young people fully understand it. The goal is that, by the end of this project, this generation can have a better sense of what America's healthcare system is and how different it is from other countries. Majority of the population wants to live a long and healthy life, but not everyone has the same access to that because of the way America's healthcare system is set up.

HEALTH, SOCIETY, AND POPULATIONS

APPROACHING FEMALE HEALTH: HOW CONNECTING COMMUNITIES AND EMPOWERING YOUNG GIRLS CAN IMPROVE HIV/AIDS IN SUB-SAHARAN AFRICA

Author(s): Victoria Graffam

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25780>

Young women and girls in many parts of sub-Saharan Africa are disproportionately affected by HIV compared to their male counterparts due to gendered issues like child marriage, female genital mutilation, lack of formal education, and sexual assault. Data was analyzed from the World Health Organization, United Nations, and non-profit experiences to analyze what efforts are most effective in reducing rates of HIV/AIDS in this extremely diverse region of the world. Kakenya Ntaiya, founder of Kakenya's Dream, is one of the biggest inspiration for this research with the work she's done in her own community on educating girls. Kakenya's Dream isn't the only intervention that has proven to make improvements in the lives of young girls and women, other programs include church programs testing and educating pregnant mothers, petitions for legislation to end female genital mutilation, and ending child marriages. Many of these interventions have shown improvements in the community. In being able to integrate each piece in one community we believe can make a meaningful improvement in the lives of young women and girls. Because this is a huge issue and includes a magnitude of cultural adaptations, the practical limits of achieving this goal will also be addressed.

HEALTH, SOCIETY, AND POPULATIONS

WHY ARE MATERNAL MORTALITY RATES FOR MINORITIES ARE SO HIGH?

Author(s): Demi Jefferson

William C. Parker Scholar

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23964>

Maternal mortality is a topic that has been relevant for that past few years especially in regards to minorities such as african american women. Black women are more than 3 times more likely to have a maternal death than white women in the United States, according to a review presented at the American Diabetes Association's 80th Scientific Sessions. Something that plays a role in these pregnancy related deaths are racial disparities. Access to healthcare is not always not always easy to get but even when minorities do have access to healthcare it doesn't guarantee that they will get the proper treatment that they deserve. We've seen that no matter the education or the class ranking black women's concerns have been looked over and haven't been taken seriously just because of the color of their skin. Throughout the years we've witnessed celebrities such as Serena Williams almost lose her life because her concerns weren't being taken seriously and continue to witness Black women risk their lives giving birth and after birth because of unconscious bias and racism in the healthcare community. I think this is a important topic to talk about because it is important that this issue is not to keep going unnoticed and to try to figure out how we can decrease the maternal mortality rate in minorities in general but especially black women because the healthcare system has been failing them for a long time. The goal of this project is to identify and talk about the problems black women may have from the start of their pregnancy until the end of their pregnancy. Once these problems are identified it's important to discuss and find solutions to them. Then once these solutions are discovered then the discussion of how they should be implemented in society will begin.

HEALTH SCIENCES

ACCESS TO HEALTHY FOOD OPTIONS FOR LOW INCOME AMERICANS

Author(s): Jaylee Murphy

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24003>

Chronic illnesses have become some of the leading killers in the United States, bringing the importance of a healthy diet to the forefront of conversations surrounding disease prevention. Studies have shown that a healthy diet can significantly reduce one's risk for developing a variety of illnesses later in life. Being a society that strives for convenience, fast and processed foods have become the norm. Eating a healthy diet is a seemingly simple solution to the ever growing rates of disease in the U.S., yet it is far from simple. The fact of the matter is that healthy food options are not equally accessible to all Americans. At the center of this issue are socioeconomic factors, in particular education and income level. Often those from low socioeconomic classes are forced to stretch every dollar to meet their needs- diet being one of the first aspects of everyday life that is sacrificed. Many programs have been created to help provide low income citizens with food security, such as the Supplemental Nutrition Assistance Program (SNAP). We used data from the Center on Budget and Policy Priorities, the Physicians Committee for Responsible Medicine, and studies published to the American Journal of Preventive Medicine to examine health and diets of those receiving SNAP assistance. We found that SNAP helps to reduce food insecurity in the United States, but the majority of recipients still lack the means to maintain a healthy diet. Therefore, it is important to understand the cycle of negative health outcomes that result from a poor diet, especially for people enrolled in food assistance programs. Because SNAP provides assistance to so many low income families in the United States, potential areas for improvement within the program will also be addressed.

HEALTH SCIENCES

PROBLEMS MINORITIES FACE WITH MENTAL HEALTH SERVICES

Author(s): Priya Patel

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25394>

This project focuses on the communities that are considered minorities based on their race, ethnicity, sexual orientation, socioeconomic status, the kind of community they live in, and the limitations these kinds of factors play in getting the healthcare help you need, especially when it comes to mental health in America. This project focuses on highlighting mistreatment and misdiagnoses many of these communities face because of the fact that they are a minority. To further understand specific problems they face, this project will focus on research that revolves around mental health care disparities, and in what aspects mental health services and healthcare professionals are more dismissive in. This project will review research that goes into great detail on how mental health services often does not take account of racial and ethics disparities that are more dominant now. Other research should show how clinics are scarce in communities where there is poverty and more of a need for mental health services. This research should show that racial and ethnic minorities have less access to mental health services compared to Caucasians, which leads to not understanding what specific mental health illnesses are more prominent in some minorities compared to others. This project will address how specifically systemic racism may play a role in these problems. Therefore, instead of taking into account each individual patient's background, healthcare professionals follow their mainstream knowledge (that is mainly applicable to Caucasians and learned from studying them) and diagnose patients inaccurately in some cases. The goal of this project is to bring these issues to light more and discuss some solutions that should possibly be enforced to improve the healthcare system and its professionals.

HEALTH SCIENCES

CROSS-DOMAIN ANALYTICS: OPPORTUNITIES FOR IMPROVING DIAGNOSTIC OUTCOMES

Author(s): Erika Skaggs

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25822>

A recent study examining the rate of misdiagnoses in ICUs found that more than 250,000 Americans die each year following a mistaken diagnosis. While some of these deaths were likely unavoidable, this does call into question the analytic methods physicians use to assess patients. Traditionally, medicine has relied on heuristics, generalities and other informal processes to gather information and make judgements about patient care, largely because better options have been either unknown or unavailable. Unfortunately, this not only results in mismanaged cases, it further marginalizes patients who do not fit the standard model. This project is meant to survey the state of the field as it relates to structured analytic methods and their application in a clinical setting, as well as the role technology might play in addressing this disparity. The project involved a review of recent articles from the Journal of the American Medical Association on subjects related to analytic methods, artificial intelligence (AI), and biomedical sensors. Those results were cross referenced against works produced by the security and intelligence community to gauge if there has been an interdisciplinary exchange of methodologies. The investigation showed a weak relationship between the tools used by physicians to diagnose and monitor patients and those employed by national security professionals. However, it did find significant activity in the last five years surrounding the role that AI might play in evaluating large data sets, such as aggregate patient records, and some promise in applying those techniques to individual cases. These findings indicate that structured analytic methods and “smart” technologies have thus far been under utilized as a mechanism for improving patient outcomes. This indicates a need for further research into the practical application of intelligence methods in medicine.

HEALTH SCIENCES

SOCIOECONOMIC STATUS AND HEALTHCARE EFFECTS ON EACH OTHER

Author(s): Elizabeth Tudor

Faculty Mentor(s): Robyn Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23967>

Socioeconomic status includes one's education and occupation,. Socioeconomic status can have an effect on all different aspects of one's life. This presentation will look into how socioeconomic status and America's healthcare system have had direct effects on each other.

This will be accomplished through a critical analysis of previous research on this topic in three steps. This presentation will begin on the findings how much healthcare truly costs and how it affects those of different financial situations. The presentation will then go into various options there are for better healthcare, while acknowledging that our healthcare system has caused significant financial burden on many people and for some, it has caused bankruptcy. It will conclude with findings from research on what direct correlations socioeconomic status can have on one's health and vice versa.

We know through the debate going on about whether or not Universal Healthcare should be used in America, that those of lower socioeconomic status groups do not have proper health insurance. There are also important ways that our healthcare system disadvantages people's socioeconomic status. The analysis to be presented will highlight the complexity of this relationship.

HISTORY

GRIPE ESPAÑOLA: PUBLIC HEALTH AND REVOLUTIONARY GOVERNMENT IN MEXICO 1918-1920

Author(s): Elena Liu

Chellgren Fellow, Honors Program,

Faculty Mentor(s): Joseph Clark

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23692>

A little over a century ago in 1918, the Spanish influenza ravaged the world. As death tolls loomed during each of its three waves, nations across the globe turned to measures such as mask mandates and sanitation enforcement in an attempt to control the pandemic. While the impact of this devastating event in the U.S. and Europe has been widely researched, less is known about the experience throughout Latin America. My project focuses on the public health response to this crisis in Mexico, where over five-hundred thousand individuals died of the “gripe española.” In particular, I am asking how the unique post-war context of the nation at that time dictated both federal and public response to the outbreak of the influenza. While the Spanish flu spread through a rebuilding Europe, it arrived across the Atlantic in the midst of the Mexican Revolution. This study is based on archival documentation, press publications, and health bulletins. My research methodology focuses on analysis of the work of the CSS (Consejo Superior de Salubridad), which was formed in 1917 to respond to the health crisis, and other major health bodies. In addition, I examine the writing of everyday Mexicans during this period from newspapers and private correspondence in order to analyze public perception of the event. I expect to find that destroyed infrastructure and a fractured economy limited the pandemic response from the Mexican government, while its indiscriminate tragedy served as a unifying force for a nation divided over the Mexican Revolution.

HONORS

A REVIEW OF FACTORS AFFECTING PRE-MEDICAL STUDENT SUCCESS

Author(s): Thomas Calderaro

Honors Program

Faculty Mentor(s): F. Douglas Scutchfield

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23953>

A systematic review was conducted to address the question: “What benefits/hinders pre-med students’ success in admissions to medical school?” Ultimately, this question is being asked so that the pre-med curriculum, programming, and experience will maximize student success in being admitted to a US medical school. The systematic review ultimately excluded all but 20 articles, which were analyzed by three reviewers. It was found there is more research necessary to support the effects of many premedical factors on the success of students. Non-academic factors that seem to have a significant impact on premedical success are shadowing, research, service, and building a support system. Many academic and miscellaneous factors also exist and may be useful in developing premedical programs and pathways in the future.

HONORS

CONSIDERING ANIMAL ETHICS

Author(s): Anna Hawse

Honors Program

Faculty Mentor(s): Daniel Kirchner

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23954>

As a society and as individuals, we frequently interact with animals as pets, for research purposes, and for consumption. This interaction frequently results in questions about what our ethical obligations are to these animals. This topic has been addressed by many authors with varying degrees of success. This paper examines the ethical theories of several authors including Bentham, Mill, Kant, Singer and others in order to examine how their ethical theories apply to animals, and the strengths and weaknesses of attempting to apply those theories.

HONORS

A DESCRIPTIVE ANALYSIS OF IMPOSTOR SYNDROME IN HIGH-ACHIEVING UNDERGRADUATE STUDENTS

Author(s): Shelby McCubbin

OUR Summer Research Fellow (2020), Gaines Fellow, Honors Program

Faculty Mentor(s): Tara Tuttle

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23648>

Impostor syndrome (also known as impostor phenomenon, impostorism, etc.) refers to persistent feelings of inadequacy, even when successful. Though often linked to high achieving women (Clance and Imes 1978), impostor syndrome applies to anyone that believes themselves to be less competent than others' perceptions of them. Common phrases associated with impostor syndrome are, "I just got lucky", "I feel like a fake", "I cannot fail", or "It's not a big deal" (in response to compliments following achievements). According to past literature, impostor syndrome is often linked to a variety of detrimental effects including anxiety (Cuncic 2020), burnout (Villwock et al. 2016), and a sense of disbelonging.

The original aim of this research project was to investigate the prevalence of impostor syndrome within a community of honors students. This group was specifically being focused on because honors students are often recruited to a school due to their academic merit/achievements, yet there has not been much research regarding their mental health and personal well-being once in these programs/colleges (Cognard-Black and Spisak 2019; Cuevas et al. 2017; Kelleher 2017). There have been previous studies looking at impostor syndrome in medical students (Masqood et al. 2018), graduate students (Barr-Walker 2019), and high achieving women, but little linking the sensation to undergraduate students and even less targeting honors students specifically. This is problematic because college students are already experiencing a "mental health epidemic" (Gross 2019; Roy 2019), and impostor syndrome fostering feelings of anxiety and isolation will only worsen the issue. It is therefore important to not only potentially identify the presence of impostor syndrome, but also create a standard by which other education institutions can recognize and address it. However, this project is now limited to an initial literature review.

HORTICULTURE

REPURPOSING NEXT GENERATION SEQUENCING DATA FOR A MORE SUSTAINABLE AGRICULTURE: ENSET A CASE STUDY

Author(s): Bridget Bolt

OUR Sustainability Summer Research Fellow (2020)

Faculty Mentor(s): Carlos Rodriquez-Lopez

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23928>

One main challenge to modern agriculture resides on reducing its environmental impact while maintaining yield and quality. Healthy microbiomes provide services to plants by protecting them against disease and environmental insult. The development of new varieties with enhanced microbiome host capabilities has potential to increase sustainability by reducing the use of non-renewable agronomic inputs (e.g. water, fertilizers, and pesticides). To achieve this, it is paramount to first determine what are the differences between the microbiotas of the target crop and its wild counterparts, and then to identify what are the genes controlling plant microbiome assembly that have been affected by domestication. Almost all current approaches used to characterize plant associated microbiotas are based on Next Generation Sequencing technologies. Equally, the genotyping of large populations required for marker-assisted breeding is normally achieved using Next Generation Sequencing approaches. The development of a technique that concurrently provides both microbiota and host genotype information would reduce both the time and the cost associated to future projects aimed at the development of new crop varieties with enhanced host capabilities. We propose that Genotyping By Sequencing (GBS) data generated to genotype crop accessions, could be repurposed to characterize the microbiota of such individuals. To test our hypothesis, we used published GBS data from 148 wild and cultivated accessions of the Ethiopian crop Enset (*Ensete ventricosum*) to study their leaf endo-biome. The analysis was conducted through a series of steps: Genotyping by Sequencing (GBS) data was quality checked to remove poor-quality reads. Then data was demultiplexed and trimmed to generate a unique data set for each of the 148 samples included in the study. Unique sequencing tags were identified and quantified for each sample. In parallel, a local database containing all bacterial and fungal currently available genome sequences was produced by downloading bacterial and fungal genomes from NCBI. Finally, unique sequencing tags were BLASTED to the local database. Reads that presented a sequence similarity above e^{-20} and scoring (match- mismatch) values= 1-2 were considered positive matches for the given microbial species. Approximately 2% of the 2 million sequencing tags obtained from sequencing enset leaves passed such thresholds and were considered as belonging to microbial species that constitute the enset endo-biome. Interestingly, our results showed that the microbiota composition of cultivated and wild enset accessions was different. The validation of GBS data for microbiome analysis using the current gold-standards in the field, will result in immediate availability of numerous data sets containing both crop genomic and microbiome information, significantly reducing the cost of future research projects aimed at the identification of alleles associated to microbiome assembly.

HORTICULTURE

DEVELOPING A TOOLKIT FOR BACTERIAL PANGENOMIC STUDIES: A CASE STUDY OF THE CELLULOSE PRODUCING GENUS KOMAGATAEIBACTER

Author(s): Alexander Stewart

Honors Program

Faculty Mentor(s): Kendall Corbin, Carlos Rodriguez Lopez,

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24107>

Recent advances in sequencing technology and robust bioinformatics applications have allowed genomic research to move beyond the study of single genomes and begin comparative analysis of diverse genomic datasets—pangenomics. The pangenome is a summary of the genetic diversity present in a genomic dataset; it consists of genes present in all genomes (core pangenome) and genes that are only present in a subset of the sample (accessory pangenome). Elucidating the pangenome of a taxonomic unit provides insights on taxon diversity and unique genes that allow organisms to adapt to their environmental niches.

Despite the abundance of bioinformatics tools to study the pangenomes of bacteria, there are relatively few automated pipelines to accomplish such analysis. This project aims to develop an automated Bacterial Pangenomic Pipeline (BPP) that utilizes previously published and newly developed applications to conduct pangenomic studies at the genus level. Through the development of the pipeline, a pangenomic study will be conducted on the *Komagataeibacter* genus of bacteria. Bacteria from the genus *Komagataeibacter* are strong candidates for molecular enhancement due to their ability to produce the exopolysaccharide cellulose. Bacterial cellulose (BC) exhibits unique structural and chemical features that are attractive for applications in the medical, pharmaceutical, and biotechnology industries. However, large-scale success has been limited by the performance capabilities of the bacteria. In this study, the BPP will be used to identify candidate genes for bioengineering in *Komagataeibacter*. Overall, we anticipate the BPP will benefit the wider research community by providing a robust, integrated pipeline for genus-level pangenomic studies.

JOURNALISM & MEDIA

CANDIDATES FOR PUBLIC OFFICE PERCEPTION OF NEWS COVERAGE

Author(s): Kaitlynn Albers

Chellgren Fellow

Faculty Mentor(s): James Hertog

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24146>

There is little in the literature that addresses the question of how candidates for public office perceive news coverage of their campaigns. This research project explores how political candidates evaluate news coverage of their campaigns. Consideration is given to candidates' relationship with the news media, their evaluation of coverage on multiple content characteristics and their overall evaluation of the news media's performance. Characteristics of candidates including political party, gender, race, age, income, electoral success, campaign budget and more will be compared to evaluations of coverage. The impact of candidates' experience with the media will be compared to their use of alternative media to campaign, their satisfaction or dissatisfaction with running for office and their willingness to run again. The research method will be an online survey of political candidates from 2020 administered through an e-mail invitation to visit a website where the survey is hosted. It is part of a multi-year project that has been running since 2008. Results from 2020 will be compared to previous survey findings.

Key words: perception, news media, political candidates, public office, campaigns, Republican, Democrat, performance

KINESIOLOGY & HEALTH PROMOTION

PAIN CAUSATION IN PATIENTS DIAGNOSED WITH FAIS

Author(s): Cambria Dotson

Honors Program

Faculty Mentor(s): Michael Samaan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23992>

This project is focused on the relationship between hip pain, muscle strength and muscle morphology (size and fat infiltration) in patients diagnosed with femoroacetabular impingement syndrome (FAIS). Patients with femoroacetabular impingement syndrome (FAIS) exhibit severe hip joint pain and muscle weakness. The relationship between the hip joint musculature (strength and morphology) and hip pain in patients with FAIS is not well documented. Therefore, this project is focused on the relationship between hip pain, muscle strength and muscle morphology (size and fat infiltration) in patients diagnosed with FAIS.

KINESIOLOGY & HEALTH PROMOTION

ENGAGING AND EMPOWERING APPALACHIAN YOUTH VIRTUALLY THROUGH A PEER-LED E-CIGARETTE PROGRAM

Author(s): Julia Estes, Camille Wright

Faculty Mentor(s): Melinda Ickes

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23326>

Background: In recent years, e-cigarette use has increased amongst youth and young adults with enormous spikes starting in 2016. According to the CDC, 20% of high school students are using these products as of 2020. There is a growing need for education and empowerment to prevent youth from using and support youth in developing advocacy-related skills to prevent others from initiating use. In response to the epidemic of e-cigarette use among American youth, a peer-led e-cigarette prevention and empowerment program was developed by researchers and college students engaged in tobacco prevention.

Purpose: Evaluate the effectiveness of a virtual peer-led e-cigarette education and prevention program by sharing data collected and lessons learned on students' confidence for advocacy efficacy, e-cigarette education, and virtual engagement.

Method: Peer-led facilitators partnered with the rural high school teens and provided a two-part presentation. Part one combined general e-cigarette awareness education and hands-on training in tobacco policy advocacy; part two involved reflecting on takeaways from session one, expanding on barriers to advocacy, and solidifying an action plan moving forward. The advocacy curriculum was tailored toward evidence-based approaches for policy promotion and implementation in similar communities. Participants were sent a link to an online survey through Qualtrics, a secure survey database, following the training.

Results: 20 students were reached. All students reported they learned something new about e-cigarettes, felt confident to be an advocate in their school and community, enjoyed having a college student facilitator present the program, and the facilitator kept them engaged virtually through hands-on activities and opportunities.

Conclusions: Rural high school teens were engaged and empowered after participating in education, prevention, and advocacy-related training. Results support young people's desire to be involved in advocacy efforts, and the need for additional tailored presentations to reach youth in different communities.

KINESIOLOGY & HEALTH PROMOTION

EXPLORATORY ANALYSIS OF HIP JOINT MUSCLE FUNCTION AND CARTILAGE HEALTH IN FEMOROACETABULAR IMPINGEMENT SYNDROME

Author(s): Marlee Scholten

Chellgren Fellow, Honors Program,

Faculty Mentor(s): Michael Samaan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24040>

Femoroacetabular Impingement Syndrome (FAIS) is an orthopaedic condition that consists of abnormal hip joint morphology and severe hip pain. Current conservative treatments for FAIS are not very effective in reducing FAIS-related symptoms, which leads to surgical treatment of FAIS. Surgical treatment (hip arthroscopy) of FAIS involves a reshaping of the hip joint and is effective in reducing hip pain and symptoms. The long-term effects of hip arthroscopy for FAIS on hip joint mechanics and cartilage health are not well understood.

This ongoing study involving FAIS patients has investigated gait mechanics, muscle strength, and magnetic resonance imaging (MRI) to understand the potential changes in hip mechanics, hip strength and hip cartilage health that may occur during the first year after hip arthroscopy. In order to truly understand the effects of hip arthroscopy on hip joint function and health in the FAIS population, an asymptomatic, healthy control group will be used as the comparison group for this study. As of now, this study has recruited and tested 7 pre-surgical FAIS patients with 3 complete post-operative (1-year) datasets. An additional two post-operative patients are scheduled for testing in April and May.

The gait analysis will provide information on how hip joint loading patterns differ from healthy controls and potentially change after hip arthroscopy. Hip joint strength measures will provide us with information on how both FAIS and hip arthroscopy affects hip joint muscle strength in our FAIS patient population. Our MRI techniques provide us with quantitative information on the proteoglycan content and collagen structure of the hip joint cartilage. My current role in this project is to take the MRI scans into Matlab and perform cartilage segmentation. I do this twice through to get more accurate data. With this, we can see the decomposition of the patient's hip cartilage before and after surgery.

LIBRARIES

CREATING A NOVEL HEALTHCARE DELIVERY MODEL TO ADDRESS SOCIAL AND HEALTH DISPARITIES IN LEXINGTON, KENTUCKY

Author(s): Humza Anwar

National Conference on Undergraduate Research (NCUR) Presenter(2020-21), OUR Summer Research Fellow (2020), Honors Program

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23714>

The contemporary Coronavirus pandemic has exposed vulnerabilities in the American healthcare system, particularly as it relates to minorities and indigent populations. While the current crisis highlights healthcare disparities today, these vulnerabilities have existed for a long time. The Hunter Foundation for Health Care (HFHC) was the first nonprofit health maintenance organization (HMO) developed in the state of Kentucky in the 1970s. The Foundation was created to address healthcare disparities for indigent populations within specific geographic areas of Lexington. These disparities included a lack of primary-care access, health insurance, and transportation for health services. The HFHC achieved its goals until it ceased operation in 1976. Utilizing the extensive and unprocessed Hunter Foundation for Health Care Records at the University of Kentucky Special Collections Research Center as a guide, the goal of this project is to develop a novel health care delivery model by using the HFHC as a case-study for comparison. Today, there is inadequate research on identifying the state of indigent citizens with respect to healthcare delivery models. According to the U.S. Census Bureau in 2019, the poverty rate stood at 10.5% and as many as 26.1 million Americans reported not having any form of health insurance. These broad figures reflect an even deeper underlying issue in medium-sized cities, one that does not account for healthcare needs in specific areas facing disproportionate numbers of uninsured or impoverished citizens. In order to better understand these issues, census and geographic data will be used to identify areas in Lexington that lack adequate healthcare resources. This data will assist in demarcating areas of Lexington that face the greatest barriers to accessible and affordable healthcare outcomes. The findings of this model will provide valuable information on equitable healthcare delivery for poor and minority citizens.

LIBRARIES

TO SERVE, PROTECT, AND REFLECT? EXPLORING RACIAL DISPARITY IN THE LOUISVILLE METRO POLICE DEPARTMENT

Author(s): Briley Chambers

National Conference on Undergraduate Research (NCUR) Presenter(2020-21), Honors Program, Singletary Scholar

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23766>

In 1979, Louisville, Kentucky, had a population that was 24 percent Black, but a police department that contained 93 percent white officers. Issues of discrimination in hiring, promoting, and assigning of personnel within the Louisville Division of Police led to a court ruling that 15 percent of the department should be Black, a percentage corresponding to the proportion of non-whites in the metropolitan area labor market. By analyzing an archival collection of court records relating to the case *Louisville Black Police Officers Organization v. the City of Louisville* in the Judge Charles M. Allen Papers at the University of Kentucky Special Collections Research Center, research will uncover how the resulting consent decree affected the demographics of the department in the decades after the decision and how it affects current demographics. The collection is comprised of briefs, judgements, and correspondence related to this case, which aimed to improve employment opportunities for Black officers in Louisville. Through the study of these court records and papers of Judge Allen, who presided over the case, we can understand how the criteria for promotion eligibility affected non-white officers disproportionately. By analyzing the press releases and personal letters from officers and their families, we can better interpret the effect that employment standards had on law enforcement and its durability. Further research of Louisville city reports will uncover the long-term effects of affirmative action on the racial composition of the Louisville Division of Police and examine if the police department has reached the goals of the court ruling.

LIBRARIES

LOST HISTORY: UNCOVERING LEXINGTON, KY'S EARLY JEWISH COMMUNITY

Author(s): Austin Coke

National Conference on Undergraduate Research (NCUR) Presenter (2020-21), Honors Program

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23691>

Jewish history often becomes lost within a dominantly Christian community's narrative, such as the case in Lexington, Kentucky. While the Jewish community grew significantly enough to build a synagogue in 1904, the synagogue has retained very little of its early history. Using the large and unprocessed archival collection of one of the most prominent Jewish citizens in Lexington at the time, research will uncover many of the figures and actions that took place during this significant time period. The Moses Kaufman Papers at the University of Kentucky Special Collections Research Center contains correspondence, writings, and voluminous scrapbooks filled with clippings related to Jewish cultural life in Lexington during the years 1873 to 1924. Qualitative analysis of this extensive collection of letters and articles will establish a timeline of significant events and a network of men and women who, along with Kaufman, helped to establish the formal Lexington Jewish community. Further research on this project will discover how the Jewish community was represented in Lexington through local newspapers and identify other prominent supporters of the Jewish community in Lexington during the early 20th century.

LIBRARIES

“MEN OF THE HILLS” EXAMINING PAST PHILANTHROPIC ORGANIZING IN CENTRAL KENTUCKY AND ITS PORTRAYAL OF APPALACHIA

Author(s): Emily Keaton

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter (2020-21), Chellgren Fellow, Honors Program

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24141>

Throughout the past century, Appalachian Kentucky has remained actively involved in grassroots organizing, as well as pursued by outside activists for anti-poverty and environmental change work. This cannot be fully understood outside of the context of fossil fuel labor, which has largely impacted the region's geography and left Appalachians disenfranchised after companies exploited both people and resources for profit. The resulting poverty has required and inspired internal community response, state activism, and national programs, like the notable War on Poverty efforts in the 1960s. One such responding, prominent philanthropic organization mostly composed of former Appalachian residents, the Kentucky Mountain Club (1929-2013), sought to use their newfound urban wealth and social capital to fund scholarships and healthcare facilities in the place they once called home. Unique to most philanthropic organizations, membership was not solely limited to those living in its established location (in this case, Lexington), and members were regionally focused on an area other than their own, which posed challenges in organizing and sheds light on their nostalgic mountain pride and settler-colonial narrative of Appalachia. By using newly donated Kentucky Mountain Club Records at the University of Kentucky Special Collections Research Center, this research will explore the former Club's founding views on how to market Appalachia as a natural bounty, structure social and philanthropic gatherings and fundraisers, and support educational advances through scholarships, as well as its internal social processes that, though once common, have fallen out of favor. Further qualitative analysis will examine the impact that such narratives have had on Appalachian policy efforts and portrayals in larger American spheres.

LIBRARIES

CROSSWAYS: THE INTERSECTION BETWEEN RACIALIZED RAILROADS AND RACIAL EQUITY IN THE WORKPLACE

Author(s): Olivia Morris-Bush

Chellgren Fellow, First Generation, Gaines Fellow, William C. Parker Scholar,

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23741>

Despite government policies and laws that condemn racial discrimination in the workplace, this does not mean that discussions and ideas for improving racial equity in the workplace cease to exist. When discrimination in the workplace occurs, individuals and unions can represent marginalized employees' interests. The letters from Thomas Redd (1891-1941), an African American railroad worker who was involved in the Colored Brakeman of the Kentucky Division of the Road union and the co-founder of the Association of Colored Railway Trainmen and Locomotive Firemen (ACRT) brings awareness to how African Americans had to advocate through unions to have their grievances and concerns heard by the Illinois Central Railroad Company (IC) leadership.

The intent of this project is to explore how the racialized landscape of the IC can be uncovered by analyzing the racialized language of Thomas Redd's letters from the University of Kentucky Special Collections Research Center and Cornell University's Kheel Center for Labor-Management Documentation and Archives. By conducting a qualitative analysis of the racialized language used by Redd to describe how IC African American employees endured racial discrimination will reveal the racial dynamics of the IC workplace environment. Thomas Redd used his persuasive writing skills and leadership position in the Colored Brakeman of the Kentucky Division of the Road as a means of advocacy that brought visibility to African American IC employees that did not have the privilege to challenge acts of racial discrimination. After a qualitative analysis of Redd's letters' racialized language, there will be a need to compare Redd's recommendations for a racially equitable work environment to current employment policies related to racial discrimination and anti-racism.

LIBRARIES

LEXINGTON AND LOUISVILLE: A TALE OF TWO CITIES

Author(s): Aaron Shrout

National Conference on Undergraduate Research (NCUR) Presenter (2020-21)

Faculty Mentor(s): Carol Street

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24072>

The city of Lexington, Kentucky, was once one of the largest and wealthiest settlements west of the Allegheny Mountains. Lexington supported the first university in the western region and earned the nickname “Athens of the West” for its bustling economy and architecture. One of the few elements it lacked was a reliable transportation network to connect it to its rival city of relatively equal size, Louisville, as well as the more established city of Cincinnati and Frankfort, the state capitol. In the early 1800s, transportation meant trains, and city leaders sought to connect their city by creating the Lexington and Ohio Rail Road Company. The company ultimately failed and trains to connect Lexington wouldn’t become a reality for years. In the meantime, Louisville grew exponentially due to its access to transportation via railroads and the Ohio River. Utilizing the unprocessed Lexington and Ohio Rail Road Company Board of Directors Record Book, 1830-1833, from the University of Kentucky Special Collections Research Center, as well as census data, and available records on trends in population growth, industrialization, available transportation, levels of poverty, and total economic output, research will map how the two cities were affected due to access to transportation. Quantitative analysis will explore how decisions and a company’s failure that happened in the early 1800s altered the size and stature of Lexington today.

MATHEMATICS

USING SEMIALGEBRAIC PARAMETRIC ANALYSIS BY METAPROGRAMMING IN PORTFOLIO OPTIMIZATION

Author(s): Philip Meersman

Faculty Mentor(s): Yuan Zhou

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/26068>

One classic problem in quantitative finance is portfolio optimization, which consists of assigning weights to assets in a portfolio to maximize one's expected return while keeping the level of risk at a desired level. This problem can be modeled as a linear program (LP), using a risk aversion parameter μ . For a given single value of μ , the LP can be solved using any standard LP solver. In this work, however, the problem is considered parametrically: the optimal solution is sought for every possible value of μ . This describes how weights to the portfolio assets would be assigned from the timid investor to the bold. This is accomplished by applying the novel technique of semialgebraic parametric analysis by metaprogramming (SPAM). Demonstrated in this talk is the method of applying SPAM to a textbook example of portfolio optimization. Generated in this way are numerical and symbolic representations of the solution set as well as a graphical representation of these results.

MICROBIOLOGY, IMMUNOLOGY & MOLECULAR GENETICS

CHARACTERIZATION OF ADIPOSE TISSUE GENE EXPRESSION IN THE GENE AFR2 WITH MICE TREATED WITH CCL₄ IN BL/6 AND C3H MICE

Author(s): Cheyenne Chandler

OUR Summer Research Fellow (2020), Chellgren Fellow, William C. Parker Scholar,

Faculty Mentor(s): Brett Spear

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24134>

In the human body, several organs are required to maintain metabolic homeostasis and provide the body with an adequate environment for healthy growth. The digestive system, including the liver, is necessary for providing the intake and processing of food to maintain metabolic pathways. A failure of liver function could have negative consequences on human health. Non-alcoholic fatty liver disease (NAFLD), which can reduce normal liver function, is a rapidly growing disease in humans that is associated with obesity. It is estimated that over 25% of Americans suffer from NAFLD, and this number is expected to grow. Environmental toxins, including carbon tetrachloride (CCl₄), can also damage the liver.

The liver is a vital organ and contains several cell types that maintain homeostasis. Other organs cooperate with the liver to provide the adequate metabolites that the human body requires. Adipose tissue, located outside the liver, includes epididymal white adipose tissue (eWAT) and brown adipose tissue (BAT). eWAT is an adipose tissue that contains lipid storing cells and BAT is an adipose tissue that uncouples oxidation in the mitochondria and produces heat. In the Spear lab, where I performed my research, *Zinc fingers and homeoboxes 2 (Zhx2)* was identified as a gene that can influence liver disease, including NAFLD. The overall purpose of this study is to broaden possible *Zhx2* targets, and the hypothesis is that there are several gene clusters that influence NAFLD.

Using mouse liver samples from a CCl₄ experiment in different two different mouse strains, my research identified gene clusters that are impacted by *Zhx2*. Another locus called *Afr2* also affects liver disease. My of *Afr2* and *Zhx2* in adipose and liver tissue add to our understanding of how metabolic pathways are affected by liver disease.

MODERN AND CLASSICAL LANGUAGES, LITERATURES AND CULTURES

COMMANDING & COMMUNICATING A CLEAR RESPONSE TO THE EUROPEAN UNION: AN ANALYSIS OF IMPROVING HEALTHCARE SYSTEMS FOR PATIENTS IN LINGUISTICALLY DIVERSE SETTINGS

Author(s): Tori Vestal

Oswald Research and Creativity Awards Winner (Fall 2020) (1st or 2nd place), Chellgren Fellow, University Scholars Program, William C. Parker Scholar

Faculty Mentor(s): Sihui Ke

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24061>

This designed research project aims to examine the various healthcare practices and systems that are used to communicate information European Union states and greater Europe. How can the European Union improve the state of health literacy to various populations such as immigrants? What methods of communication in healthcare act as most beneficial to ensure that valid results of healthcare practices on immigrants are reported internationally? The project analyzes the role of language, global health, and communication in immigrant populations, as well as barriers and approaches to resolving issues. Such barriers may include the absence of access to health literacy among immigrants and access to services such as translation and healthcare interpreting for countries in the European Union. Methodologies of this analysis include a diverse range of surveys, samples, questionnaires, and cross-sectional studies compared among countries in the European Union and Europe. Languages assessed can include Arabic, Somali, French, and Dari.

MOLECULAR & CELLULAR BIOCHEMISTRY

METHODS IN DETERMINING THE EFFICACY OF NOVEL WNT INHIBITORS USING THE ZEBRAFISH MODEL

Author(s): Kenan Andre Flores

Honors Program

Faculty Mentor(s): Jessica Blackburn

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23663>

The Wnt signaling pathway is a focus of cancer research because of its highly activated state in many types of cancer. Testing of drugs that inhibit the Wnt signaling pathway is a method to find possible cancer therapeutics. Large scale drug screening in mice is difficult because of their cost, which has resulted in alternative models. One of these alternatives, the zebrafish model, improves on these limitations because of its low-cost and ability to produce results rapidly. The Blackburn lab completed a screen of over 770 FDA-approved drugs to find compounds that could be repurposed to inhibit Wnt signaling. We found 8 novel chemicals that inhibited the Wnt signaling pathway. To further determine the efficacy of these 8 drugs as possible cancer therapeutics, the Blackburn lab created a three-part protocol that tests the drugs capacity to inhibit the Wnt signaling pathway. The first portion uses a zebrafish line in which cells that have activated Wnt signaling fluoresce with Green Fluorescent Protein (GFP). Under normal conditions, the tail of the developing zebrafish larvae glows green under a specific color of light. Inhibition is expressed as a decreased expression of GFP, resulting in a decrease of fluorescence in the tail. The second portion tests for inhibition through the amputation of the caudal fin. Inhibition results in a decreased regeneration of the fin. The third portion tests for inhibition through eye development in zebrafish embryos. These embryos are placed in a solution called BIO that over stimulates the Wnt pathway, resulting in an eyeless phenotype. By Inhibiting the expression of the Wnt pathway, these embryos can be rescued and develop their eyes normally. The goal of the experiment is to narrow down which of the 8 drugs identified in the initial screen can be moved into pre-clinical testing in human cancer cells.

MOLECULAR & CELLULAR BIOCHEMISTRY

UNDERSTANDING INSULIN-DEGRADING ENZYME (IDE)-PHOSPHATIDYLINOSITOL PHOSPHATE INTERACTIONS

Author(s): Lexi Nolletti

Chellgren Fellow, Gaines Fellow, Honors Program,

Faculty Mentor(s): David Rodgers

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23662>

The Insulin-degrading enzyme (IDE) is a widely expressed protein responsible for breaking down insulin, the amyloid beta peptide (involved in the development of Alzheimer's Disease) and other cellular substrates. This research aims to identify how IDE gains access to its substrates, which are typically found in endosomes within a cell. Our hypothesis is that a small fraction of the IDE present in a cell's cytosol is drawn into the endosomes by binding to phosphatidylinositol phosphate (PIP) lipids located on the outer membranes of these subcellular compartments.

While we have not yet obtained conclusive results, much of the semester was spent attempting to crystalize rat IDE produced in insect cells and bound with the polar portion of a PIP to better define the binding site on the enzyme. Computational modeling has identified the most likely sites of phosphatidylinositol binding, but successful crystallization of an IDE-phosphatidylinositol complex would support our hypothesis and guide future investigations of IDE's biochemical activity. Efforts are also underway to test the proposed binding site by determining if the PIP polar portion acts as an inhibitor of the enzyme.

MOLECULAR & CELLULAR BIOCHEMISTRY

ENDOSOMAL LOCALIZATION MECHANISM OF INSULIN-DEGRADING ENZYME

Author(s): Sarah Sprigg, Courtney Martin

National Conference on Undergraduate Research (NCUR) Presenter (2020-21)

Faculty Mentor(s): David Rodgers

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23001>

The purpose of our research is to determine how Insulin-degrading enzyme (IDE) localizes in a cell to gain access to its amyloid beta and insulin substrates. Current research suggests that levels of amyloid beta and insulin are both controlled by the enzymatic activity of IDE, however, it is not clear how the largely cytosolic IDE encounters these substrates. Further understanding of this mechanism would be relevant for therapeutic approaches that target IDE for treatment of both Type 2 Diabetes and Alzheimer's Disease. Evidence suggests that a fraction of IDE localizes to cellular endosomes, where it could gain access to substrate peptides. We hypothesize that IDE binds to phosphatidylinositol phosphate (PtdInsP) head groups on outer membranes of endosomes, resulting in IDE localizing to endosomal compartments. In order to test our hypothesis, we developed and assayed multiple IDE variants with mutations in the proposed binding site for PtdInsP head groups. We tested the mutants for binding to liposomes doped with PtdInsPs, and found that as expected, mutations in the proposed PtdInsP interaction site abrogated liposome binding. These results support our proposed mechanism for endosome localization, suggesting that IDE degrades amyloid beta and insulin in these subcellular compartments. We are now beginning to test this localization mechanism in cultured cells.

MOLECULAR & CELLULAR BIOCHEMISTRY

DIMINISHING GLYCOGEN AGGREGATES IN ALZHEIMER'S DISEASE

Author(s): Meredith Williams

Chellgren Fellow

Faculty Mentor(s): Matthew Gentry

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24124>

Alzheimer's disease (AD) is a progressive dementia that affects millions of people. This disease causes loss of memory, ability to respond to environmental changes, and independence. In the United States, AD is the fifth leading cause of death in people over the age of 65 years. Scientists have been researching this complex neurological disease and its genetic, environmental, and other unknown factors to discover a cure. A potential contributing factor to AD pathogenesis is the presence of abnormal glycogen accumulation, which typically serves as the main storage molecule of glucose, in the liver, muscles, and brain. Utilizing the 3xTG mouse model of AD, we administered antisense oligonucleotides (ASO) by intracerebroventricular (ICV) injections to knockdown glycogen synthase in the brain. ASOs are small molecules that interfere with RNA to allow for precise control of targeted protein expression. We assessed the effect of this treatment after 4 weeks and analyzed the brains utilizing gas chromatography mass spectrometry (GCMS), western blots, and immunohistochemistry (IHC). GCMS was used to determine the metabolic profile and glycogen levels. Western blots were used to evaluate the degree of successful knockdown of glycogen synthase at the protein level. IHC staining analyzed with HALO software detected glycogen aggregate degradation. Through these techniques, it was determined that the knockdown of glycogen synthase was successful alongside a drastic decrease in glycogen levels. These results provide evidence that the ASO drug is a powerful tool to modulate glycogen metabolism and has potential to produce the same results in humans. Further research into the regulation of glycogen metabolism and its behavioral effects in AD patients may lead to potential reversal of its symptoms and partial restoration of memory.

MUSIC

COMPACT DISC RECORDING OF JOHN HYDE'S 1799 TREATISE, "A NEW AND COMPLETE PRECEPTOR FOR TRUMPET AND BUGEL HORN"

Author(s): Andrew Reynolds

OUR Summer Research Fellow (2020), University Scholars Program

Faculty Mentor(s): Jason Dovel

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24032>

"Baroque" trumpet is the valveless ancestor of the modern trumpet and was the instrument that Baroque composers like J.S. Bach, G. Handel, A. Vivaldi wrote for. UK is one of the few institutions in the world to offer instruction on the valveless Baroque trumpet, which our ensemble was established in 2013 by Dr. Jason Dovel. The UK Baroque Trumpet Ensemble has since programmed some spectacular performances with leading baroque performers, including John Foster, Friedemann Immer, and Augusta McKay Lodge.

Over the summer of 2020, the UK Baroque Trumpet Ensemble was the first ensemble to record John Hyde's 1799 Treatise. Originally, we were going to record on campus, in real-time, with all players in the same room. As a result of Covid, the ensemble decided to continue the project and get creative with the logistics. Dr. Dovel produced "click-tracks" for every song. A click-track is an audio track with a drumbeat to establish the tempo. The ensemble utilized this by recording our individual parts with headphones. UK students recorded from their various residences, which include Kentucky, Indiana, Virginia, and Missouri. Once all of the students had recorded their individual parts, Dr. Dovel put them together in the music editing software ProTools. Once he had them aligned, those tracks were sent to a professional recording company (Joel Crawford Recording in Cincinnati, Ohio) who mixed and mastered over 50 tracks for the final product. On August 17, 2020, the audio was uploaded to CDBaby.com, which made the disc available internationally through iTunes, Spotify, Apple Music, Youtube, etc. The ensemble also produced physical discs that are used to promote to prospective students.

NEUROSCIENCE

THE RELATIONSHIP BETWEEN SLEEP AND ALZHEIMER'S DISEASE

Author(s): Lindsay Beechem

National Conference on Undergraduate Research (NCUR) Presenter(2020-21), Honors Program

Faculty Mentor(s): Marilyn Duncan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23429>

Alzheimer's Disease (AD) is a neurodegenerative disease that is characterized by amyloid beta ($A\beta$) plaques, neurofibrillary tangles, neuronal death, and profound cognitive impairment. Previous studies have indicated that increased $A\beta$ and alterations in the daily sleep-wake cycle are early risk factors and possible predictors of AD. Acute sleep deprivation decreases $A\beta$ clearance, and increased $A\beta$ levels stimulate neuroinflammation and accelerate loss of neurons and synapses. Likewise, it has been shown that there are higher rates of sleep disorders in AD patients. However, limited studies have investigated whether sleep fragmentation accelerates the progression of AD pathology. This partial review will discuss experiments investigating the link between sleep and AD. Additionally, we completed three pilot studies exploring whether chronic disruption of daily sleep-wake cycles with sleep fragmentation (SF) increases $A\beta$ and neuroinflammation in the brains of transgenic mice that serve as an experimental model for AD. Mice were sorted into an undisturbed sleep (US) group and an SF group, involving stimulation for one-hour periods during the light phase, 4 times/day, 5 days/week for 4 weeks. Sleep monitoring using the noninvasive piezoelectric system showed that the US mice slept as expected during the light phase; however, SF mice had greatly reduced sleep during the SF intervals, and sleep loss was only partially restored during the dark period. Protein analysis showed that hippocampal levels of $A\beta$ 40 and 42 were significantly increased in SF compared to US mice. Additionally, gene expression markers of neuroinflammation in the hippocampus were significantly elevated in SF mice. These results suggest that fragmentation of the daily sleep-wake cycle stimulates hippocampal levels of $A\beta$ and neuroinflammation. If future rodent studies support these findings that chronic SF advances AD pathology, then improving sleep consolidation would be a potential therapeutic strategy for reducing the progression of AD in humans.

NEUROSCIENCE

VIRTUAL AUTHENTIC LEARNING EXPERIENCES IN MOLECULAR BIOLOGY USING DATA SONIFICATION

Author(s): Sydney Daniels, Kayla Horne, Taylor La Mantia, Andrea Hernandez, Emme Bradley, Lordina Mensah

National Conference on Undergraduate Research (NCUR) Presenter(2020-21), OUR Summer Research Fellow (2020)

Faculty Mentor(s): Luke Bradley, Timothy Moyers, Michael Baker

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24101>

As careers in STEM fields continue to grow at a rapid speed and biotechnology becomes more integrated with daily life, fostering education in STEM becomes increasingly necessary for students and for the public. However, COVID-19 has limited authentic-learning opportunities for students and simultaneously demonstrated the need for an increased public understanding of basic biomedical science. Authentic-learning experiences are a proven, effective approach for students to learn fundamental science concepts, while gaining exposure to real world science and gaining a stronger sense of belonging in STEM and higher education. High school and introductory college level students have a limited educational background which poses a challenge to understanding molecular biology and increases STEM attrition. To address this overall need, we have assembled an interdisciplinary team to build a virtual authentic-learning tool utilizing data sonification (i.e. translating data to sound) to analyze protein amino acid sequences. Using musical models, the effects of a mutation on protein structure and function can be easily and intrinsically recognized which ultimately increases students' understanding of the molecular basis of disease. Natural and mutant amino acid sequences were retrieved from UniProt's protein database, and amino acids were mapped to a musical scale based on hydrophobicity properties. At residues where mutations arise, a wave shaping distortion occurs to sonically demonstrate how a mutation disrupts the way the protein folds or binds with its targets. Using these methods, we have created models of various genetic disorders including epileptic encephalopathy, osteogenesis imperfecta, epidermolysis bullosa simplex, amyotrophic lateral sclerosis, and Charcot-Marie-Tooth disease. Current students have participated in this authentic-learning experience and have demonstrated increased understanding of molecular biology, and we expect that the results of this project will lead to a widespread experiential learning module shared with the STEM Education community.

NEUROSCIENCE

LEARNING TOOL FOR PARKINSON'S DISEASE-ASSOCIATED PROTEIN MUTATIONS USING DATA SONIFICATION

Author(s): Emily Guerrero

Chellgren Fellow, First Generation, Honors Program, William C. Parker Scholar

Faculty Mentor(s): Luke Bradley, Timothy Moyers, Michael Baker

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24140>

Public education on STEM (Science, Technology, Engineering, Math) has become necessary in understanding the significance of biomedical science and biotechnology. The COVID-19 pandemic has led to the dependence on an online-based learning environment that limits students' ability to gain STEM authentic learning experiences. Authentic Learning experiences allow students to comprehend STEM concepts and make connections to real-world issues. This research project uses data sonification, or the process of translating data into sound, as an authentic learning tool to recognize changes to the structure and function of proteins related to understanding the molecular foundation of diseases such as Parkinson's disease. Parkinson's disease is a neurodegenerative disorder with a known genetic cause by the mutation of specific proteins recognized by biomedical researchers. These mutated and natural sequences for proteins, such as Alpha-Synuclein, LRRK2 (Leucine-rich repeat kinase 2), DJ-1 Protein, Parkin Protein, and PINK1 (PTEN-induced putative kinase 1), are collected from the UniProt protein database. Then the amino acid in each protein sequence is classified by the hydrophobicity index and transferred into a musical scale through the data sonification application. The application processes the music pattern and generates an audible distortion at the mutated positions of the protein. The distortion indicates a disruption in protein folds or binding sites that lead to phenotypic changes related to the disease. Overall, the project demonstrates the use of data sonification as a virtual learning tool in understanding complex protein structures concerning Parkinson's disease through the use of music patterns that offer a direct way of detecting mutations with audible sounds.

NURSING

PROMOTING SAFE INFANT SLEEP PRACTICE IN ECUADOR: PRELIMINARY FINDINGS

Author(s): Nidhiben Patel, Nadja Nelson

Chellgren Fellow, First Generation

Faculty Mentor(s): Hartley Feld

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23737>

Ecuador's annual mortality rate from sudden infant death (SIDS) is four times higher than other countries in the region. Prone or side sleep positioning contributes to increased risk of SIDS in infants globally. Providing the American Academy of Pediatrics evidenced-based guidelines and education, as well as the provision of Finnish baby boxes with a safe sleep surface, are affordable and accessible interventions used globally in high-income countries to promote safe sleep. Little is known about this practice in the context of a low or middle-income country, like Ecuador. The aim of this research was to determine if the provision of the box and safe sleep education improved safe sleep practice, specifically the sleep position. We used a secondary analysis of a longitudinal randomized control trial of 16 pregnant and early postpartum mothers. Women were recruited from Shoulder-to-Shoulder partner community health clinic in a low-resource, peri-urban community in Santo Domingo, Ecuador. Pre/post data was analyzed for change in sleep position intentions before birth and safe sleep practice at 1 month postpartum. Responses to open ended questions reflected the mother's rationale in decision making regarding sleep practice, these were categorized as barriers and facilitators. There was a 3-fold increase of mothers who adopted the safe sleep position (supine/back); these mothers reported that the education was helpful. However, mothers who intended to put the baby to sleep in the prone position continued to do so, and many mothers reported more than one position. Women reported that cultural or safety concerns were difficult to overcome, particularly the fear of choking. Preliminary data suggests a trend that education promotes behavior change from the side to supine position. The cultural and social context of this region of Ecuador may not facilitate supine sleeping for all families.

OBSTETRICS & GYNECOLOGY

EXPOSURE TO AN ENVIRONMENTALLY RELEVANT PHTHALATE MIXTURE DISRUPTS OVULATORY EXTRACELLULAR MATRIX REMODELING IN MOUSE ANTRAL FOLLICLES IN VITRO

Author(s): Katie Land

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter (2020-21), OUR Research Ambassador (2020-21)

Faculty Mentor(s): Patrick Hannon

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22914>

Phthalates are chemicals found in common consumer products (cosmetics, personal care items, food/beverage containers). Exposure to multiple phthalates is unavoidable, and detectable levels have been measured in the ovary. Therefore, an environmentally relevant mixture of phthalates (PHTmix) was investigated to determine the effects on ovulation. Ovulation requires remodeling of the extracellular matrix (ECM). ECM remodeling is regulated by various matrix metalloproteases (MMPs), tissue inhibitors of MMPs (TIMPs), a disintegrin and metalloproteinase with thrombospondin-like motifs (ADAMTS), plasminogen activators (PLAT, PLAU), and inhibitors (Serpins). We hypothesized that PHTmix exposure would decrease ovulation rates by altering the levels of ECM remodeling factors. Antral follicles from adult CD-1 mice were cultured for 96h to support pre-ovulatory development, and treated with vehicle control (dimethylsulfoxide, DMSO) or PHTmix (1-500µg/ml). Media were then replaced with maturation media ± human chorionic gonadotropin (hCG, ovulatory stimulus) and treated with DMSO or PHTmix. Ovulation was assessed and follicles were collected across the ovulatory period (4, 11h) for gene expression analysis (n=4-10, p≤0.05). Treatment with hCG alone resulted in a 78% ovulation rate. However, all tested doses of hCG+PHTmix decreased ovulation rates with the hCG+500µg/ml group being statistically equivalent to the DMSO group that did not ovulate. Exposure to the PHTmix yielded increased expression of *Mmp9* (11h), *Mmp14* (4, 11h), *Mmp16* (4, 11h), and *Mmp19* (11h) relative to hCG alone. Further, the PHTmix decreased expression of *Timp1*, *Serpine1*, and *Serpinb2* at both timepoints, but yielded both increases (1µg/ml) and decreases (500µg/ml) in *Adamts1* at 4h relative to hCG alone. These data suggest that the PHTmix directly inhibited ovulation via decreased expression in PA inhibitors (Serpins) and MMP inhibitors (TIMPs), which potentially led to non-functional compensatory increases in MMP expression. This is concerning because phthalate exposure may contribute to ovulatory defects- a leading cause of infertility in women. Supported by R00ES028748, P30ES026529.

OBSTETRICS & GYNECOLOGY

OVULATION IS INHIBITED BY EXPOSURE TO AN ENVIRONMENTALLY RELEVANT PHTHALATE MIXTURE VIA DECREASES IN ANGIOGENIC FACTORS IN MOUSE ANTRAL FOLLICLES IN VITRO

Author(s): Frances Miller

Faculty Mentor(s): Patrick Hannon

Poster Presentation [Presentation Date/Time]

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23311>

Phthalates are endocrine-disrupting chemicals utilized as solvents and plasticizers in numerous cosmetic, building, and medical products. Our laboratory has shown that exposure to an environmentally relevant phthalate mixture directly inhibits ovulation in mouse antral follicles *in vitro*. However, the mechanism by which phthalates inhibit ovulation is unknown. This study investigated how phthalates disrupt angiogenesis, a pivotal process for successful ovulation. Angiogenesis occurs late in the ovulatory period and is the process of new blood vessel formation within the ovulating follicle and transforming corpus luteum. To mimic human phthalate exposure, this study utilized an environmentally relevant phthalate mixture (PHTmix) derived from urinary phthalate levels in pregnant women. We hypothesized that PHTmix exposure would decrease angiogenic factors, including vascular endothelial growth factor A (VEGFA) and placental growth factor (PGF), leading to inhibited angiogenesis. Antral follicles mechanically isolated from adult CD-1 mice were first treated with FSH (follicle stimulating hormone) for 96hr to stimulate development and simultaneously treated with vehicle control (dimethylsulfoxide, DMSO) or PHTmix (1-500 µg/ml). After preovulatory development, the media were replaced with ovulation inducing maturation media (± human chorionic gonadotropin, hCG) and additionally treated with DMSO or PHTmix. The treated media were utilized to quantify angiogenic factor concentrations at 11hr and 18hr ovulatory timepoints via enzyme linked immunosorbent assays (ELISAs) (n=3-9, p≤0.05). Exposure to hCG + PHTmix resulted in a decrease in VEGFA levels relative to hCG at 11hr (100, 500 µg/ml) and 18hr (1, 10, 100, 500 µg/ml). Additionally, hCG + PHTmix exposure decreased PGF levels relative to hCG at 11hr (1, 10, 100, 500 µg/ml) and 18hr (100, 500 µg/ml). Ultimately, these data suggest that exposure to phthalates inhibits ovulation by decreasing angiogenic factors, VEGFA and PGF, thus potentially contributing to ovulatory defects, which are the leading cause of infertility in women. Supported by R00ES028748, P30ES026529.

OTOLARYNGOLOGY

RAPID QUALITATIVE ANALYSIS OF SEMI-STRUCTURED INTERVIEWS INVESTIGATING THE EFFECT OF COVID-19 ON FAMILIES WITH CHILDREN WHO ARE DEAF OR HARD OF HEARING

Author(s): Callihan Moraska

Honors Program

Faculty Mentor(s): Julie Jacobs, Tina Studts

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24016>

Evidence-based practices, programs, and policies often do not reach the populations they are intended to benefit. This research-to-practice gap is an ongoing problem that dissemination and implementation (D&I) research aims to address. As an emerging field, D&I science is characterized by the study of methods to increase the adoption of evidence-based practices in medicine, public health, and other related settings. D&I science utilizes both qualitative and quantitative data analysis methods. However, traditional qualitative analysis methods can be complex and time-consuming. Rapid content analysis is an emerging approach that uses the characteristics and content of language to provide an understanding of qualitative data through systematic classification, coding, and theme identification. Unlike other qualitative methods, rapid content analysis does not require data transcription, allowing for more timely dissemination of results to targeted populations. The need for rapid content analysis is evident in our study investigating the effects of COVID-19 on families with children who are deaf or hard of hearing. In the wake of the pandemic and the sudden, immense changes in healthcare delivery, we assessed families' experiences with hearing healthcare services. We also examined parent and child well-being. In order to utilize the rapid analysis method, we designed a summary template based on the major themes identified in the semi-structured interviews that we conducted. Coding the interviews required our researchers to interpret and assign data into individual summary templates. Using these templates, we consolidated the data into a single matrix based on the identification of overarching themes. Using the rapid analysis method, the goal of our study is to quickly provide actionable data to inform proactive changes to public health practices and policies that meet the needs of the deaf and hard of hearing community.

PHARMACOLOGY AND NUTRITIONAL SCIENCES

PERIVASCULAR ADIPOSE TISSUE MEDIA EXPLANT IMPAIRS ENDOTHELIAL FUNCTION IN OBESE MICE EXPOSED TO EARLY LIFE STRESS IS FAT DEPOT-SPECIFIC

Author(s): Irena Antic

Faculty Mentor(s): Analia Loria

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24026>

Maternal Separation and Early Weaning (MSEW) is a mouse model that mimics Adverse Childhood Experiences (ACEs) and early life stress effects on cardiovascular and metabolic systems, increasing the risk of obesity, hypertension, and cardiovascular disease. We have shown previously that female MSEW mice fed a high-fat diet (HFD) exhibit a metabolic syndrome-like phenotype and obesity-induced hypertension, as they present an exacerbated obesogenic response as well an increase in circulating adrenal cortex-derived hormones. We also know that the fat surrounding vessels (perivascular fat) releases factors that can influence the vascular function and metabolic processes, including adipokines such as aldosterone, corticosterone, and leptin. This study aimed to investigate whether depot-specific perivascular-derived factors influencing the endothelial function in female MSEW mice fed a HFD act via MR signaling. Female C57BL/6J MSEW litters were separated from their dams Postnatal Day (PD) 2 to 16 and weaned early on PD17. Control litters remained unhandled and weaned PD 21. Mice were placed on HFD for 20 weeks. Vascular reactivity studies were performed using thoracic aortas. Cumulative Concentration Curves (CCR) were performed for Acetylcholine (Ach) and Sodium Nitroprusside (SNP) post serotonin constriction. MESAT induced worsened vascular relaxation impairment in obese MSEW female mice. A two-week spironolactone treatment did not influence vascular relaxation in rings without explant media in either group. Spironolactone treatment improved relaxation in both groups similarly in the presence of PVAT but did not influence vascular relaxation in the presence of MESAT. In conclusion, treatment with MR antagonist restores endothelial function in both female control and MSEW mice in the presence of PVAT. However, the MR antagonist does not influence relaxation in the presence of MESAT. Thus, MESAT-derived factors worsening endothelial function in obese MSEW female mice are not dependent on MR signaling.

PHARMACEUTICAL SCIENCES

DESIGN AND SYNTHESIS OF ANALGESICS WITH REDUCED ABUSE POTENTIAL

Author(s): Riley Droppleman

Chellgren Fellow, Gaines Fellow, Honors Program

Faculty Mentor(s): Thomas Prisinzano

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24128>

In healthcare systems throughout the United States, opioid analgesics have been utilized as effective ways to relieve pain, whether it be following surgery or for aiding chronic conditions. The administration of these drugs, which includes morphine, hydrocodone, and others, has increased over the years and remains to be a preferred method of pain management. Despite its role as a cornerstone treatment for pain relief, its addictive qualities have catalyzed an epidemic that has contributed to over 70% of the 70,630 drug overdoses in 2019, as reported by the Center for Disease Control and Prevention. More specifically, mu opioid receptors (MORs), where these current analgesics bind to in order to elicit a pain-relieving response, contribute to the side effect of increased abuse potential. With the death toll related to opioid substance abuse disorder rapidly rising, it is clear that opioids with reduced addictive qualities are necessary to counteract the damage done by the opioid epidemic. To develop a solution, another opioid receptor, kappa, can be targeted to deliver pain relief with reduced abuse-related side effects. Utilizing classical medicinal chemistry techniques, such as the design, make, test, analyze (DMTA) method, this research seeks to synthesize novel kappa opioid agonists designed to lower the potential for substance abuse while maintaining effective pain-relieving properties. This process will include ensuring selectivity at the kappa opioid receptor (KOR) and future testing of compounds in vitro to test agonist potential. Full and high-potency partial kappa agonists possessing less than 10nM activity and at least 100-fold selectivity will be selected for further in vivo analysis.

PHYSICS AND ASTRONOMY

ANALYSIS OF GAMMA RAY DETECTOR DATA FOR THE NDTGAMMA EXPERIMENT

Author(s): Gabija Ziemyte

National Conference on Undergraduate Research (NCUR) Presenter (2020-21), Chellgren Fellow, Honors Program,

Faculty Mentor(s): Christopher Crawford

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24062>

The goal of the NDTGamma experiment is to measure effects of the weak nuclear force in the reaction of neutron capture on heavy hydrogen, producing a gamma ray with 6.2 MeV of energy. Initial tests of this experiment were carried out in collaboration with NOPTREX at the Los Alamos National Laboratory at FP 12 at LANSCE using a small 4x4 CsI(Tl) detector array and a D2O target. The detector pulses were analyzed using digital signal processing algorithms, and a goal of the initial tests was to demonstrate fast pulse counting techniques for 6.2 MeV gamma rays. I will present these algorithms and the resulting gamma ray spectrum from this test run, which will demonstrate the suitability of these components for the full 100-detector array in the future NDTGamma experiment.

*This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics under Award Number DE-SC0014622

PLANT AND SOIL SCIENCE

EXAMINING EFFECTS OF GOLD NANOPARTICLE EXPOSURE ON AUTOPHAGY IN CAENORHABDITIS ELEGANS

Author(s): Katie Chheang

First Generation

Faculty Mentor(s): Olga Tsyusko

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23738>

Novel approaches for modulation of autophagy are being investigated when developing therapies for neurodegenerative diseases, characterized by the accumulation of misfolded proteins and the decreased autophagy processes. Metal nanoparticles with unique physicochemical properties show potential for such treatment. Our research aimed to examine the effect of Gold Nanoparticles (Au-NPs) on autophagy, which is involved in the longevity of a model organism, *Caenorhabditis elegans*. We hypothesized that exposure of *C. elegans* to Au-NPs at sublethal concentrations results in mild stress with activation of the autophagy pathway via two transcription factors (TF), HLH-30 and PHA-4 (TFEB and FOXA in mammalian systems). These TFs are the vital regulators of autophagy in the longevity pathway in *C. elegans*. At first, we examined the effects of Au-NPs on mortality, reproduction, and growth to identify sublethal concentrations that can induce mild stress in *C. elegans* without significant toxicity. The sublethal concentrations for mortality were between 10 mg/L and 20 mg/L. The exposure of Au-NPs at 20 mg/L for 48h showed a decrease in the average number of offspring in the 1st phase of reproduction but recovered in the 2nd phase. *C. elegans* exposed to Au-NPs at 20 mg/L for 48h had reduced growth by ~67%, indicating significant toxicity at this concentration. Thus, activation of the HLH-30 and PHA-4 was tested via their nuclear translocation at 10mg/L using GFP reporter strains. Partial nuclear translocation and increase in GFP fluorescence intensity were observed in the gonad and intestine regions after exposure to Au-NPs at 10 mg/L, suggesting partial activation of these TFs. Nematodes exposed to 10 mg/L of Au-NPs shown a significant increase in lifespan with a median of 3 days when compared to control.

PLANT AND SOIL SCIENCES

NO-TILL AGRICULTURE AND ITS EFFECTS ON SOIL MOISTURE RETENTION IN A LONG-TERM EXPERIMENTAL CORN FIELD

Author(s): Josh Ehl

Gaines Fellow

Faculty Mentor(s): Hanna Poffenbarger

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23994>

Over the past several decades, the use of no tillage agricultural practices across farmland in the United States has steadily grown in popularity. No-tillage refers to direct seeding of a crop into the soil without any mechanical disruption. Despite the growth of no-till, most cropland still receives some form of tillage to manage crop residues, prepare the ground for planting, and manage weeds at some point in the crop rotation. No tillage agriculture has a number of unique benefits that make it ideal for crop production in the Eastern United States, particularly in the face of mounting challenges to agricultural production from climate change and wide scale topsoil loss. This study aims to contribute to the growing body of literature surrounding no-tillage agriculture by analyzing its effect on moisture retention within the crop rooting zone, which extends below the topsoil layer by approximately 60 centimeters. The experiment in this study was conducted on the Blevins long term tillage study plot, an experimental agricultural field established in 1970 to quantify and compare the effects of no tillage, conventional tillage, and nitrogen fertilization practices on grain corn yield. Located on the University of Kentucky's Spindletop Farm, the Blevins plots are planted to corn each spring and harvested in the fall; in the winter, the plots are covered with a small grain cover crop. After analyzing soil moisture data collected with Acclima soil moisture sensors installed in the plot from late June to mid September in 2020, we found that there is a statistically significant difference in soil volumetric water content between the two tillage treatments over the majority of days. We also found that no till corn yielded 26% more grain than conventionally plowed corn when averaged across nitrogen rates. These results indicate that no tillage practices retain soil moisture longer and in greater quantities when compared to conventional tillage practices with benefits to the crop.

PLANT AND SOIL SCIENCES

INVESTIGATING THE ROLE OF TAS3 IN ROOT NODULATION IN TRIFOLIUM PRATENSE.

Author(s): Caleb Gooden

National Conference on Undergraduate Research (NCUR) Presenter (2020-21)

Faculty Mentor(s): Arthur Hunt

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24096>

Root nodulation is a process recognized among legumes in which host roots are infected with a soil bacterium resulting in nodules on the root system. These nodules fix nitrogen from the atmosphere, and in agriculture, nitrogen-fixing crops help to reduce the need for fertilizer and are thus part of sustainable practice. Studies in *Medicago truncatula*, a nitrogen-fixing legume, have shown the process of root nodulation to be suppressed by the expression of a regulatory RNA (TAS3). The TAS3 gene promotes the production of lateral roots, secondary roots that extend from the primary system, by blocking transcription factors responsible for developing nodules. Thus, TAS3 is an attractive target for manipulation to improve nitrogen fixation in legumes and enhance their agronomic value. In *Arabidopsis*, TAS3a transcripts may end at one of two alternative polyadenylation sites, the choice of which determines whether functional or non-functional TAS3a RNAs are made. We hypothesize that if two polyadenylation (poly(A)) sites are present in the TAS3 region of *Trifolium pratense* (red clover), then differential use of these sites will be seen in lateral roots and nodules. Reverse transcription of *T. pratense* RNA was conducted to obtain concentrated cDNA to be used as a PCR template. 3'-RACE will be subsequently used to identify and sequence different TAS3 poly(A) sites. We expect that the proximal site (that yields non-functional TAS3) will be utilized in nodules. If so, we will move forward by conducting agrobacterium mediated transformation of a gene knockout into *T. pratense* to further define the roles of TAS3 in nodulation in clover.

PLANT AND SOIL SCIENCES

THE EFFECT OF CHEMICAL DISPERSANTS, LAND USE, AND SOIL DEPTH ON RECOVERED SOIL ORGANIC MATTER

Author(s): Madison Sydnor

Honors Program,

Faculty Mentor(s): Hanna Poffenbarger

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23863>

There are many ways to separate and classify soil organic matter (SOM). These frameworks have commonly separated soils by characteristics such as particle size or density. Separating SOM into mineral-associated (MAOM) and particulate (POM) fractions has recently become a common practice since these two fractions vary greatly in their formation, persistence, and functionality. This framework is valuable since these characteristics can be utilized to inform management strategies as we adapt to a globally changing climate. In this study, we investigated how unique dispersing agents, land use, and soil depths impact the amount of POM and MAOM recovered. Between two dispersing agents, we found that deionized (DI) water was an equally effective dispersing agent as sodium hexametaphosphate (NaHMP), a commonly used chemical dispersant. Additionally, we found that sample recovery efficiency was not impacted by soil depth or land use. These results suggest that DI water performs comparably well to NaHMP as a dispersant and reduces the potential for soil organic matter redistribution from one fraction to the next. Accurately characterizing and separating SOM in a laboratory environment is critical for gaining a realistic picture of organic matter in the natural soil environment and is crucial for developing strategies that uphold soil integrity and successfully mitigate climate change.

PLANT PATHOLOGY

FEEDING A GROWING POPULATION: LEGHEMOGLOBIN AS A VISUAL MARKER FOR DEVELOPING CISGENIC PLANTS

Author(s): Rebecca Caldbeck

Oswald Research and Creativity Awards Winner (Fall 2020) (1st or 2nd place)

Faculty Mentor(s): Dr. Pradeep Kachroo, Dr. David Hildebrand,

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24094>

Intensification of food production, due to the rising global population, has made it increasingly relevant to focus on sustainable crop genetic improvement, namely in a cisgenic manner. Transgenic improvement faces a multitude of cumbersome regulatory issues, as it contains a gene of bacterial origin. Cisgenic improvement bypasses such regulations, as it refers to a modification involving a recipient and donor from identical species.

Glycine max (soybean) contains soy leghemoglobin protein in the root nodules. The leguminous plant is of high importance, with its wide-ranging habitat, it is a readily available food source- and one of the most economical sources of protein on the planet. Leghemoglobin is responsible for the red coloration visible in healthy nodules and is essential for protecting the nitrogenase enzyme, as well as scavenging free oxygen for respiration. The key aspect of the protein is the red pigment that could be applied as a visual screenable marker in cisgenic plant breeding.

The primary goal is to create transformants that express leghemoglobin's red pigment to develop a more efficient visual screenable marker. If successful, the leghemoglobin marker could be expressed together with the gene of interest to screen for transformants that express traits of interest.

This cisgenic method could be applied to enhance levels of omega-3 fatty acid and protein content in soybeans, for example, which would provide an invaluable addition to global nutrition. Through improving the nutritional value of plant products, the long-term impacts of the project could be environmentally beneficial in enhancing current protein production via reducing land and water required comparatively for meat.

In addition to soybeans, having an effective visual screenable marker to facilitate genetic improvement would be an asset to further the improvement of plant genetics for a variety of crops. The project has the potential to have far-reaching impacts on the food, health, and agricultural industries.

POLITICAL SCIENCE

UNDERSTANDING POST-WAR MILITARY OCCUPATIONS: ARGUING DEFINITIONS WITH MODERN EXAMPLES

Author(s): Remi Allen

Honors Program

Faculty Mentor(s): Daniel Morey

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23869>

The Iraq War and the War in Afghanistan are both widely considered to be recent examples of post-war military occupations by the United States and its allies based on existing definitions of what constitutes a military occupation. There is a fundamental flaw of ambiguity in the current definitions that allows these two seemingly similar military situations to be classified in the same way. This flaw makes these two politically distinct situations seem more similar than they truly are. This paper argues that the differences in levels of control over governmental processes held by those of the original state affects how these cases should be classified. The United States and allies had far more control over governmental processes in post-war Iraq than they did in Afghanistan, and as such, these post-war scenarios should not both be classified as occupations. This issue of classification demonstrates the ambiguity problem that defines previous definitions, therefore these definitions should be refined in order to incorporate consideration for post-war governmental decision-making and power of the state in which conflict occurred.

POLITICAL SCIENCE

EDUCATION AND COUPS D'ÉTAT

Author(s): Mihir Kale

Chellgren Fellow, Gaines Fellow, Honors Program

Faculty Mentor(s): Clayton Thyne

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24933>

This study analyzed whether education impacted the likelihood of a coup d'état. Defined as the illegal and overt attempt by the military or other elites in the state apparatus to unseat the sitting executive, more than 44 coups have been attempted in just the past decade. While prior literature had analyzed a number of coup determinants, such as ethnic conflict and regime legitimacy, one factor that had yet to be explored was the relationship between education and coups d'état. Equitable access to education was previously found to increase civic engagement, create new avenues of change, and catalyze democratization. It was hypothesized that an increase in levels of education would decrease the likelihood of a coup. Data that cataloged the mean-years of education for every country between the 1946 and present was studied in relation to whether a coup had occurred in the same timeframe. Using a Chi-square test, coups were found to occur in higher frequency in low-educated states (6.25%) versus high-educated states (1.25%). A multiple regression analysis demonstrated a negative correlation ($b = -.205$) between education and coups. This study successfully demonstrated a negative relationship between education and coups d'état in support of the hypothesis, and may be used by policymakers looking to dissuade a coup while providing a foundation for further analysis of the relationship between education and coups d'état.

PSYCHOLOGY

HOW DO FAMILY CONVERSATIONS ABOUT SEX RELATE TO FEELINGS OF SUPPORT AND FUTURE PARENTHOOD AMONG LGBTQ+ PEOPLE?

Author(s): Chelsea Bass

OUR Summer Research Fellow (2019), OUR Summer Research Fellow (2020), Showcase 2019, Honors Program

Faculty Mentor(s): Rachel Farr

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23860>

Sex education is an important part of adolescent development, but LGBTQ+ (Lesbian, Gay, Bisexual, Transgender, Queer) individuals are often not represented in either formal school sex education or family conversations about sex. This lack of representation is othering to LGBTQ+ individuals and plays a role in negative mental and sexual health outcomes. Parents often operate from cisgender and heterosexual norms when talking about sex and may omit identity-relevant information for LGBTQ+ youth. Not having this information may cause LGBTQ+ adolescents to feel unsure and/or discouraged about future parenthood. In contrast, social support both from peers and family members is associated with lower levels of negative mental health outcomes in LGBT individuals. The aim with the current study is to examine the content of recalled parent-child discussions about sex and if they play a role in feelings toward future parenthood, perceived social support, or gender congruence in LGBTQ+ adults.

Participants consisted of 433 LGBTQ+ individuals contacted through the MTurk survey platform as part of a larger study about the experiences of LGBTQ+ adults. Each participant was asked whether their parents talked to them about sex at any point during their adolescence, as well as clarifying questions dependent on the answer to the first question (ex. “What kinds of topics did you talk about with your parents regarding sex?”; “Do you know why your parents did not talk to you about sex?”). All participants also completed a series of measures related to their feelings about future parenthood, identity comfort, and overall psychological well-being. Results indicated a positive association between sex being positively framed and comfort with one’s gender. This suggests that a broadening of how sex is discussed with adolescents could benefit LGBTQ+ individuals in ways previously unexplored.

PSYCHOLOGY

ETHNIC IDENTITY SALIENCE AND PEER GROUP RACIAL/ETHNIC DIVERSITY AMONG YOUTH: IMPACTS ON PERCEIVED EXPERIENCES OF RACIAL AND ETHNIC BIAS

Author(s): Simone Bibbs

William C. Parker Scholar

Faculty Mentor(s): Christia Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24019>

Previous research has shown that ethnic identity centrality and salience influence perceptions of bias (Operario & Fiske, 2001). Research has also shown that schools and peer groups serve as important contexts for the construction and expression of youth's racial/ethnic identity and their experiences of discrimination (Lewis, 2003; Benner & Graham, 2013). The current study assessed the role of ethnic identity and racial diversity of peer groups on perceived experiences of ethnic and racial bias. Participants were 63 children (67.2% boys and 32.8% girls) ($M_{age} = 7.75$ years, $SD = 1.31$) from various public elementary schools in the upper southern United States. Children were asked to self-describe their ethnicity/race and 35.1% described themselves as White, 7.9% Black or African American, 4.4% Latinx/Hispanic, 3.5% American, 3.5% Biracial White and Black, 2.6% Asian, and 2.6% reported another race/ethnicity. 44.6% of children reported that most of their friends were of a different race/ethnicity than themselves and 37.5% reported that most of their friends were of their same race/ethnicity, this was significantly different from chance, $\chi^2(3) = 14.14$, $p = .003$. Regression analysis also suggest ethnic identity salience significantly predicted perceptions of racial discrimination, such that those who thought about their ethnicity more frequently also noticed more discrimination overall, $p = .001$, and from peers, $p = .002$. However, peer group racial diversity did not predict perceptions of discrimination. Overall, findings illustrate that ethnic identity salience impacts children's perceptions of racial discrimination, but this may not be related to the race of their peer group.

PSYCHOLOGY

THE EFFECT OF VAGUS NERVE STIMULATION ON SLEEP QUALITY AND EMOTION IN HEALTHY ADULTS

Author(s): Constance Bledsoe

Chellgren Fellow, Honors Program, William C. Parker Scholar

Faculty Mentor(s): Lauren Whitehurst

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23751>

The vagus nerve is considered central to emotional and physical functioning. Specifically, the vagus nerve is deemed critical in integrating brain and body responses to internal and external stressors and regulating homeostatic behaviors, like sleep. Until recently, exploring the effects of the vagus nerve on behavior required invasive surgery, however, new non-invasive stimulation technologies has allowed for explorations into the direct effects of the vagus nerve on behavior and health outcomes. In our study, we will be examining the effects of electrical, transcutaneous vagal nerve stimulation on sleep and emotional functioning in thirty-four healthy, non-smoking adults between the ages of 18-65. In a within subjects, crossover, double-blind design, participants will receive both active or sham (no electrical pulses) stimulation (one week apart) through custom earbuds designed to deliver electrical pulses that stimulate afferent vagal nerve fibers. Stimulation will be delivered between the hours of 9-11pm each night and will be followed by nightly and morning surveys examining participants' sleep duration (i.e. amount of hours slept), sleep quality (i.e. refreshed feelings upon awakening), and emotion function (i.e. mood, anxiety about days activities). We hypothesize that active vagus nerve stimulation will reduce anxiety, decrease negative emotions, and increase sleep duration and sleep quality. The results from this project will contribute to a greater understanding of the role of the vagus nerve in the psychobiology of sleep and emotional function. Future studies will examine mechanistic relationships between the vagus nerve and behavior using stimulation paradigms.

PSYCHOLOGY

THE INFLUENCE OF ROHYPNOL ON LEGAL DECISION-MAKING

Author(s): Eliot Bradshaw

OUR Summer Research Fellow (2020), Chellgren Fellow

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23721>

Sexual assault is a problem on college campuses, and drugs are implicated in many cases. Rohypnol, a "date rape drug," renders victims incapable of consent, making it especially interesting concerning jury decision-making. Only two previous studies have examined the impact of a rape victim ingesting Rohypnol on legal decision-making. These studies found that negative forensic evidence (absence of Rohypnol in the bloodstream) led to greater leniency and a more favorable view of the defendant. For the current study participants were recruited through Amazon's Mechanical Turk and read a mock police report describing a sexual assault. The design is a 3 (evidence of Rohypnol: yes, no, not tested) x 2 (participant gender) between-participant design. Following the summary, participants rendered a verdict and rated their perception of both the victim and defendant's credibility, responsibility, and memory. We hypothesized main effects of (a) evidence- participants who read about evidence of ingesting the drug should have higher pro-victim ratings (e.g., guilty verdicts) than when there was no evidence of ingesting Rohypnol (b) gender- female participants should have higher pro-victim ratings than male participants. Additionally, we predicted that victim credibility ratings should mediate the relationship between the evidence of Rohypnol and verdict. Thus, evidence of Rohypnol should lead to higher ratings of victim credibility, and this should lead to more guilty verdicts.

PSYCHOLOGY

THE INFLUENCE OF DEFENDANT TATTOO PLACEMENT AND STYLE ON JURY DECISION-MAKING

Author(s): Eliot Bradshaw

OUR Summer Research Fellow (2020), Chellgren Fellow

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23722>

Tattoos have historically been associated with deviance and criminality, but little research has been done about tattoos in the courtroom. The current study extended previous research and examined the influence of tattoos' placement and style on juror decision-making. Participants were recruited through Amazon's Mechanical Turk (n= 244) and read a mock trial summary describing an assault. Using a 2 (placement: neck- arm) x 2 (style: aggressive- passive) between-participants design with a control group, participants were randomly assigned to one of nine conditions, and read a vignette where the defendant was identified by a distinctive tattoo, or boots in the control condition. A yin yang and dolphin were used as the positive tattoos while barbed wire and a wolf were used as aggressive tattoos. Following the trial summary, participants were asked to render a verdict, rate their perception of the believability, credibility, and honesty of both the victim and defendant, and rate their feelings about tattoos in general. We hypothesized main effects of: (a) tattoo placement- defendants with a neck tattoo would be perceived more negatively than defendants with a tattoo on the arm; (b) tattoo style- defendants with aggressive tattoos would be perceived more negatively than defendants with positive tattoos; (c) tattoo presence- defendants with a tattoo are perceived more negatively than those with no tattoo (i.e., the control group). Additionally, we predicted an interaction of tattoo placement and tattoo style so that perceptions of a passive tattoo will remain fairly constant despite location, while an aggressive tattoo will be perceived much more negatively, and lead to more guilty verdicts when on the neck as compared to the arm.

PSYCHOLOGY

LIVED EXPERIENCES OF YOUTH WITH LGBTQ+ PARENTS: FEELINGS OF OPENNESS AND/OR ACCEPTANCE TOWARDS THE SELF, THE FAMILY, AND OTHERS

Author(s): Calisse Burand

OUR Summer Research Fellow (2020), Honors Program

Faculty Mentor(s): Rachel Farr

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23900>

Although families with lesbian, gay, bisexual, transgender, and queer (LGBTQ+) parents have become increasingly visible, there is a lack of representative and intersectional research analyzing the lived experiences of their children. Because LGBTQ+ families are disproportionately geographically, racially/ethnically, and economically diverse compared to families headed by cisgender heterosexual parents, representative and intersectional research is particularly important. Research into both the outcomes and lived experiences of youth in these diverse families is important in shaping policy, law, and practice in terms of broader regulatory and therapeutic systems. The present study attempts to fill this gap of knowledge and representation by using a diverse sample of 50 youth between the ages of 12-25 with at least one LGBTQ+ parent to examine the ways in which LGBTQ+ parents' identities impact youth's feelings of openness and/or acceptance about others, themselves, and their families. The codebook analyzed feelings of openness and acceptance by determining whether participants recounted that their parents' sexual identity led them to be open/accepting of others, whether participants felt they had an open/accepting/supportive environment in the home, what participants advice would be for other youth with LGBTQ+ parents, their use of "Love Makes a Family" discourse, and their own anticipated or actual pathways to parenthood. Although youth often recounted experiences of discrimination from others due to the identities of their parents, themselves, and/or their family, they are likely to feel open and accepting towards others, themselves, and their families through recounting their own experiences and advice they would give to other youth with LGBTQ+ parents. In addition, youth regularly endorse the concept of "chosen families" as well as the idea that families can "look" different than the heteronormative 'nuclear family' ideal. Participants also regularly endorsed pathways to parenthood beyond the heteronormative ideal, like adoption, fostering, or through previous relationships.

PSYCHOLOGY

ELEMENTARY AGED CHILDREN'S PERCEPTION OF DISPROPORTIONATE DISCIPLINE AND SENSE OF SCHOOL BELONGING

Author(s): Destiny Coleman

Faculty Mentor(s): Christia Brown, Sharla Biefeld

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24046>

There are many pieces of research that study large disparities in race, sense of belonging, and discipline in schools across the United States (Okonofua & Eberhardt, 2015). For example, national data has demonstrated that compared to White students, Black students receive unequal treatment at school in areas such as school discipline (Bottiani & Bradshaw, 2017). This disproportionate discipline frequently takes the form of more out of school suspensions for Black students, than their White peers; furthermore, this discipline also impacts children's sense of belonging (Fisher, Dawson-Edwards, Higgings, & Swartz, 2020). We investigated the link between disproportionate discipline and elementary aged children's sense of belonging at school. We hypothesize that students stereotyped as misbehaving would have a lower sense of belonging and that experienced discrimination in discipline would predict lower belonging. We also hypothesized that this relationship would be moderated by children's race. We collected data from 61 children from 6 to 11 years old, the mean age was 7.75, ($SD=1.31$), who attended after school programs in the upper south of the US. 20 (30.3%) participants were girls and 41(62.1%) were boys and 9.1% of the participants identified as Black, 4.5% Biracial (White and Black), 6.1% Latin/Hispanic, 60.6% identified as White, 6.1% Asian, 1.5% identified as Biracial, other, and 4.5% other. Results indicate that White and Asian students had a higher sense of belonging at school than Black, Latinx, and Biracial children, $F(1,53) = 7.605$, $p = .008$. Furthermore, experiencing racial discrimination in discipline did predict having a lower sense of school belonging, $\beta = -.305$, $p = .035$; however, this was not moderated by children's race.

PSYCHOLOGY

THE THERAPEUTIC ALLIANCE IN THE UNIFIED PROTOCOL: PATIENT-THERAPIST RELATIONSHIPS IN COGNITIVE-BEHAVIORAL THERAPY

Author(s): Anna Garlock

OUR Summer Research Fellow (2020), Honors Program, Singletary Scholar

Faculty Mentor(s): Shannon Sauer-Zavala

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24122>

Background: The therapeutic alliance refers to the working relationship between therapists and patients. Research has repeatedly shown that the therapeutic alliance is related to positive outcomes in treatments for mental health difficulties. However, many of these studies have assessed the alliance relatively infrequently, raising questions about whether changes in the alliance precede or are preceded by symptom changes. The primary goal of the present study is to use intensive session-to-session measures of components of alliance development (i.e., agreement on goals, tasks, and the therapeutic bond) to determine their temporal relations with depression, anxiety, and loneliness.

Method: This study is a secondary data analysis from Sauer-Zavala et al. (under review). The completed-treatment sample consisted of 59 treatment-seeking individuals who met DSM-5 (APA, 2013) criteria for at least one emotional disorder. Participants completed the Unified Protocol, a manualized, cognitive-behavioral treatment. Before each session, participants reported their symptoms. After each session, participants rated the quality of the alliance. We used hierarchical linear modeling to test if the alliance predicted session-to-session symptom change or if symptoms predicted session-to-session change in the alliance.

Results: Within persons, increases in depression symptom predicted increases in therapeutic bond, $B = -.05$, $SE = .02$, $p < .01$, task alliance, $B = -.08$, $SE = .02$, $p < .01$, and goal alliance, $B = -.05$, $SE = .02$, $p = .03$. Between persons, participants with a stronger therapeutic bond reported lower depression symptoms, $B = -.17$, $SE = .08$, $p = .05$.

Discussion: Overall, these results suggest alliance components do not predict symptom change. Rather, session-to-session symptom change may predict development of the therapeutic alliance. However, people with more depressive symptoms than their personal average may develop stronger therapeutic bonds.

PSYCHOLOGY

LOSS AVERSION AND GAIN ATTRACTION BY PIGEONS (RISK PREFERENCE OF PIGEONS)

Author(s): Sophia Gonzales

Chellgren Fellow, William C. Parker Scholar

Faculty Mentor(s): Thomas Zentall

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23906>

Contrary to rational economic theory, prospect theory predicts that people will make different decisions depending on whether those decisions involve losses or gains. People tend to be risk-averse when the decisions involve potential gains but are risk-prone when the decisions involve potential losses. In this experiment, we explore whether pigeons show a similar effect. In our first experiment, we gave the pigeons a choice between a risky side and a safe side. On both sides, the pigeon is shown 3 pellets. If the pigeon chooses the 'risky' side, it is given either 1 or 3 pellets; If the pigeon chooses the 'safe' side it is always given 2 pellets. In either case, the pigeon received 2 or an average of 2 pellets, a loss of 1 pellet. We found that the pigeons showed a clear preference for the risky alternative. In the second experiment, the pigeon is shown 1 pellet on both sides. If it chooses the risky side, it gets either 3 pellets or 1 pellet (an average of 2 pellets). If the pigeon chooses the safe side, it always gets 2 pellets. In the second experiment, the pigeons did not show a preference. Thus, pigeons, similar to humans, tend to be risk-prone when they are faced with potential losses but they are not risk-averse when it comes to gains. The results of these experiments suggest that pigeons do not conform to either rational economic theory or optimal foraging theory. Instead, they appear to be subject to framing effects predicted by prospect theory.

PSYCHOLOGY

CHILD PHYSICAL ABUSE: PERCEPTIONS IN THE COURTROOM

Author(s): Ann Hines

Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23669>

Various forms of child abuse are observed across the United States. While the most common types of child abuse are neglect and physical abuse, research investigating legal decision-making tends to explore child sexual abuse. Thus, little is known about how child physical abuse is perceived in the courtroom (but see Bornstein et al., 2007). The present experiment aims to expand the literature on child abuse by further investigating child physical abuse. Its purpose is to identify common attitudes and perceptions of jurors towards child physical abuse with regard to the type of physical abuse and intention of the perpetrator. This study will use a 2 (type of punishment: spanking or paddling) x 2 (degree of assault: first or third) x 2 (participant gender) between-participants design. The study uses the scenario of a father physically injuring his son. Participants will be provided with one summary (of a possible four) of a child physical assault trial that includes an image of a bruise sustained from the punishment. Participants will then be asked to judge the defendant as guilty or not guilty and answer a series of questions relating to the trial, including those regarding credibility of the victim and the level of responsibility of the defendant. The hypotheses for this study are as followed: (1) participants will be more likely to convict the defendant in the paddling condition than in the spanking condition, (2) a main effect of participant gender such that female participant will have higher pro-victim judgments (e.g., guilty verdicts) than males, and (3) an interaction will occur between type of punishment and assault degree where paddling will produce equally high conviction rates for both degrees, but spanking will produce higher conviction rates in third degree compared to the first degree.

PSYCHOLOGY

JUROR PERCEPTIONS OF HETEROSEXUAL AND SAME-SEX SPOUSAL RAPE IN THE COURTROOM

Author(s): Haley Hintz

Oswald Research and Creativity Awards Winner (Fall 2020) (1st or 2nd place), Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22540>

Approximately 10-15% of American women will be raped by a spouse in their lifetime (Bureau of Justice Statistics, 2002). Research suggests that the American public regards spousal rape as *wrong but not rape* (Lynch et al., 2017). Research on spousal rape has centered on heterosexual couples despite a higher likelihood that LGBTQ+ individuals will experience severe intimate partner violence (IPV) (Rollé et al., 2019). Therefore, the present study investigated mock jurors' perceptions of spousal rape in heterosexual and same-sex couples in the courtroom. We employed a 2 (victim gender) x 2 (defendant gender) x 2 (participant gender) between-participants design. Participants were asked to read a vignette about a spousal rape trial, render a verdict of *guilty* or *not guilty*, and rate variables related to the case (e.g., severity of the crime). There were two hypotheses for this study: We predicted a main effect of participant gender in that women would be more pro-victim (e.g., higher blame ratings) than men (Gerber et al. 2006; Golding et al., 2016; Wasarhaley et al, 2017). There was support for this hypothesis. Women blamed the defendant more than men. We also predicted a main effect on political orientation such that liberal participants will be more likely to render pro-victim judgements (for example, rate the victim as more moral), than conservative participants (Graf, 2018; Kurtzleben, 2017). There was support for this hypothesis. Liberal participants rendered more guilty verdicts than conservative participants. Exploratory analyses found that differences between heterosexual and same-sex spousal rape generally did not emerge.

PSYCHOLOGY

PERCEPTIONS OF STALKING IN A CIVIL TRIAL

Author(s): Emily Jones

Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23718>

Stalking is a common occurrence, with 14 in every 1,000 Americans being victims of stalking each year (Catalano, 2012). Past studies found that attorney's gender (Nelson, 2004) or the nonverbal behavior of the defendant (Hodgson, 2014) can impact jurors' perceptions of criminal cases. However, far less research has been conducted on how jurors perceive civil cases, and no research has investigated the perception of civil stalking cases. Regarding civil court, it is important to note that civil court may be a better option for stalking victims because they can receive financial compensation for trauma and have more control over a case. The present study is meant to fill this gap in civil court research. I will use a 2 (Reason for filing civil suit: presented or not) x 2 (Sued party: individual or third-party--university) x 2 (participant gender) between-subjects design. Participants will read a trial summary and then answer questions about the trial (e.g., decision for plaintiff or defendant, credibility of plaintiff). There are three hypotheses. First, there will be a main effect of gender on decision for plaintiff. Women will be more likely than men to side with the plaintiff compared to the defendant in a civil stalking case as past research has shown that women are typically more pro-victim than men (Jenkins & Schuller, 2007; Livingston et al., 2019; McKimmie et al., 2014). The second hypothesis is that there will be a main effect of giving a reason for going to civil court on decision and damages awarded to a plaintiff. The final hypothesis is that there will be a main effect of party sued for damages awarded, due to past findings that civil cases involving a third party ended up being more favorable for victims than when an individual was sued (Lippert et al., 2017).

PSYCHOLOGY

ASSOCIATIONS BETWEEN SLEEP AND TRAJECTORIES OF RESPIRATORY SINUS ARRHYTHMIA RESPONDING IN CHILDREN

Author(s): Grace Markowski

OUR Summer Research Fellow (2020), STEM Cats Peer Mentor

Faculty Mentor(s): Peggy Keller

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/25643>

Different patterns of parasympathetic nervous system (PNS) reactivity to stress can create vulnerability for various adverse outcomes in childhood, such as depression (Bosch et al., 2009) and externalizing problems (El-Sheikh & Hinnant, 2011). Previous research indicates that poorer sleep is associated with higher resting respiratory sinus arrhythmia (RSA) for children (Elmore-Staton et al., 2012). To the best of our knowledge, no study has examined relations between sleep and changes in PNS activity *during* a stressor. Therefore, the current study investigates such changes; it is hypothesized that children's worse objective and subjective measures of sleep will be associated with higher and more prolonged RSA responses during a mirror tracing task.

Children completed a mirror tracing task while their RSA was monitored. Prior to the task, a three-minute baseline period was recorded. To record RSA, electrodes were placed on the torso. Participants wore an actigraph for seven nights to collect data on sleep. Participants also completed the School Sleep Habits Survey (SHSS; Wolfson & Carskadon, 1998) subscales for sleep/wake problems and daytime sleepiness.

Data were analyzed using multi-level modeling (level 1 = time segment; level 2 = participant). Child daytime sleepiness, sleep/wake problems, and sleep minutes were unrelated to trajectories of RSA during the mirror tracing task. However, participants with lower sleep *activity* and higher sleep *efficiency* had higher levels of RSA that increased more in response to the stressor initially but then declined similarly to participants with poorer sleep. At the end of the task, participants with lower sleep activity and higher sleep efficiency demonstrated slight increases in RSA while those with poor sleep continued to show declines in RSA. These findings suggest that childhood sleep difficulties may alter development of homeostatic regulatory mechanisms of the PNS, potentially leading to reduced reactivity to stress and less rapid recovery from stress.

PSYCHOLOGY

CHILD GENDER AND PARENT SEXUAL ORIENTATION INTERACT TO PREDICT PEERS' ATTITUDES

Author(s): Peter McCauley

Faculty Mentor(s): Christia Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24002>

Past research has examined how children perceive and evaluate their peers based on group identities, such as sexual orientation (e.g., Bigler & Liben, 2007; Heinze & Horn, 2009). However, little research has examined how children perceive and evaluate peers based on the characteristics of their peers' families. Children's attitudes about peers' families may be especially important when considering same-sex families (see Farr et al., 2016). In this study, we examined children's desire for proximity (i.e. wanted friendship and interaction) for children with opposite-sex parents and same-sex parents; moreover, we examined how these evaluations differed across gender. Participants were 131 children (61 girls), ages 5-11 ($M = 7.79$, $SD = 1.73$). The majority of participants identified as white (78.9%), followed by Hispanic (7.0%), Black (6.3%), other/biracial (5.5%), and Asian (2.3%). Participants were shown a picture of opposite-sex and same-sex parents and their children and read a small vignette about the family. They then responded to measures evaluating their feelings towards the child in the vignette, including their desired closeness (proximity). Results indicated that boys, $F(2, 132) = 4.60$, $p < .05$, and girls, $F(2, 120) = 11.59$, $p < .01$, had higher proximity scores for children in opposite-sex parented families than same-sex parented families. Additionally, participants identifying as boys had higher proximity ratings for boys versus girls, $F(1, 132) = 19.01$, $p < .01$, while girls had higher proximity ratings for girls versus boys, $F(1, 120) = 33.40$, $p < .01$, regardless of parent sexual orientation. This suggests that a peer's gender is more important than characteristics of the peer's family (i.e., parent sexual orientation) when predicting children's attitudes. Future research should extend these findings and continue to investigate how children's attitudes about their peers are influenced by both peer and parent characteristics.

PSYCHOLOGY

THE IMPACT OF VICTIM DRUG USE ON LEGAL DECISION-MAKING DURING A RAPE TRIAL

Author(s): Kelsey Naylor

University Scholars Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23641>

In the US, it is estimated that nine out of every ten victims of rape are a female with approximately 4-35% of sexual assaults involving drugs (Tjaden & Thoennes, 2000, Negrusz et al., 2005). Due to the high prevalence of voluntary or involuntary drug use at the time of a rape, it is important to investigate the effect of victim drug use in jury decision making. Current research on drug use in the courtroom has only investigated alcohol and rohypnol, which is a date rape drug. Studies about these two drugs showed that perceived guilt is not altered by a defendant's intoxication (Wall et al., 2000). Additional research has found that females perceive a rape victim as more credible than males (Jenkins & Schuller, 2007). To extend the current literature I will use a 6 (type of drug) x 2 (participant sex) mixed-factors design, with type of drug as a within-participants factor. The participants ($N = 100$) from the University of Kentucky will read six different fictional rape cases that contain a male defendant and a female victim. Each fictional rape case will include the female being under the influence of five different drugs: 1) alcohol (beer), 2) hallucinogenic (LSD), 3) opioid (heroin), 4) marijuana, and 5) stimulant (Adderall). There will also be a control condition involving no drugs. I hypothesized that the stimulant, Adderall, will be associated with the highest number of verdicts because this drug is associated with improved memory and the hallucinogenic drug, LSD, will be associated with the least number of guilty verdicts because this drug involves hallucinations (i.e., a victim appears) less credible. A second hypothesis is that female participants will be more pro-victim than male participants (see Schuller et al., 1998).

PSYCHOLOGY

EFFECTS OF A JAILHOUSE INFORMANT ON MURDER CASE

Author(s): Morgan Ouellette

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23323>

It is no secret that the justice system in the United States has many flaws. One such area whose reliability is often called into question is the use of jailhouse informants. A jailhouse informant is someone who “provides testimony about his/her knowledge of a crime based on information obtained while incarcerated,” (Neuschatz, 2007). Oftentimes, said knowledge is obtained through conversations that occurred between the informant and the accused. However, jailhouse informant testimony is not always reliable due to incentives offered by the prosecution; in some cases, the conversations are entirely fabricated. In the past, research on the impact of jailhouse informants has only used individual jurors. The present study will extend previous research by investigating the impact of a jailhouse informant in a jury context. There were three types of juries: (a) no jailhouse informant; (b) jailhouse informant testified because he felt bad for the victim (reliable jailhouse informant); and (c) jailhouse informant testified because he received an incentive (i.e., reduction in prison sentence; unreliable jailhouse informant). Participants in six-person juries heard an audiotape of a trial and then deliberated about the case until a verdict was reached. There will be three hypotheses for the research: (1) the pattern of guilty verdicts should be a function of the credibility of the jailhouse informant (reliable > unreliable)—the no jailhouse informant condition should lead to few if any guilty verdicts; (2) Participants will find the reliable jailhouse informant more influential in rendering a guilty or not guilty verdict than the unreliable jailhouse informant; and (3) for juries that render a guilty verdict, the jailhouse informant will be mentioned most often when the jailhouse informant was reliable.

PSYCHOLOGY

TO WHAT EXTENT DOES SOCIAL PROBLEM-SOLVING INTERVENTION HELP CHILDREN AT RISK FOR ADHD?

Author(s): Lydia Pack

OUR Summer Research Fellow (2020), Honors Program, Singletary Scholar

Faculty Mentor(s): Elizabeth Lorch

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23242>

Attention Deficit Hyperactivity Disorder (ADHD), is the most commonly diagnosed childhood disorder (Milich & Roberts, 2015). Children with ADHD exhibit elevated levels of inattention, impulsivity/hyperactivity, or a combination of both. ADHD is known for causing children to struggle socially with their peers and other relationships in their life. These children are often labeled as “problem-children” from a young age, and often experience issues in impulsivity control and decision-making, particularly in academic settings (Hoza, 2007). These problems also often affect these children’s relationships with peers in their age range, which is significant as peer relationships have shown to be one of the greatest predictors of future delinquency or success (Hoza, 2007). This project aimed to address the social problems of children at risk for ADHD with an intervention that gave these children strategies for dealing more effectively with others.

PSYCHOLOGY

THE IMPACT OF CULTURAL DIFFERENCES BETWEEN A JAILHOUSE INFORMANT AND A DEFENDANT ON JURY VERDICT

Author(s): Anna Phan

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24004>

The purpose of this study is to investigate the influence of differences in cultural background for a jailhouse informant and defendant's interaction regarding a guilty or not guilty verdict from jury members in a court trial. A jailhouse informant is called by a prosecutor to testify against an accused suspect. This jailhouse informant provides the jury with information that the defendant has confessed to them. Prior research has shown that a jailhouse informant leads to more guilty verdicts than a control conditions without one; the jailhouse informants greatly influence participants in a mock jury trial. The present study will use a 2 (Jailhouse informant affiliated group: Jewish or Neo-Nazi) x 2 (Defendant affiliated group: Jewish or Neo Nazi) x 2 (Participant gender) design with two control conditions: only Jewish defendant and only Neo-Nazi defendant. We will recruit participants through Amazon's Mechanical Turk system. The participants will be presented the study using Qualtrics.com. They will read a fictional child sexual assault case and then they will answer a series of questions regarding the case (e.g., credibility of the victim, believability of the jailhouse informant). Based on previous studies suggesting jurors are more likely to render guilty verdicts when given jailhouse informant testimony, I have two hypotheses. First, I predict that conditions with a jailhouse informant should yield higher guilty verdicts than control conditions without one. Second, I predict that conditions where the defendant and jailhouse informant share the same cultural affiliation should yield higher guilty rates than conditions where they are of opposing affiliations.

PSYCHOLOGY

THE RACE-CRIME CONGRUENCY EFFECT ON DRUG TRAFFICKING CASES IN THE COURTROOM

Author(s): Sarah Ross

Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22930>

Many years ago, social psychologists recorded a juror decision-making bias called the race-crime congruency effect: a tendency to associate and negatively perceive Black men more than white men for stereotypically congruent Black crimes, but they do the opposite for stereotypically congruent white crimes. The present study explored the race-crime congruency effect and how certain drug types might be considered more stereotypical to a race. A Qualtrics survey was administered to 105 undergraduate students (82.8% females and 17.1% males). A 2 (Perpetrator race: Black or White) x 3 (Drug types: crack cocaine, pain pills, and marijuana) x 2 (Participant gender) mixed-factors design was used; gender was considered a between-participants variable. Participants read vignettes and rendered verdicts. We hypothesized main effects of: (a) drug type-trafficking crack cocaine will be judged more negatively compared to pain pills and marijuana; (b) Perpetrator race--Black perpetrators will be judged more negatively than white perpetrators; and (c) Participant Gender-- female participants would have less harsh perceptions than males. Finally, we predicted an interaction between defendant race and drug type; the most negative perceptions would be found in the Black defendant and crack cocaine condition. The results found support for hypothesis (a). In addition, there was a post-hoc participant gender x race interaction for perceived severity of the crime. For the ratings of white defendants, males had lower severity ratings than females according to a repeated measures t-test, $t(103)=.623$, $p=.010$. However, for Black defendants there was not a significant difference between severity level, $t(103)= -.560$, $p=.209$. Together this suggests that the race-crime congruency effect with drug type and race was not present, but race does matter when participants rate the severity of a drug crime.

PSYCHOLOGY

CHILDREN'S PERCEPTIONS OF ADOPTED AND TRANSRACIAL FAMILIES

Author(s): Loren Shelley

William C. Parker Scholar

Faculty Mentor(s): Loren Shelley, Sharla Biefeld, Christia Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23935>

According to literature, there is variation between adoptive families and array of experiences that come with adoption (Vandivere et al., 2009). Studies have turned to the intersectionality of race, family resources, and status between adopted children and their variability in achievement outcomes (Raleigh & Kao, 2012). Importantly, research shows there is a lack of awareness towards the perceptions of transracial adoption (Lee et al., 2013). Furthermore, perceptions of adopted children, especially those of transracial families, have great impact on future perceptions regarding transracial adoption. In the current study, we predicted that transracial target families would be viewed more negatively than same race target families. Additionally, we predicted that participant's race would be a significant factor and white participants would have more negative perceptions compared to minority participants towards target families. Negative perceptions included measures of how scary and gross children perceived adoption. We interviewed children 5-11 years of age (N=128 participants; girls= 61, boys=67). Children's ethnic backgrounds ranged; majority identify as White (SD= .822). Children were asked to rate how scary or gross they perceived each identifiable adoption family (white parents and black boy, white parents and white boy, black parents and white boy, & black parents and black boy). Attitudes towards adopted children predicted negative feelings towards transracial families, but not same race families. Preliminary data analysis suggests that more negative attitudes towards adopted children predicted negative feelings towards transracial families, $\beta = -.237$, $p = .008$, but not same race families, $p = .480$. Results from a mixed ANOVA indicate that there was no significant main effect of target family race or an interaction between target family race and participant race.

PSYCHOLOGY

ELEMENTARY SCHOOL CHILDREN'S ATTITUDES TOWARDS SAME AND CROSS-RACIALLY ADOPTED PEERS

Author(s): Payton Sinkbeil

First Generation, William C. Parker Scholar, Psychology Scholars

Faculty Mentor(s): Michelle Tam, Christia Brown,

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24150>

A large body of research has examined how children's attitudes towards their peers' can differ based on the race of their peers (Shutts, Pemberton, & Spelke, 2013). However, much less research has examined how the race of a child's *family* affects their peers' attitudes. This is especially important as cross-racial adoptions are becoming more commonplace (Zill, 2017). The current study aimed to understand how children's attitudes towards their peers differ based on both the peers' race and the peers' parents' race. Participants were 132 children (70 boys, 61 girls) between the ages of 5 and 11 ($M = 7.79$, $SD = 1.73$). The majority of participants identified as white (78.9%), followed by Hispanic (7.0%), Black (6.3%), other/biracial (5.5%), and Asian (2.3%). Children were first shown pictures of adopted children that were either White or Black, with either White or Black parents. They were then asked about their positive attitudes, negative attitudes, and desire for proximity (desire for physical closeness/sharing environments) towards the children in the picture. Results indicated that participants' positive and negative attitudes towards targets were not affected by either the target's race or the parents' race; however, children's proximity ratings for targets were predicted by an interaction between target race and target parent race. Specifically, participants gave significantly higher proximity ratings towards targets whose race matched that of their parents versus those with cross-race parents, $F(1,127) = 5.03$, $p < .05$. Results may suggest that children have a greater desire for closeness for families composed of "matching" family demographics. Future research should examine the psychological processes behind children's preference for "matching" race families.

PSYCHOLOGY

PUBLIC PERCEPTION OF PLEA BARGAINS IN A DUI CASE ENDING IN A DEATH

Author(s): Avery Thompson

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22281>

The U.S is faced with a growing problem of Driving Under the Influence (DUI) cases--9.5% of all arrests were from DUIs in 2019 (FBI, 2019). Combined with limitations of court resources (i.e., time and space), plea bargains comprise 90% to 95% of court cases including DUI cases (Webster et al., 2020). Research on public perceptions of plea bargaining is limited. It is critical to understand this perception because the public's respect and obedience of the laws is important for policy and legal decisions (Rattner et al., 2001 as cited in Webster et al., 2020). The present study was designed to investigate public perceptions of plea bargaining as a function of victim age, location of DUI incident, and plea bargain sentence in a DUI related case ending in death. The present study used a 2 (Victim Age: 6 year old vs. 40 year old) x 2 (Victim Location: Street vs. Car) x 2 (Plea Bargain Sentence: Probation vs. Jail) within-participants design. Participants read eight different summaries describing a DUI case in which a person was killed--the defendant was charged with 2nd Degree Manslaughter. After reading each summary, participants answered questions about the plea bargain (e.g., support of plea bargain and severity of crime). We hypothesize participants would have a more negative perception of the plea bargain when: (a) the sentence involved probation compared to jail because probation may be perceived as rewarding a guilty defendant (Webster et al., 2020); (b) there was a child victim compared to an adult victim because children tend to be perceived as innocent and undeserving (Bottoms et al., 2009); and (c) a victim was hit by the DUI driver on the street rather than in a car because a pedestrian is totally defenseless.

PSYCHOLOGY

THE INFLUENCE OF FEMALE SEXUAL ORIENTATION IN RAPE CASE DECISION MAKING

Author(s): Sidney Toon

Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23728>

The crime of rape is a problem plaguing women in the United States with one in five women experiencing rape at some point in their lives (Black et al. 2011). This is not just a problem for heterosexual women, but for lesbian and bisexual women as well, who are often victims of rape (see National Intimate Partner and Sexual Violence Survey, 2010). Additionally, previous legal decision making research that has shown jurors, particularly male jurors, often do not convict in rape cases and often attribute blame to the victim (Strömwell et al., 2014). When considering this information, it is important to determine if this unwillingness to convict extends to cases involving lesbian and bisexual women. Therefore, the purpose of the current study is to investigate a woman's sexual orientation as a factor in legal decision making. I will use a 4 (victim sexual orientation: bisexual who mentioned previously dating men and women, bisexual with no mention, heterosexual, and lesbian) x 2 (juror gender) between-subject design. Participants will be asked to read a summary of a rape trial, render a verdict, and then answer other questions related to the trial (e.g., victim credibility, anger toward the defendant). There are two hypotheses for the study: The first is that, across conditions, female jurors will have more pro-victim judgments (i.e., more guilty verdicts) than male jurors due prior research that has found female jurors tend to empathize more with female victims (Brown & Testa, 2008; Krulewitz, 1981). Second, all participants will perceive lesbian and bisexual victims more positively than heterosexual victims because the possibility of a sexual encounter is deemed unlikely (i.e., consent would likely not be given; see Ford et al., 1998).

PSYCHOLOGY

LATINO PARENTS' PERCEPTIONS OF DISCRIMINATION, THE FREQUENCY OF ETHNIC-RACIAL DISCUSSIONS, AND THE EFFECTS ON ELEMENTARY SCHOOL CHILDREN'S PERCEPTIONS OF DISCRIMINATION

Author(s): Maria Vela

William C. Parker Scholar

Faculty Mentor(s): Christia Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24067>

The current study examines the relationship between Latino parents' perception of biases toward Latino immigrants and how frequently they talked about discrimination with their children. The study was conducted on first- and second-generation immigrant children living in a predominantly European American community (N=66, mean age=10 years). We predicted that parents who perceived more biases toward Latino immigrants would discuss discrimination more often with their children than parents who perceived less bias. Results indicate that parents' perception of biases predicted their conversations about discrimination only among highly engaged parents.

PSYCHOLOGY

HITTING BACK AND HITTING ON: ATTITUDES ABOUT CROSS-SEX CONFLICT PREDICT ATTITUDES ABOUT SEXUAL HARASSMENT

Author(s): Natalie Vincent

Honors Program

Faculty Mentor(s): Michelle Tam

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23786>

A large body of research has examined targets of sexual harassment as well as the negative effects of sexual harassment (Bursik & Geffter, 2011; Jewell et al., 2015; Olson, 1984). However, relatively little research has examined what predicts perpetration of sexual harassment. Understanding predictors of sexual harassment perpetration can provide vital insight to aid in academic interventions targeting sexual harassment issues and concerns. Thus, the current study examined the relationship between early adolescents' attitudes about cross-sex conflict and their attitudes about sexual harassment. Participants were 142 seventh-grade students (46 boys, 96 girls) ranging from 11 to 14 years old ($M = 12.44$ years, $SD = .61$). Participants were ethnically diverse, and 43.7% identified as White, 20.4% identified as Black/African American, 20.4% identified as Latino/Hispanic, 2.1% identified as Asian, and 13.4% identified as other/multiracial. Participants' attitudes about cross-sex conflict were assessed by asking if they thought it was okay for 1) a boy to retaliate against a girl who had verbally/physically harassed him, and 2) a girl to retaliate against a boy who had verbally/physically harassed her. Attitudes about sexual harassment were assessed by asking if they thought it was okay to perform different forms of verbal, physical, and electronic sexual harassment. Results indicated that both boys ($\beta = .46$, $t(35) = 3.04$, $p < .01$) and girls ($\beta = .29$, $t(84) = 2.29$, $p < .05$) believe that when retaliation is acceptable against the opposite sex, sexual harassment directed toward the opposite sex is acceptable, too. Essentially, children's attitudes about retaliation from an angering situation (due to verbal or physical aggression) can predict their attitudes about cross-sex sexual harassment. Researchers should further this research by investigating what individual differences may affect their likelihood of cross-sex retaliation or sexual harassment.

PSYCHOLOGY

THE PRICE OF JUSTICE: HOW THIRD PARTY AND INDIVIDUAL DEFENDANTS' ABILITY TO PAY CIVIL RAPE SUITS AFFECTS TRIAL OUTCOMES

Author(s): Heidi Waterman

Honors Program

Faculty Mentor(s): Johnathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/22938>

The combination of many acquittals in criminal court rape trials and the expanding scope of legal liability for sexual harassment has motivated plaintiffs to file civil rape suits against individuals and third parties (e.g., companies) in recent years. Civil court allows plaintiffs to sue for damages (e.g., receiving compensation for psychological trauma), making this type of court an attractive route for victim justice. Little is known about juror perceptions of civilly litigated rape cases involving corporate defendants and individual defendants. Only one published study has investigated rape in civil court. Lippert et al. (2018) found that female participants had more pro-plaintiff rulings than males and that participants had more pro-plaintiff rulings when the defendant was a third party than an individual. It was unclear from Lippert et al., however, whether a defendant's ability to pay damages impacted legal decision-making in a rape civil trial. I will use a 2 (Defendant: Third Party (Hotel) or Perpetrator) x 2 (Ability to Pay) x 2 (Participant Gender) mixed-factors design (Participant Gender will be a between-participants factor). Community members will read the four different scenarios about an alleged rape in a hotel and answer questions about each scenario. We hypothesize that there will be a main effect of: (1) Participant gender--females will be more pro-plaintiff than males (e.g., more Plaintiff decisions); (2) Ability to pay—there will be more Plaintiff decisions if the defendant can pay; and (3) Defendant identity- there will be more Plaintiff decisions when the defendant is a third party rather than an individual.

PSYCHOLOGY

BATTERED WOMEN WHO KILL THEIR ABUSERS: CHILDREN AS WITNESSES

Author(s): Molli Wilkins

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23284>

Domestic violence is prevalent in the United States, especially for women. It is estimated that approximately one in three women will experience intimate partner violence (Schafer et al., 1998). Some battered women kill their male partner. Previous literature has investigated juror perception of this unique aspect of domestic violence in courts (Hodell et al., 2012). Hodell et al. found that mock jurors are more willing to convict a battered woman of homicide when her male partner was asleep at the time of the murder than when he was awake. It is important to explore other factors that may influence juror perception of battered women who kill their partner, such as whether children are direct or indirect witnesses to a partner being killed. We should note that in the U.S., millions of children are witnesses to domestic violence every year (Rizo et al., 2020). The present study sought to examine juror perceptions of a homicidal battered woman if her child was present during the murder. We used a 2 (Participant Gender) X 4 (Child Presence During Killing: directly witnessed, in house, not in house, no child) between-subjects design. Participants were asked to read a trial summary and decide on a verdict (murder, manslaughter, not guilty by reason of insanity) based on the information they were provided. There were two primary hypotheses for this study. **(1)** We hypothesize that female participants will give more **not guilty** of murder verdicts than male participants when a child is mentioned. **(2)** We hypothesize that participants will give more **not guilty** by reason of insanity verdicts when a child is witness to the murder than if the child was just present in the home, not present, or when no child was mentioned during the trial.

PSYCHOLOGY

THE IMPACT OF AGE ON STALKING TRIALS

Author(s): Alyssa Williams

First Generation, Honors Program

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23791>

Criminal stalking, or a pattern of harassment, attention, or contact in any form that is unwanted and directed at a specific person that could cause that person “reasonable fear”, is prevalent throughout the United States. To develop anti-stalking legislation, it is important to understand how certain characteristics of the victim and defendant can influence the perceived harm and seriousness of a criminal stalking case. In the past, perceptions of stalking cases have been investigated with college-aged victims and defendants. For example, in a study conducted by Emily Dunlap, Emily Hodell, Jonathan Golding, and Nesa Wasarhaley (2012) guilty verdicts of a defendant in a stalking case were examined. The main focus of Experiment 1 in this study was whether men or women would render more guilty verdicts, with the age of the victim and defendant remaining the same throughout the conditions and only changing the victim/defendant genders (Dunlap et al., 2012). The present study will extend this research by examining mock-jurors’ perceptions of ex-intimate stalking involving both younger and older victims and defendants. I will use a 2 (age of victim and defendant: 25 or 55 years old) X 2 (participant gender) between-participants design. The participants in this experiment will read a stalking trial summary, render a verdict, and then answer several questions about the case (e.g., victim and defendant credibility). There are two hypotheses: (1) there will be a main effect of victim/defendant age, such that there will be more guilty verdicts in the 25 year old victim/defendant scenario compared to the 55 year old victim/defendant scenario; and (2) there will be a main effect of participant gender—female participants will be more pro-victim (e.g., more guilty verdicts) than males.

PSYCHOLOGY

THE RELATIONSHIP BETWEEN INTERPERSONAL ABUSE AND SUBSTANCE USE RISK AMONG JUSTICE-INVOLVED WOMEN IN RURAL APPALACHIA

Author(s): Summer Williams

Faculty Mentor(s): Christal Badour, Michele Staton,

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23289>

Justice-involved women from rural Appalachia experience high rates of interpersonal (IP) abuse (e.g., physical, sexual, or emotional abuse), and may use substances to self-medicate the emotional distress they experience following abuse. The purpose of this study is to examine to what extent mental health difficulties account for the relationship between IP abuse and substance use in a sample of disadvantaged women (N=270) currently incarcerated in rural Appalachian jails. During face-to-face interviews, women reported their IP abuse history, severity of mental health difficulties (e.g., depression, anxiety, and PTSD), and substance use. Using a multiple indirect effect model, higher numbers of IP abuse types were significantly associated with greater substance use risk through the pathway of more severe PTSD symptoms (but not depression or anxiety). Our findings suggest that addressing PTSD may be an important target for substance use treatment among justice-involved rural Appalachian women with multiple IP abuse types.

PSYCHOLOGY

PERCEPTIONS OF ATHEIST DEFENDANTS IN A RAPE TRIAL

Author(s): Shania Young

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24115>

In America, sex crimes occur at a relatively high level. As such, researchers investigate the factors causing these crimes, as well as how these crimes are perceived in court. Regarding the latter, one of the factors examined is how jurors are impacted by the characteristics of the defendant. One such characteristic is the defendant's religious background. Researchers have shown that certain religious backgrounds are viewed negatively. This includes if a person is an atheist. According to Gervais (2014), people consider atheists to be more criminal and atheists are distrusted compared to non-atheists (see Edgell et al., 2006). Recent research by Brown-Iannuzzi et al. (2019) even found that when rape victims were described as atheists, conviction rates lowered. The present study aims to determine whether these negative assumptions about atheists will persist when applied to someone accused of rape. This study will use a 3 (Defendant religion condition: Atheist, Christian, no mention of Religion) x 2 (Participant gender) between-subjects design. Participants will read a trial summary of a rape trial and answer questions regarding the trial. After reading the trial, participants will answer questions about the trial, including rendering a verdict and rating victim and defendant on credibility. There were three hypotheses: 1) we predicted a main effect of Defendant religion condition, such that pro-defendant judgements (e.g., defendant credibility) should be higher when he is not an atheist; 2) we expected a main effect of gender, such that conviction rates will be higher among women than men across conditions; and 3) we predicted the perceived morality of the defendant would mediate the relationship between the defendant's religiosity and the verdicts, such that jurors will perceive an atheist as less moral, therefore increasing guilty verdicts.

PSYCHOLOGY

THE EFFECT OF MULTIPLE VICTIMS ON JUROR PERCEPTIONS IN CHILD SEXUAL ASSAULT CASES

Author(s): Jaclyn Jamison

Honors

Faculty Mentor(s): Jonathan Golding

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23846>

In the United States, 26.6% of girls, and 5.1% of boys report experiencing sexual assault in their lifetime (Finkelhor, et al., 2014). There has been much research on child sexual assault cases in the courtroom and the factors that influence juror decision-making. Previous research has shown that juror gender and victim age have an effect on juror decision-making. However, there has been little research on how multiple victims of the same sexual abuser affect juror decision-making, and whether or not multiple victims “improve” the believability of the children. The present study aims to fill this gap in the literature. This study uses a 2 (age of victim 1: 6 or 15 years old) x 2 (age of victim 2: 6 or 15 years old) x 2 (participant gender) + 2 control conditions (6-year-old and 15-year-old only) between-participants design. Participants were asked to read a trial summary detailing a sexual assault of one or two victims. Participants were then asked to decide a verdict and answer additional questions relating to the trial. There are four hypotheses: (1) There will be a main effect of participant gender, females will produce more pro-victim judgments and guilty verdicts than males; (2) There will be a main effect of the number of victims, where 2 victims will produce more guilty verdicts overall than 1 victim; (3) There will be an interaction between the age of victim 1 and the age of victim 2, such that when the 6-year-old is presented first and the 15-year-old second, more guilty verdicts will result than when the 15-year-old is present first and the 6-year-old second; (4) The pattern for the number of guilty verdicts will be: 6-6 > 6-15 > 15-6 > 15-15.

PSYCHOLOGY / NEUROSCIENCE

ETHANOL-INDUCED NEUROTOXICITY IN FETAL ALCOHOL SPECTRUM DISORDERS

Author(s): Olivia Klee

Honors Program

Faculty Mentor(s): Mark Prendergast

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23763>

Fetal Alcohol Syndrome Disorder (FASD) is caused by maternal drinking during pregnancy. In-utero alcohol exposure creates reactive aldehyde species, which form adducts on AMPK. In addition to AMPK inhibition, ethanol also causes increased reactive oxygen species (ROS), lipid peroxidation, and neuroinflammation. The present study exposes 10 day old rat pups to ethanol as an organotypic third trimester model of binge drinking. Results showed that AICAR is neuroprotective against ethanol toxicity in three separate regions of the hippocampus.

PUBLIC HEALTH

THE IMPACT OF COVID-19-RELATED RESTRICTIONS ON MOTOR VEHICLE CRASH FATALITIES

Author(s): Rachel Wagers

Honors Program

Faculty Mentor(s): Julia Costich

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24143>

Reports on the impact of Covid-19-related restrictions on motor vehicle crash (MVC) fatalities have varied widely. Some investigators report that reductions in volume have reduced fatalities, while others have found increases associated with increased incidence of high vehicular speeds. Kentucky has a relatively high rate of MVC fatalities, reflecting its rural and mountainous roadways and persistent underuse of safety belts. We sought to determine whether activity restrictions in response to Covid-19 increased or decreased the state's MVC fatality toll.

MVC fatalities were compared by week in 2020 with those in 2019, isolating the period between March 16 and May 22, when the most stringent statewide activity restrictions were in place. We tested variations between the two periods for statistical significance.

MVC fatalities declined immediately following the announcement of activity restrictions but increased after the initial two weeks, ultimately exceeding the 2019 total for the period under analysis by a statistically significant 8.33%. Total MVC fatalities for 2020 exceeded the 2019 total by a slight but statistically insignificant margin.

Statewide activity restrictions may have reduced Kentucky's motor vehicle traffic and lowered MVC fatalities immediately following their imposition. However, this effect was short-lived and failed to lower MVC fatalities overall.

Maintaining desirable secondary effects of public health actions requires both enforcement and reinforcement. Particularly in rural areas with suboptimal roadways, increased risk of MVC fatality reflects factors that are independent of temporary activity restrictions.

PUBLIC HEALTH

EXPLORING THE INTEGRATION OF CLINICAL AND COMMUNITY ORGANIZATIONS TO ADDRESS UNMET SOCIAL NEED: A SOCIAL NETWORK ANALYSIS

Author(s): Brooke Woosley

First Generation

Faculty Mentor(s): Rachel Hogg-Graham

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24017>

A growing body of research has emerged highlighting the importance of addressing individual unmet social needs as a strategy to improve health outcomes. While it is acknowledged that partnerships between clinical and community-based organizations are a key component in addressing social needs, very little is understood about the characteristics of these partnerships and how they facilitate patient linkages across sectors. This study uses whole network analysis to examine collaboration between clinical and community organizations working to address social need. The Program to Analyze, Record, and Track Networks to Enhance Relationships (PARTNER), a social network analysis (SNA) tool, was used to gather data on the relationships between clinical and community-based organizations working across sectors in Fayette County, KY. Respondents were identified by a large hospital system where they selected organizations they commonly partner with when patients present with unmet social needs. SNA methods were used to measure the quantity and quality of relationships between organizations, including key measures of value, trust, and network structure. While all respondents have some degree of referral or assessment strategy across organizations, clinical and community organizations group within their own sectors in addressing social needs. Organizations across sectors typically communicate on a weekly basis and participate in very little resource and data sharing, while those in the same sector connected daily. No organization selected the sharing of tracking systems or services as working well in referral processes and funding limitations were identified as an important barrier. Most organizations reported efforts to address social need to only be somewhat successful in the community. Health and community-based organization continue to work in silos, with limited integration across sectors. Improved resource and data sharing coupled with development of funding strategies that incentive cross-sector integration may help improve community efforts to address social needs and improve health outcomes.

RETAILING AND TOURISM MANAGEMENT

A GLOBAL PANDEMIC'S EFFECT ON THE RETAIL INDUSTRY

Author(s): Sabriyah Arain

Honors Program

Faculty Mentor(s): Scarlett Wesley

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23933>

It is commonly known that the effects of the COVID-19 pandemic have impacted many industries, including healthcare, transportation, and leisure to name a few. One particular industry that seems to have been greatly affected is retail. With many individuals deciding to stay safe at home rather than go out shopping, this poses a question regarding how retail companies are changing their selling and promotional strategies. It is apparent that online shopping has become more popular. However, what may be less apparent is how retail stores are adapting. With fewer customers entering the stores, it is important to look into what companies are doing in an attempt to encourage more foot traffic. This project takes an in-depth look into how COVID-19 has affected the retail industry in terms of visual displays, shopping patterns, and marketing tactics. The main focus will be on how companies have changed these components of their strategy during the 2020 holiday season as compared to the 2019 holiday season. The fourth quarter of the year is oftentimes the most important period for retailers, for it is when they have the largest opportunity to make sales. From analyzing how visual displays, shopping patterns, and marketing tactics have been altered as a result of the pandemic, this project will conclude with inferences of what the future of the retail industry may look like, along with whether or not some changes in retail strategies and consumption patterns may be permanent or long-lasting.

RETAILING AND TOURISM MANAGEMENT

TRANSFORMATIVE EXPERIENCES THROUGH SOLO FEMALE LEISURE TRAVEL

Author(s): Kate Drafz

Faculty Mentor(s): Pei Zhang

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23788>

Solo female leisure travel is a continuously growing market segment in the tourism industry. Research indicates that this type of travel generates distinct benefits for females, such as feeling empowered. Previous literature has discussed travel motivations, constraints, and benefits of solo trips for female leisure travelers. Yet the results remain mixed and incomplete. The current study further examines the negative and positive experiences encountered during solo female travel, the constraints that affect the traveler, and how these experiences transform solo female travelers after their trips are completed. The study contributes to the existing literature by investigating how solo female leisure travel experiences impact women and, consequently, transcend beyond the destination.

The data utilized in this pilot study were 30 anonymous forum entries of solo female travelers collected from user-generated content websites including Tripadvisor, Lonely Planet, and Reddit. These forum entries were chosen based on their content and relatedness to the research objectives (i.e., purposive sampling). Some entries focused on specific locations, while others describe general experiences. It is important to note that the sample may not be completely representative of the general population of solo female travelers due to its size and entry time.

Two primary personal transformations were identified: newfound self-confidence and strength and global awareness of different cultures. The findings also reveal common positive experiences of being independent and negative experiences associated with fear and different cultural norms. More importantly, women who had more positive travel experiences found there to be more positive impacts in their everyday lives following travel. The study concludes that solo leisure travel can significantly impact the inner self of women and how they interact with the outside world. Becoming aware of the possible lasting benefits of solo travel through seasoned female travelers' experiences may influence and inspire prospective solo women travelers.

SOCIAL WORK

COVERING COVID: THE IMPACT OF COVID-19 ON SELF-CARE AMONG TELEVISION JOURNALISTS

Author(s): Shauna Kitts

Chellgren Fellow, First Generation

Faculty Mentor(s): Justin Miller

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23876>

This research project consisted of contacting television journalists nationally to invite them to participate in a survey regarding their self care habits. In the era of COVID and the 24 hour news cycle television journalists were examined in order to determine self care affecting their biases in news delivery.

SOCIOLOGY

CAREGIVING IN COVID-19: ASSESSING SLEEP, STRESS, AND ALCOHOL USE

Author(s): Jasmine Ahmad

Chellgren Fellow

Faculty Mentor(s): Mairead Moloney

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23974>

Background: Research has highlighted the bidirectional relationship between alcohol usage and insomnia. Multiple studies have indicated that increased sleep disruption and increased alcohol use often result from acute stress. Acute stress as a result of COVID-19 and quarantine conditions may impact caregivers differently than non-caregivers. Caregiving for children or older adults is associated with poor sleep, increased distress, and increased alcohol use. Emergent data suggests that females, more than males, increased alcohol consumption during COVID-19. Caregiving for children was a strong predictor. We ask: Do caregivers, compared to non-caregivers, have different alcohol use, sleep, and mood outcomes during COVID?

Methodology: This study assessed adults aged 21+ who have Internet access. Our REDCap survey asked participants to first assess their current COVID experiences and next retrospectively answer the same scales considering pre-COVID experiences. Three surveys were conducted over 9 months and qualitative interviews were conducted with a subsample of participants. Paired sample t-tests assessed pre- and during-COVID drinking, sleep quality, perceived stress, and depression symptoms.

Results: Survey 1 had 795 participants (34% were caregivers of children/adults). Mean age was 49 years. Most participants were white (80%), female (87.5%), highly educated (81% \geq college degree) and worked full- or part-time (65.8%). Alcohol intake remained consistent for non-caregivers but increased significantly for caregivers. Poor sleep quality increased significantly for both groups during COVID; however, caregivers experienced worse sleep quality compared to non-caregivers. Caregivers also reported significantly higher stress compared to non-caregivers. Both caregivers and non-caregivers experienced significant increases in depression symptoms, but caregivers were worse off. Upcoming analyses of surveys 2 and 3 will offer insight into changes over time. Likewise, as qualitative interviews continue, unique individual experiences will serve as contextually vit

SOCIOLOGY

ADULT EDUCATION AND CHILDHOOD DEVELOPMENTAL DISORDERS: ELUCIDATING RELATIONSHIPS USING THE NATIONAL SURVEY IN CHILDREN'S HEALTH

Author(s): Hope Makumbi

Faculty Mentor(s): Anna Hansan

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24066>

Hypothesis: There exists a significant relationship between a mother's educational attainment and the likelihood that her child was referred to a developmental specialist.

Developmental disorders are highly prevalent among children in the United States. Approximately one in six children in the United States have one or more developmental disorders. Developmental disorders include a range of diagnoses, including ADHD, Autism Spectrum disorder, and intellectual disabilities.

Parental socioeconomic status may influence a child's likelihood of experiencing a developmental disorder. Namely, poverty may influence children's risk. Children with special needs are more likely to come from a low-income family, and poverty is a major contributor to poor health in children.² Additionally, a lack of education in the household may be detrimental to a child's development. Past studies have indicated individuals with a higher level of education are more likely to have better health outcomes for both themselves and their children. Parental education may also complicate diagnosis. A lack of education in a parent or guardian may lower recognition that their child may be having developmental issues.

A common factor that may relate to a child's development is their birth weight. A lack of maternal education is a possible precedent to low birth weight in neonates. Children born to families of lower socioeconomic status (namely, with low-income levels and low educational attainment) are more likely to be born with a low birth weight. A low birth weight can result in significant health and developmental problems as infants grow, possibly persisting into adulthood.

SPANISH

A BILINGUAL APPROACH TO COMBAT COVID-19 IN YOUNG ADULTS AND THE LATINX COMMUNITY.

Author(s): Karmen Loehr

Honors Program

Faculty Mentor(s): Ruth Brown

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23957>

This purpose of this research was to provide a place for groups with an increased risk of contracting COVID-19 to learn more about their risk, what to do about it, and what resources they can benefit from. The target audience is young adults and the Latinx community. In order to share these findings with this specific underserved group, the information was compiled into a bilingual website. The purpose behind this bilingual website is to provide outreach for treatment/prevention and resources regarding COVID-19 for young adults and the Latinx community. Previous research has uncovered disparities faced by the Latinx community, and this research pin points how those disparities are affecting their contraction of the virus. The research was extended to community organizations and local resources that would be successful in helping prevent, treat, and inform the target audience. While this pandemic is ever-changing and new findings and regulations are emerging every day, the importance of keeping the young adult and Latinx communities informed and in touch with these resources continues to increase.

TOXICOLOGY & CANCER BIOLOGY

USING CULTURALLY-FOCUSED STORYTELLING TO EMPOWER APPALACHIAN KENTUCKY YOUTH TO UNDERSTAND AND ADDRESS CANCER DISPARITIES IN THEIR COMMUNITIES

Author(s): Lauren Collett

OUR Summer Research Fellow (2020), First Generation, Robinson Scholar

Faculty Mentor(s): Nathan Vanderford

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23873>

Kentucky has the highest cancer incidence and mortality rates in the nation with the Appalachian region of the state being most affected. The objectives are to describe the key social determinants contributing to Kentucky's cancer disparities through the written accounts of Appalachian youth, to identify Kentucky as ranking first in the nation in overall cancer incidence and mortality rates with the greatest burden of the disease being in the Appalachian region of the state, and to recognize storytelling as an important method for individuals to conceptualize and communicate the burden of cancer around them as well as to envision possible culturally-tailored interventions. Twenty-five Appalachian Kentucky youth participants of the University of Kentucky's Appalachian Career Training in Oncology (ACTION) program were engaged in a cancer storytelling exercise to write culturally-framed essays focused on their personal experiences with cancer as well as causes of and solutions to Appalachian Kentucky's cancer disparities. Content analysis was used to identify common themes in the essays regarding types of cancer observed, causes of cancer in Appalachia, and proposed solutions to lower cancer rates. Each sentence was coded with a meaning unit that was grouped into categories, with each category being grouped into a theme. The analysis was repeated three times with independent secondary and tertiary review. The most frequently identified themes that drive high cancer rates in Appalachian Kentucky are geography, cultural use of tobacco, and environment with tobacco use, lack of screening, and cultural adherence being most frequently identified as contributing factors. The most common cancer types referenced in the essays were breast, lung, and prostate. Common proposed solutions to decrease cancer rates in Appalachian Kentucky were to improve education and awareness, increase screening rates, and increase tobacco cessation rates. Through storytelling, youth gained a better understanding of cancer in their communities and envisioned culturally-tailored, community-based intervention strategies that could aid in reducing the cancer burden in Appalachian Kentucky.

TOXICOLOGY & CANCER BIOLOGY

INVESTIGATING CANCER IN APPALACHIA THROUGH CONTENT ANALYSIS OF ORAL HISTORY INTERVIEWS

Author(s): Courtney Martin

5-Minute Fast Track Competition Finalist (Fall 2020), National Conference on Undergraduate Research (NCUR) Presenter (2020-21)

Faculty Mentor(s): Dr. Nathan Vanderford

Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/24132>

Kentucky ranks 1st in the United States in overall cancer incidence and mortality rates. Within Kentucky, the Appalachian region experiences the highest rates of cancer. These disparities necessitate further investigation and action that will drive a reduction in cancer rates in the region. Using convenience sampling, we recruited individuals to participate in an oral history interview project about cancer in Appalachian Kentucky using a one-group within-subjects approach. All but one of the interviews were held in-person and questions were administered in a semi-structured fashion. The main questions of interest focused on the problems being faced in Appalachian Kentucky, the factors contributing to the high rates of cancer in the area, potential solutions that would lower cancer rates and participants were asked to define what a successful future would look like for the region and how the future may look without intervention. Qualitative content analysis was used to analyze the interviews. Collected data were categorized by theme, subtheme and subtopic. Themes that emerged include lack of access to healthcare, lack of physicians, distrust of health care providers, and lack of health care literacy. Our findings illustrate the need for increasing health care access, eliminating distrust between patients and providers, addressing the economic burden in the area, and increasing cancer literacy levels. These changes can be implemented in various ways including through government interventions that could aid in increasing the number of and access to health care facilities in the region and implementing policies that would provide cancer education to residents in the area including through provision of cancer curricula in schools. Implementing these changes has the potential to reduce the cancer burden in the area.

WRITING, RHETORIC, AND DIGITAL STUDIES

LONELINESS DURING MASS SOCIAL DISTANCING: AN EXPLORATORY QUALITATIVE STUDY OF LONELINESS IN COLLEGE STUDENTS DURING THE COVID-19 PANDEMIC

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National Conference on Undergraduate Research (NCUR) Presenter(2020-21), OUR Summer Research Fellow (2020), Honors Program

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Symposium Project Link:

<https://symposium.foragerone.com/showcase-of-undergraduate-scholars/presentations/23949>

The COVID-19 pandemic has created a unique environment to study loneliness in college students. Loneliness has a deeply rooted history in psychology and sociology where both attempt to explain it as either a lack of physical contact, a discrepancy in one's actual quality or type of relationships and the quality or type of sought-after relationships, or as an emotional reaction to social factors. One way that psychologists have attempted to quantify loneliness is with the UCLA loneliness scale. Previous research has focused on the conceptualization and definition of loneliness, social stress theory regarding studying mental health, and the strength of interpersonal ties with a move to predominantly online communication. To build on this research, I conducted mixed-method research interviewing 16 students ages 19 to 24 and utilized the UCLA loneliness scale to inform my qualitative data. The interviews in this study address stress through major life events, chronic strains, and daily hassles known as social stress theory. They also discuss the strength of different relationships due to social distancing. My analysis demonstrates that many students define loneliness during the pandemic with different parts of existing academic theories. My findings suggest that, within social stress theory, the pandemic is a major life event that has resulted in other stressful events which in turn causes chronic strain as it persists—stress proliferation. My interviews also tend to highlight instability within online relationships potentially due to a lack of social cues or face-to-face context. Interventions based on these findings may include creating new online methods of community building for new and returning students, promoting safe outdoor activities, and establishing support groups aimed specifically at those who feel lonely or isolated.

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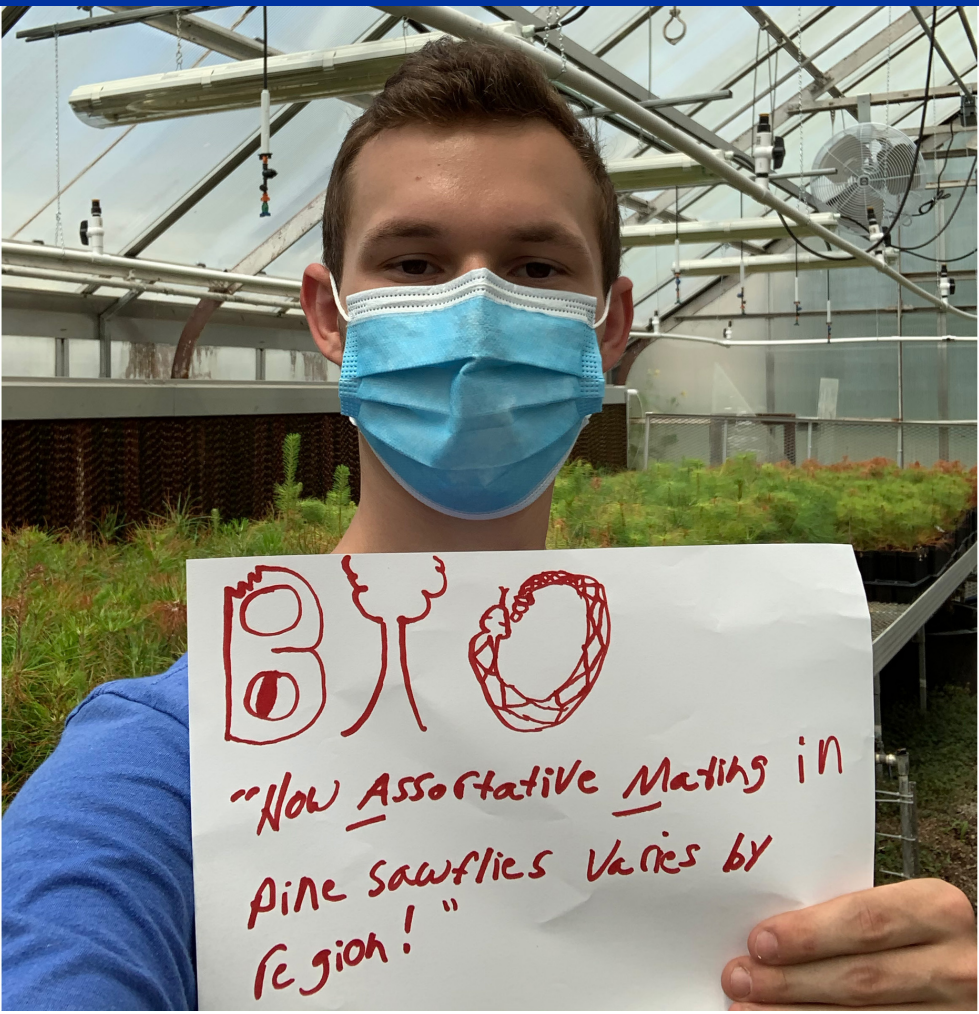
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