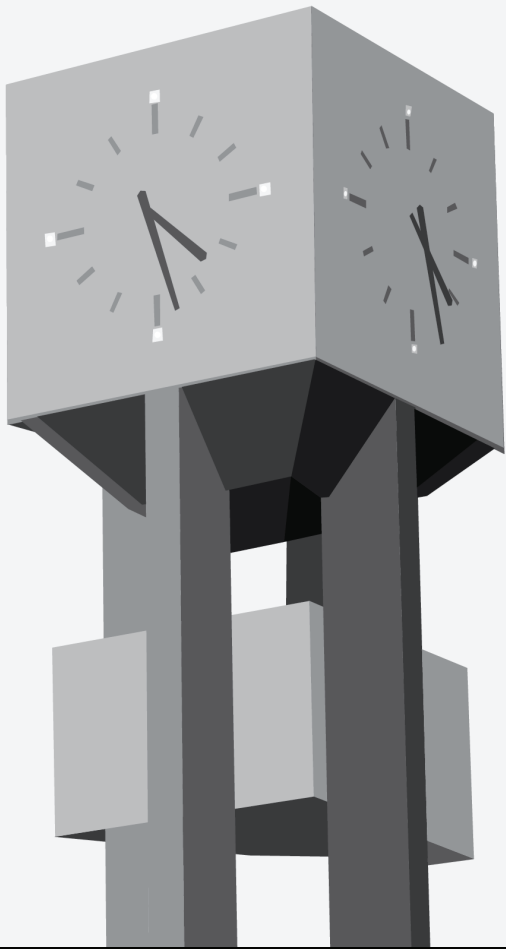


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Acknowledgements

The articles featured in Ergo are peer reviewed by a committee of students and faculty from Weber State University. The staff and faculty advisors for Ergo would like to thank the reviewers for volunteering their time and expertise and contributing to the production of this research journal. The success of this journal would not be possible without the commitment of everyone involved.

We would like to acknowledge the following donors:

The Stephen & Susan Denkers Family Foundation
The George S. & Dolores Dore Eccles Foundation
The Kem & Carolyn Gardner Foundation
The Ralph Nye Charitable Foundation
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A Special Note to Contributors

To: Our authors and readers of ERGO,

This edition of ERGO is special. It may look similar to past editions in terms of total length and number of student articles, but behind this edition is a tale of resilience. The collection here spans the 2020-2022 academic years. Unwritten in these articles are personal experiences of the COVID pandemic: the sudden shutting of our lives, fear, unknowing, stress, anxiety. Our research was paused indefinitely, our courses moved online, and our lives upended in many ways. But the fact that you are reading these articles means that we didn't stop there. We adapted and evolved. We figured out ways to continue asking questions and seeking answers. We sought connections amid isolation and found solutions to issues we didn't know we needed to answer. I am reminded of a quote by one of my favorite scientists, Marie Curie: "Nothing in life is to be feared, it is only to be understood. Now is the time to understand more so we may fear less." This is as true today as it one hundred years ago. If you read between the printed lines of this special edition, you will find stories of resilience and pursuits of understanding in the time of fear.

To the authors of this edition, we see you and commend you. You brought curiosity, intellect, and spirit to your project during a time when it was easy to give up. You persevered and succeeded. The skills that you have used and honed in these research projects, during this pandemic time, will serve you well as you continue in your academic and professional pursuits. The community at Weber State University — your peers, mentors, faculty, staff, and all those who played a role in your research pursuits — wish you the greatest success in your future endeavors.

Sincerely,

A handwritten signature in black ink that reads "Tracy M. Covey". The signature is written in a cursive, flowing style.

Tracy M. Covey, Ph.D.
Assistant Director, Office of Undergraduate Research
And the entire Office of Undergraduate Research

Letter from the Editor

To: Authors, Mentors, and Readers of ERGO

The optimist in me would like to think that as our lives have stretched and adjusted to the impacts of a global pandemic, we have all come to better understand and appreciate the need for the scientific process and therefore value research more than our pre-pandemic selves. This optimism is made real to me by the works contained in this combined volume of Ergo. These articles exemplify the importance and value of research at an undergraduate level while also standing as a work of resilience during a time in which the landscape of being a student has been constantly changing. Research can provide an immense amount of comfort and guidance during times of great change, and I don't think we need empirical data to know that these are times of great change and that we all would benefit from more comfort these days.

Being the graphic designer and editor for Ergo is a dream job position for me. I have always loved research. When I was a college student, from time to time I would come across a piece of research I didn't need for an assignment but was interested in reading and I would save it. I would save it to read as a reward for completing said assignment, that's how much I love research. My life has been profoundly impacted by research, both as a reader and an undergraduate researcher myself. I believe that research has a profound impact on all our lives, whether we realize it or not.

I share this bit of personal transparency because I think it is easy to forget how important undergraduate research is as a voice in academic conversations and discoveries. When I was in college, I remember classmates wondering aloud if anyone would even care to read their research, which is why it is important for you to know that people like me exist. The research I have read in the time I've been involved in Ergo has filled my world with vibrant color and deep reward. The ideas, questions, and topics that are addressed in this journal exist because of the time and experiences that

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these students are presently living in and that is exactly what makes it so important. The lens and perspective of being a student researcher is one that is not only unique to these students and their experiences, but it is exceedingly valuable.

Through these times of change and challenges I invite all those reading to find comfort and connection, much like I have, through the amazing work included in this edition of *Ergo*.

A handwritten signature in black ink. The first letter is a large, stylized 'B' with a checkmark-like flourish above it. The name 'Brin Berezay' is written in a cursive script across the 'B'.

Brin Berezay
Editor-in-Chief & Graphic Designer
Office of Undergraduate Research
Weber State University

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Potential Student Colonization by Bacterial Pathogens in the Medical Laboratory

Monica Fernandez, Natalie Finlinson, and Amber Sugden

Mentor: Kendal Beazer

Department: Medical Laboratory Science

ABSTRACT:

Studies evaluating the body's microbiome for differences amongst bacterial composition are at the forefront of microbiological studies. The nasal microbiome is comprised of the microorganisms that live within the nares and nasal passageways and differs based on a plethora of conditions, such as disease and exposures. The nasal microbiome has been shown to have been colonized by pathogens, such as Methicillin-resistant *Staphylococcus aureus* in established healthcare professionals, this suggests that those in healthcare are exposed to pathogens that can lead to species specific changes of the nasal microbiome. Nasal microbiomes of first year and last year Medical Laboratory Science students will be evaluated using DNA sequencing of the bacterial genomes within the nasal microbiome; thus, giving an insight into how the nasal microbiome of college Medical Laboratory Science students changes with exposure to potential pathogens and other bacterial species in the laboratory. DNA extracted from nasal swabs using the QIAamp DNA mini kit will be sequenced using Nanopore Technology and then compared between the two groups for differences in the microbiomes in association with program year. We saw a wider range of bacteria species and higher percentage of potential pathogens in last year students than first year students.

INTRODUCTION:

The nasal microbiome has been shown to have been colonized by pathogens such as Methicillin-resistant *Staphylococcus aureus* in established healthcare professionals, particularly nursing professionals and surgical ward employees (CDC, 2000); this suggests that those in healthcare are exposed to pathogens that can lead to species specific changes in the nasal microbiome of these healthcare professionals. Pathogen colonization of the nares of healthcare professionals creates resounding issues in patient care, as it leads to hospital acquired pathogenic infections (Legese et al., 2018).

Differences in the bacterial composition of the body's microbiome are at the forefront of microbiological studies. The nasal microbiome is the microorganisms that live within the nares and nasal passageways and differs based on a plethora of conditions, such as disease and exposures. The pertinence of studies regarding the nasal microbiome is the understanding

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of the benefits or consequences that are associated with the presence of certain bacterial species and pathogens.

The goal of this project is to understand whether college laboratory professional students experience similar pathogenic colonization rates as other healthcare professionals, and if their nasal microbiome changes significantly as they progress through their program and are exposed to more pathogens in the clinical laboratory. To evaluate these differences, the nasal microbiomes of first year and last year Medical Laboratory Science students were evaluated using DNA sequencing of the bacterial genomes within the nasal microbiome; thus, giving an insight into how the nasal microbiome of college Medical Laboratory Science students changes with exposure to pathogens and other bacterial species in the laboratory.

MATERIALS AND METHODS:

Population Selection

Twenty-four students were selected from the Medical Laboratory Science Program at the Weber State University Ogden Campus. Groups were defined as first year students, enrolled in MLS 1113 or MLS 1114, and last year students, within a year of graduating with a bachelor's degree; each consisting of twelve participants. Candidates who were on antibiotics in the last 3 months or who have ever been diagnosed as immunocompromised were excluded from this study.

Sample Collection and DNA Extraction

Collection of the nasal samples was obtained by inserting a DACRON swab approximately 2 centimeters up the nasal cavity and swirling for 3 seconds. Upon collection, the samples were placed into a 1.5 mL Eppendorf tube and refrigerated until date of extraction. Qiagen QIAmp DNA mini kits were used to extract clean, concentrated, DNA for each sample. This kit allows for the removal of PCR inhibitors, rapid homogenization, and cell lysis of the samples. DNA was collected from the spin-column, and after washing and separation, used for sequencing. (figure 1)

Sequencing

The concentrated DNA from each sample obtained from the QIAmp DNA mini kit was assigned a 16S barcode label after library prep and underwent

PCR to amplify DNA. After priming the flow cell, the samples were loaded onto the MinION nanopore sequencer for microorganism species identification.

Analysis

Statistical analysis was performed on Epime2 and R Studio to determine relative abundance, alpha diversity, T-tests, and other comparative tests.

RESULTS:

The comparative analysis of the nasal microbiomes of the seniors versus the applicants was done through evaluation of the reads per organism given by the MinION and subsequent analysis using Epime2. To verify the effectiveness of the microbial sequencing the quality was assessed using three quality assessments (Figure 2) which all were within expected values. All participants were evaluated for confounding factors such as medication use, age, and other laboratory work (Table 1).

The species diversity of the study groups was not found to be statistically significant thus we failed to reject the null hypothesis that the study groups have similar microbiome species (Figure 2). The relative abundance of the top species identified through sequencing was evaluated for differences between the study groups. There was increased prevalence of certain genera for each study group with no trend favoring either group (Figure 3 and 4).

For pathogenic evaluation of the study groups, *Staphylococcus aureus* presence was evaluated between the study groups. The seniors were found to be 2.5 times more likely to be colonized by *S. aureus* than the applicants (odds ratio information Table 1). Ultimately, there was not a significant difference in the diversity of the groups; however, there was increased prevalence of some genera in the seniors.

DISCUSSION:

This cross-sectional study shows that seniors matriculated into the Medical Laboratory Science program do not have a greater taxonomic richness than applicants not yet accepted into the program. Alpha diversity, shown as the Shannon Diversity Index, was only slightly increased in seniors; with a mean of 1.63 in seniors and a mean of 1.40 in applicants. Although, there was an outlier in the senior group which could have lowered the mean. The

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similarities in alpha diversity between groups could be due to the groups being similar in age and sharing a similar environment.

Furthermore, seniors are more likely to be colonized with bacterial pathogens, such as *S. aureus*, than applicants. We found that one third of the population of seniors were *S. aureus* carriers, while only one fifth of the applicant population were carriers. Additionally, seniors had twice the number of participants with the presence of *S. aureus*. An odds ratio was used to determine that matriculated seniors were 2.5 times more likely to acquire *S. aureus* than applicants. This increase could be caused by seniors working with *S. aureus* in courses such as Clinical Microbiology as well as other laboratory work.

This cross-sectional study used proper research technique; however, there were some limitations. Due to limited funding and the amount of flow cells provided, our sample size was limited to 24 participants. A larger sample size would have allowed us to have a better understanding of microbial diversity between populations. Another limitation was researchers were still learning the proper procedures for the Nanopore sequencer. Since this is a relatively new analyzer, there was limited experience in running it.

The purpose of our cross-sectional study was to gain an increased understanding in the nasal microbiomes between seniors and applicants, but this could not definitively show us a causal relationship. To determine if the Medical Laboratory Science Program causes greater bacterial colonization, a longitudinal study has been set up. The applicants who have participated in the cross-sectional study will be tested each year in the program to see if their nasal microbiome shifts or changes in any way.

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APPENDIX

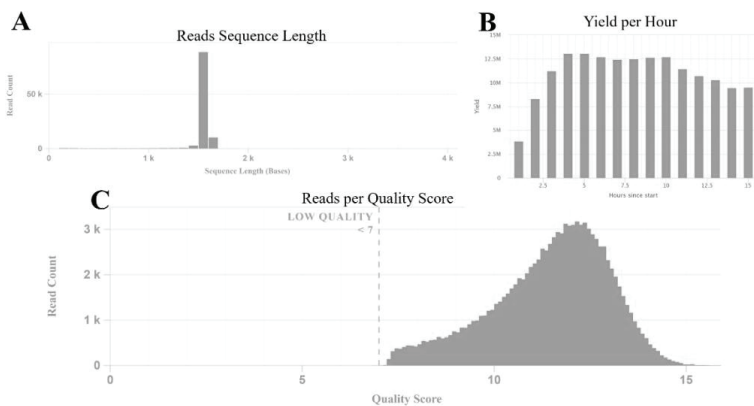


Figure 1: These graphs show the quality control of the Fastq 16S workflow used to analyze data from the MinION. In Graph A, the quality of all the reads is shown to be above the low-quality score threshold of seven, signifying greater than 20% error, with an average quality score of 11.4. Graph B shows the yield, in megabases, during the 15-hour read time which was generally consistent after the first three hours. Graph C shows the number of reads at specific sequence lengths; barcodes read at an average base length of 1,529 kilobases which is as expected in the 1,550 mode.

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Table 1. Demographic Data and *S. aureus* presence of groups

	<u>Senior (N=12)</u>	<u>Applicant (N=12)</u>
Mean Age(years)	25.58	21.45
Medication Use	0.42	0.17
Other Lab Work	0.83	0.58
Mean Hospitalization (months)	0.42*	0.37**
<i>S. aureus</i> Present	4	2
<i>S. aureus</i> Not Present	8	10

* Senior mean increased due to one senior spending five months in the hospital, the rest of the group spent little to no time in the hospital as an inpatient.

** Applicant mean increased due to one applicant spending four months in the hospital, the rest of the group spent little to no time in the hospital as an inpatient.

Medication Use and Other Lab Work presented as frequencies within each group. Medication Use defined as taking any medication that is not antibiotics, Other Lab Work defined as laboratory work outside of the MLS student laboratories, and Mean Hospitalization is defined as being inpatient. Presence of *S. aureus* between seniors and applicants. Seniors had twice the amount of *S. aureus* compared to applicants.

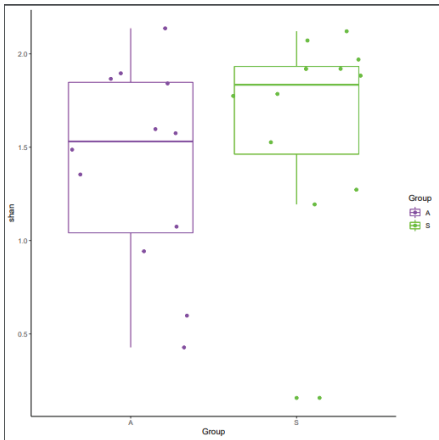


Figure 2: Box plot of Shannon diversity between applicants (purple) and seniors (green). The mean Shannon Diversity for applicants was 1.40, while the mean Shannon Diversity for seniors was 1.63. Using a Welch Two Sample T test to compare, a p-value of 0.35 was obtained, meaning the difference among means is not statistically significant. This shows that the seniors do not have a higher microbial diversity compared to applicants.

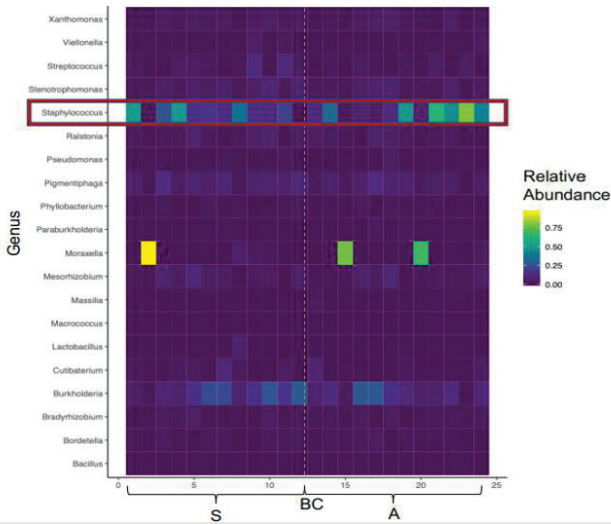


Figure 3: Relative abundance of top 10 Genera between seniors (S) and applicants (A). Staphylococcus is seen in a greater overall abundance in applicants compared to seniors.

Fighting Dragons in *Critical Role* with Cultivation Theory

Jennifer Greenlee

Mentor: Sarah Steimel
Department: Communications

ABSTRACT

With decades of theoretical application and continuous study, it might be assumed that there is nowhere left to take cultivation theory. However, with the advent of YouTube and the rise of a new nerd culture in mainstream media, there are more fields that have cropped up over the past 10 years that require the use of cultivation theory to understand the intricacies of these internet primetime shows. One such show, *Critical Role*, a Twitch stream and YouTube show, has been airing over the past five years and has shaken up the *Dungeons & Dragons* world. George Gerbner's theory (1975) first posited that exposure to television can fundamentally change the viewer. YouTube is, at its core, a slightly modified version of television, complete with commercial breaks. By breaking down *Critical Role* under cultivation theory, it is possible to extrapolate the modifications in world view and behavior that heavy viewership is likely to make in fans of the show and the overall community. The application of cultivation theory allows the research to show how fans receive and use the information and messages of *Critical Role* through a message analysis of what *Critical Role* attempts to portray and what messages are prominent in the show. This analysis will explore how this show has shaped the viewers' worldviews of the Table-Top Gaming community, including the principles of cultivation analysis, such as mainstreaming, where players in the audience hold *Critical Role* to be the best and only standard of playing *Dungeons & Dragons* because of their consumption of the show, and the resonance principle, when it is applied to an audience of typically non-mainstream and self-identified nerds when finding a group that labels themselves in the same way.

INTRODUCTION

Cultivation theory has been studied for well over four decades since its inception. While cultivation theory has focused on television, throughout the last decade, television-adjacent platforms have emerged and given viewers a new experience. Viewers of Netflix, Hulu, and Disney Plus now enjoy the ability to be heavy viewers of a single show on a daily basis when binge-watching these platforms' programming. While cultivation theory has been adapted to analyze the effects of the changing and advancing technologies of what television is becoming, it needs to continue adapt to have a continued and lasting impact on the 21st century. Among these ever-growing platforms is YouTube, a 15-year-old video-sharing platform that

allows viewers to ingest copious amounts of content from people around the world. Much like television, there are hundreds of hours of content and commercial breaks, bringing with it new applications for cultivation theory's unique niches.

One of the many shows on YouTube is Critical Role, a show about "voice actors playing Dungeons & Dragons," which just passed its sixth anniversary (Critical Role, 2021). Despite the decades of disparity between the cultivation theory's inception and Critical Role's first live stream, cultivation theory applies just as much to this show as it did to shows in the late 70s. Cultivation theory studies the effects that exposure to television has on the beliefs and the attitudes of viewers, and Critical Role's popularity and thousands of hours of content, it rivals any television show's amount of content, viewership, and community, allowing it to be analyzed through the lens of cultivation theory. Critical Role has had a profound effect on just about everything in the gaming community, whether analyzing table-top games or video games, and it has paved the way for bigger profits for the company that owns Dungeons & Dragons, Wizards of the Coast. While Critical Role is in no way the biggest channel on YouTube, it is the biggest channel for the Table-Top Role-Playing Game (TTRPG) community. This new media environment needs to be studied regarding cultivation theory, and it simply hasn't been done.

This paper analyzes cultivation theory and, specifically, how it applies to the audience of Critical Role and is divided into several sections. The first section is a literature review on cultivation theory; the second is a literature review on Dungeons & Dragons and Critical Role; the third is a methodology section; the fourth is an analysis section; and the last section is the conclusions I have come through while researching and writing this paper. This analysis aims to clearly review and examine how Critical Role has changed the TTRPG community, impacted its audience, and created a huge, devoted, and lasting fanbase.

However, this analysis is being done by a fan of the show and community. The TTRPG community is fascinating space, and it is one I have belonged to for a long time. There may be a bias present for Critical Role, as I have been a part of the community for quite some time, and the show is something I value and enjoy weekly.

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REVIEW OF LITERATURE ON CULTIVATION THEORY

Cultivation theory was first proposed by George Gerbner in 1975. Gerbner's original theory posits that exposure to television changes and modifies the viewers' perceptions of reality, attitudes, and, in some cases, behaviors. Part of cultivation theory is the idea that violence is one of the "major staples of the TV world" (Griffin, 2016, pp. 363). While theorists have often suggested that the violence seen on television might create violent behavior, Gerbner looked at the feelings and beliefs that the violence and the television world created among viewers and their reactions to those feelings and beliefs (Griffin, 2016).

Gerbner identified three major concepts that define cultivation theory and its impacts on the viewer: institutional process analysis, message system analysis, and cultivation theory. The institutional process analysis, the first prong of cultivation theory, focuses on behind the scenes of media organizations. This is designed to understand the policies and practices of the media organization in both how they are written and how they are conducted. Message system analysis is the second concept Gerbner identified as the messages television shows transmit to its audiences. Message system analysis is a deep dive into the messages that the content of a show or a group of shows portray to its viewers (Griffin, 2016). Within message system analysis, the term used to represent the violence one might witness in a show at any given time is dramatic violence. Dramatic violence is any expression of physical harm or force as part of the plot, and it can include allusions to the physical harm or tension that comes before physical harm (Griffin, 2016).

The third prong of cultivation theory is cultivation analysis, which is research that works with TV viewers who spend more time watching television and the effect of the programming. Cultivation analysis tends to focus on those who are heavy viewers who watch four or more hours of television per day (Griffin, 2016). Those who are heavy television viewers often begin to see the world in the same way that they view the world through television. This attribute of cultivation theory is the accessibility principle, referring to the people making judgment around the world around them through the information they are able to access easily and quickly. For those that watch four or more hours of television per day, the easily accessible information about the world around them is often the same message that the TV portrays. Another factor that affects heavy viewers is

mainstreaming. After hundreds of hours of television viewership, Gerbner proposed that viewers would eventually develop a similar outlook to each other because of the constant exposure to the same repeated images and labels (Griffin, 2016). Cultivation analysis also deals with the principle of resonance. Resonance is when a viewer's personal environment is similar to what they are viewing on the show. This principle states that people who have resonance with the program might be specifically susceptible to the cultivating power of the show (Griffin, 2016). The last side effect that TV viewership might have on its viewers is mean-world syndrome, which is a mistrust of others or a cynical outlook of the world that heavy viewers might suffer from because of the portrayal of the world on a television screen.

This theory was postulated in 1975. With the advancements in technology and in the extraordinary growth of screens everywhere around the world, it would not be a leap to imagine that cultivation theory has changed since its inception. Michael Morgan and James Shanahan (2010) revisited the concept of cultivation theory and the possible growth and flaws with its application to the 21st century. Morgan and Shanahan started by reviewing studies where the television shows had been divided by genre first and then the impact on thoughts and behaviors were surveyed based on the genre and not just on total TV viewership (2010). Fear, specifically the fear of crime, was something that Gerbner dove deeply into when creating cultivation theory. Many of his theories about television focused on one's fear of crime happening to them. Morgan and Shanahan reported that fictional crime shows had less to do with the fear of crime than non-fiction programming. However, cultivation theory also never accounted for the interactivity of television and viewers. With audiences able to take their complaints and thoughts to the internet and share it with an even wider audience, it is no surprise that the theory has continued to adapt to contain more interactive elements of the social internet.

Morgan and Shanahan wrote another article on cultivation in tandem with Nancy Signorielli in 2015. This article focuses more on how cultivation theory is still applicable in the era of new media and new social conditions and developments. The three researchers suggest that television was the precursor to the "feed" that is seen on every social media site now. Television continually pumped a message into every household. Now, social media does the same thing — constantly and consistently pumping unending information and messages. Despite the new influx of a variety of sources to

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view television or similar programming, cultivation theory continues to help define the messages we see. As Morgan, Shanahan, and Signorielli state, “Although the way we now receive our “stories” . . . has changed, along with the way we consume them . . . [the] important aspects of their content arguably have not” (2015, pp. 685). While people can choose more of what they want to watch, the same messages continue to permeate programming more than ever before (Morgan, Shanahan, & Signorielli, 2015).

REVIEW OF LITERATURE ON CRITICAL ROLE

While Dungeons & Dragons has become a more household name over the past four decades, it is important the reader has some knowledge of the workings of this specific TTRPG before the application of cultivation theory can be applied to *Critical Role*. Although *Critical Role* appeals to many that have not played Dungeons & Dragons, many of the principles that play a role in cultivation theory apply to the workings of the game dynamic of Dungeon & Dragons.

Dungeons & Dragons

Dungeons & Dragons has been around for decades, with the first edition released in 1974. As with most TTRPGs, there is a “leader” or “game director” referred to as either the Game Master (GM) or Dungeon Master (DM) for Dungeons & Dragons, typically taking the role of describing the world in detail. The rest of the group is referred to as the “players” who act and role-play as their characters they have designed. The DM will lead the player’s characters through a story, called a campaign, typically a story that has basic modules for its characters. These campaigns are both created by the current owners of Dungeons & Dragons, Wizards of the Coast, or published online either for free or purchase by other DMs who have written them. Many DMs also prefer to create their own stories to lead their friends through a story they have planned.

Critical Role

Critical Role is a YouTube series that has run just past five years and features an eight-person cast who play various characters using the popular TTRPG system of Dungeons & Dragons. Prior to the adaptation to the story for YouTube viewers, the *Critical Role* cast began as friends who would get together around once a month to play the game in Pathfinder, a separate spin-off of the Dungeons & Dragons system. The cast features eight friends,

who are also actors and professional voice-actors: Matthew Mercer, Marisha Ray, Taliesin Jaffe, Travis Willingham, Sam Riegel, Laura Bailey, Liam O'Brien, and Ashley Johnson. They had been playing for three years before getting tapped by Felicia Day, the founder of the gaming channel, *Geek and Sundry*, to bring their game to Twitch, a live-streaming service (Critical Role Wiki, 2021). Before *Critical Role*, TTRPG gameplay on a service like Twitch or YouTube was nearly unheard of. The show began in March of 2015. By the end of 2016, *Critical Role* had taken the gaming world and professional industry by storm (Ehrbar, 2017).

When they moved the game to Twitch on *Geek and Sundry*, the cast decided to move to a more traditional and most updated fifth edition of Dungeons & Dragons instead of using the lesser-known Pathfinder system. Matthew Mercer has been the DM for the past two campaigns. He has led the players and characters through nearly one thousand hours of gameplay between the two campaigns, all of which have been completely planned and written by Mercer (Critical Role Stats, 2021). Through the two campaigns, each of the players, O'Brien, Bailey, Riegel, Jaffe, Willingham, Ray, and Johnson, have played an individual character for that campaign. In 2018, *Critical Role* split from *Geek and Sundry* and created their own company and have continued to make lots of other content, including a talk show about the show, recaps, comic books, and a merchandising partnership with Hot Topic. Near the beginning of 2019, *Critical Role* began a Kickstarter campaign to produce a series of 22-minute cartoons. The 45-day campaign had a \$750,000 goal. They reached \$1 million in under an hour and a total of \$11.3 million raised by the end of the 45-day period, making it one of the top 10 most-funded Kickstarters of all time (Polygon, 2019). Since then, Amazon has piggy-backed onto the design of a *Critical Role* cartoon, and it will be made into a two-season cartoon.

After the hiatus that *Critical Role* took because of COVID-19, its first live-stream back had more than 100,000 viewers within the first 30 minutes of the stream. The average is around 47,000 viewers per stream (*Twitch Tracker*). Their YouTube videos regularly have more than 5 million views. This shift in popularity has brought Dungeons & Dragons to the front page. Its huge success has led to hundreds of news interviews and articles that had never addressed Dungeons & Dragons. In fact, because of *Critical Role* and the rise of Twitch and YouTube, Dungeons & Dragons had to its most profitable year in 2019 (Whitten, 2020). All of this sprang from a small home game

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that even Mercer had predicted would only last six or seven sessions online (Ehrbar, 2017).

METHODS

Finding the minute data on *Critical Role* was easy because of the community that the show has. Many people work on the site *Crit Role Stats*, which has a compilation of audience viewership, total number of hours, total dice rolls, total minutes of combat, and beyond. Beyond this site, *Critical Role* has tried to have an open relationship with its fans from the start and has made it easy for the audience to access. There are also lots of records with *Geek and Sundry* and other sites that have recorded their success and failures.

With more than 900 hours of content, this is not a scene-by-scene analysis. However, with the minutes of combat already calculated, it is relatively easy to look at dramatic violence and other themes that are present throughout the show. All dice rolls are categorized, as are certain spells and total amount of damage done and received. I have taken the numbers and tried to bring them to align with cultivation theory. I have also looked at bigger names in the community and the company for their input on what they have seen surrounding the topics that tend to bounce around the community more frequently. This analysis will allow us to look at the second and third prongs of cultivation theory in relationship to *Critical Role*, with a focus on the message *Critical Role* seems to try and portray and the principles of heavy viewership that the audience absorbs.

ANALYSIS

Several key terms in cultivation theory have been identified already, and they will be discussed in this section, namely message system analysis, dramatic violence, mainstreaming, and resonance. Message system analysis will explore the messages that *Critical Role* works to portray and those that are most prominent. Dramatic violence will be analyzed in how it impacts the audience in this format and how often the characters spend time in life-and-death peril. Mainstreaming will discuss the application of both the message to the community and the overall shift in the audiences' views and behaviors outside of the community as reported in several online spaces, which is prominent because of the typical heavy viewership of the community, creating a ready-made example of what can happen with the

accessibility principle.

Message System Analysis

No matter the movie or television show, sitting with what a show is portraying to its audience and whether that has a positive or negative effect on the community is important. This can be important especially when considering diversity and its portrayal in a show. First, looking specifically at the LGBTQ+ community, *Critical Role* has long had representation from its characters and guests, but not many of the cast openly identify as LGBTQ+. Because of the nontraditional space that *Critical Role* occupies in the Dungeons & Dragons community, representation is necessary for a better community and to continue portraying stories that are relatable, and their audience has been receptive to the roles they have played and the LGBTQ+ representation that has been consistently present. Additionally, their company has tried to be diverse racially, in the LGBTQ+ community, and in the disability community (*Critical Role*, 2021). However, there is still criticism regarding *Critical Role's* lack of diversity. The cast is white and comprised of five men and three women. The show has featured many racially and ethnically diverse guests, but there are no permanent members of the cast who are not white. The story itself has featured characters and NPCs are also varied in race, both in “traditional” human races and in fantasy races, including those that have been considered to be more villainous in previous editions of Dungeons & Dragons, which has its own separate criticisms outside of the show. While many in minority communities find a space in this community, the lack of diversity can become stark when harmful jokes have been made on camera. Apologies for these jokes have been made, and many in the audience do find it to be sincere, it is also a widespread debate when jokes, such as one made referring to a mentally-ill person baking in padded cell, are brought up by the community (*Critical Role*, 2021). These types of problems tend to continue to be an issue because of the longevity of the internet and the tendency to rewatch shows. While people who identify with these communities are often the first to defend them against the criticism, it is frequent and fertile ground for arguments that are always a simple call for diversity kind (Medium, 2019).

Based on the learning that seems to have gone into stopping harmful jokes and to increase diversity among characters, most in the community are very supportive of the message that *Critical Role* has gone great lengths to portray

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in the past five years. Since the beginning of the campaign, more diverse NPCs have been brought on, alongside diverse guest stars. *Critical Role* has also gone to lengths to make sure that their characters are respectful, and the cast consistently takes constructive criticism from the community. This feeds into Gerbner's idea that the message is influenced by the viewer, though *Critical Role's* activity in the community has brought it to a level that traditional television doesn't typically reach. While the cast cannot make themselves more diverse, they have included those who belong to minority groups.

The messages that *Critical Role* tries to portray are ones of love, friendship, loss, and recovery, though the messages that *Critical Role* portray do not shy away from heavy topics and how to overcome the losses that both character and player have experienced. Episodes have focused on developing relationships, and cast members have not been shy about personal losses that they have suffered, including talking about the meaning of the show in the cast's own lives. This included a conversation O'Brien deal with a familial loss and chronic illness or how Mercer crafted a special role for O'Brien's character in their first story because of his personal struggles (*Critical Role*, 2021). The message *Critical Role* seems to want to portray, and that the community supports and communicates their reception of, is overcoming personal hardships and inclusivity. Though not everyone agrees they are the most effective, most agree that the message is there (Medium, 2019). At the end of September 2020, *Critical Role* began their 501(c)(3) foundation, the Critical Role Foundation (CRF). The mission statement of their foundation is to "leave the world better than we found it" (*Critical Role*, 2021). CRF funds different nonprofits after partnering with them. The first nonprofit partnered with CRF is the Native Youth & Culture Fund. The first goal was to raise \$50,000, but within the first 24 hours of releasing the foundation, \$98,000 had been raised (*Critical Role*, 2021).

Dramatic Violence

TTRPGs are filled with villains to destroy and creatures to slay. This doesn't come without its drawbacks for its characters who are often in peril. It is not uncommon for characters to die or to be kidnapped. In *Critical Role*, around 21 percent of the gameplay time is combat time. This doesn't include negotiations or pre-combat time where imminent threat is possible, probable, or about to begin; therefore, more than 21 percent of the time contains some type of dramatic violence (Critical Role Stats,

2021). Assuming a little under half of gameplay is spent with some type of dramatic violence, or double actual combat time, it would be safe to assume that the same principles that Gerbner posited about dramatic violence would be seen in the community through mean-world syndrome and fear of crime in general. However, the community has an overwhelmingly positive view of characters who have caused major problems or even betrayed the main characters (Critical Role Wiki, 2021).

The principle of dramatic violence would also say that people would fear the world around them. Without surveying the community as a whole, it is very difficult to know whether or not the viewership of *Critical Role* correlates with a higher fear of crime. Despite not having that type of data available, it stands to reason that the issues might not arise or be as prominent because of the setting of *Critical Role*. A high fantasy world does not create the same accessibility and application to the world around viewers like a show such as *CSI*, *Hawaii Five-O*, or *Criminal Minds*.

Accessibility and Mainstreaming

While a single episode of *Critical Role* per week does not constitute heavy viewership, the YouTube channel for *Critical Role* reaches hundreds of thousands of views per day. They also produce content twice a week at minimum. The messages and labels that are put out and viewed every day. This brings the community to a more common epicenter that causes a “common perception of reality that resembles the TV World” (Griffin, 2016, pp. 369). Assuming that those with heavy viewership begin to mainstream their own beliefs, over time, the same people will begin to identify as TTRPG players and as nerds because they are watching those who identify as such make that distinction about themselves. This causes world views to shift because of the accessibility principle. When this show is what someone consumes daily, this is what one will expect life to look like, or at least, this is what one will expect their own TTRPG experience to look like.

This brings us to what is called the “Matt Mercer Effect” or “Mercer Effect” that has caused many problems in the TTRPG world, and not just in the Dungeons & Dragons community. The Mercer Effect details the often unrealistic expectations of new Dungeons & Dragons players who are under the perception that their new games will be similar to the games seen on *Critical Role* (Girdwood, 2019). The Mercer Effect also affects long-standing

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DMs and even players who have a lot of experience. This is one example of mainstreaming that happens within the audience. The line becomes blurred for heavy viewers who believe that a group who has never played a TTRPG before can simply hop into a game and what they have come to believe in their world outlook is the “perfect” game. Those who are experiencing Dungeons & Dragons for the first time have no other perception of what a campaign or session will look like, and DMs are held to a huge standard that the show has created by being. Older players become disillusioned with how they’ve been playing for years. This problem has cropped up in other systems with GMs for other TTRPG players. Simply put, Matt Mercer has become the face of what a good DM is that those who watch *Critical Role* sometimes have a very hard time dissociating from that ideal (Girdwood, 2019). It has become such a big issue in the community that Mercer has commented several times that he is not the only ideal. The community as a whole has pushed to move away from labeling it the Mercer Effect because, while *Critical Role* is the most watched TTRPG game, it is not the only show that has created unrealistic standards.

Resonance

Resonance is a very common principle as it describes the way that people live their lives being similar to the life they see on television (Griffin, 2016). In *Critical Role’s* case, the idea applies a little differently. People don’t see themselves in the high fantasy role that the characters are being portrayed in, but they do see themselves in the cast who are gathered around a table to a play a game that many people grew up playing. Some of these issues may even arise the identification so many people find in the cast. Most people don’t stumble onto *Critical Role* because they hate the idea of role-playing, and the show instead draws in those who identify similarly with the cast’s own identification of being a “nerd.” Often, people go out of their way to look for a way into the TTRPG community, and they find it in *Critical Role*. Most people who are watching the “nerdy voice actors” are watching because they also identify as nerds (*Critical Role*, 2021). Additionally, Gerbner (1975) stated that resonance makes people twice as susceptible to the cultivation that comes with viewership. Most who are watching are watching the show because they do resonate with the cast or the characters. This resonance also brings to light why so many devote hours a week to the show and to the stories they have found in them. Because many identify deeply with the cast and their stories, *Critical Role* has built a large and lasting

audience that has not faded despite the time investment that it takes to get into the show.

This is why the Mercer effect is doubly bad in the community. Those in the community are already so susceptible to the attitude and possible behavior changes because they are already resonating with the ideas they will see on the screen. When they see Mercer as an expert DM, they expect their own games to be like *Critical Role* because they relate to it, and they are likely heavy viewers. This also impacts why the criticism for *Critical Role* is often so fierce.

CONCLUSION

As a whole, YouTube and the TTRPG community need to be more studied instead of left in the figurative basement. People are making entire careers out of communities that most people have not heard of or have any idea how they work. Instead of studying them, many of them are just being labeled as a phenomenon when they are changing the entire face of communication and television. Entire untapped audiences have sprung up around *Critical Role* and its role in the TTRPG community. The show's unique message, although sometimes debated, has been widely received as positive, as the cast consistently provides messaging and backs up their idea that they want to leave the world better than they found it. Though, these understandings of how *Critical Role* impacts the TTRPG community are not all a perfect science. Because of the length and amount of content produced per week, most active viewers are considered heavy viewers, which means that the cultivation principles go even further here than they do with most audiences. *Critical Role* has become the gold standard for what a TTRPG should look like, and it can have negative impacts on the community, including by overapplying what is readily accessible to the show's audiences through the mainstreaming and accessibility principles. However, many people find a resonance with the community and show that they don't find in typical television viewership. They find people who identify as they do and are willing to represent them in many ways that traditional television does not. It only begins to describe why *Critical Role* means so much to so many people and why so many people dedicate hours a week to it. As Morgan, Shanahan, and Signorielli state, "Although the way we now receive our "stories" . . . has changed, along with the way we consume them . . . [the] important aspects of their content arguably have not" (2015, pp. 685).

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Inflammation and Inflammatory Markers in the Lungs of Chronically-Vaped Mice

Katlyn Langston & Alyson Stanger

Mentor: Matthew Nicholaou

Department: Medical Laboratory Science

ABSTRACT

The CDC has tracked 2,807 cases of vaping-related illness in 48 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands. There have been 68 deaths in 29 states (Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products, 2020). Individuals who use vaping substances have been found to have Vaping-Associated Lung Disease, which is inflammation of the lung tissue. This study determines whether the lung tissue from chronically-vaped mice shows pathologies associated with histological abnormalities and characterizes the cytokine immune profile of the vaped mouse lungs. Mice were sacrificed at the end of a 28-day vaping cycle and the respiratory tract was extracted during necropsy. Left lungs were used for homogenization and cytokine testing. Right lungs were used to create histology slides for staining procedures. Inflammation was found within the lungs of the vaped mice that were exposed to nicotine as was shown in pathological structures in the lung-tissue slides, as well as shown by the cytokine panel.

INTRODUCTION

Vaping usage has been on a steady incline since the introduction of electronic cigarettes in 2003. E-cigarettes work by heating a liquid to produce an aerosol that users inhale. This liquid can transport several different compounds such as: nicotine, tetrahydrocannabinol, flavorings, and other additives. Out of 2,022 hospitalized patients admitted for vaping related lung injury, 57% of patients reported using nicotine-containing products. (Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products, 2020). Individuals who use vaping products have shown several pulmonary reactions such as: chemical irritation, allergic/immune reactions, shortness of breath and/or chest pain. Thus leading to the hypothesis that the usage of vaping devices with or without nicotine causes inflammation of the lungs due to the irritation of the substances within the vaping fluid.

Cytokines that were analyzed for this study were interleukins -1 β , -2, -4, -5, -6, -10, -12 [p70], IFN γ , GM-CSF, and TNF α . Interleukin-1 β , -6, -12 and TNF α are specific markers for inflammation. Each cytokine plays a specific role in the immune system that will be tested for to determine if there is an

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imbalance after vaping, both with nicotine, and with vaping fluid without nicotine.

Hematoxylin and eosin (H&E) stain was used for this study. H&E stain is used for medical diagnosis of standard biopsies that are suspected histological damage. Hematoxylin stains the cell nuclei blue and eosin stains the extracellular matrix and cytoplasm pink. This stain was used to visualize any physical signs of inflammation including lipid-laden macrophages, lipoid pneumonia, and lymphocytes. Using the H&E stain can show the physical aspects of suspected inflammation within the lungs of vaped mice.

METHODS

Lung Processing

For this study 24 C57BL/6 six-week old female mice were used; the mice were divided evenly into 3 groups: one group received 30mg of nicotine a day, the second received vaping fluid with no nicotine, and the third was not exposed to vaping fluid. At the end of a 28-day vaping cycle, mice were sacrificed by cervical dislocation. Respiratory tissue was obtained during necropsy. The right lung tissue was immediately placed on dry ice after dissection and then stored at -80 degrees Celsius to preserve tissue for homogenization and cytokine analysis. The left lung, still attached to the mouse, was fixed with 10% formalin by inserting a needle through the trachea and filling the lung with fluid. It was then clamped off, removed from body cavity, and placed in a tube filled with 10% formalin to be fixed overnight (Mouse Lung Fixation, 2012). Due to time constraints, during necropsy, the lungs were not filled with continuous pressure per the Mouse Lung Fixation procedure, and were instead filled by inserting a syringe into the trachea where formalin was slowly injected into the lung until it expanded fully. (see figure 1.1 & 1.2)

Cytokines

Right lung tissue was homogenized through the T-PER Tissue Protein Extraction Reagent Procedure, and the supernatant was separated for processing (2017). Cytokines that were analyzed for this study (interleukins -1 β , -2, -4, -5, -6, -10, -12 [p70], IFN γ , GM-CSF, and TNF α) are specific markers for inflammation. A specific ProcartaPlex Multiplex Immunoassay cytokine panel was run over the course of two days. On day 1, the cytokine panel reagents were prepared for mixing via ThermoFisher scientific procartaPlex multiplex immunoassays user guide. A standard serial dilution

was prepared at this time to run as a control for the panel, along with several blank wells. Magnetic beads were added to the wells of the plate. Supernatant was placed into each well. Because the supernatant did not come from a cell culture, Thermo Fisher recommended that the panel be run as if it were plasma. It was incubated for 24 hours while agitated on a standard agitator. On day 2, detection antibody and streptavidinPE were added, alternating between several wash steps that were performed per the Thermo Fisher Scientific procartaplex multiplex immunoassay user guide. After the cells were resuspended, the panel was read on the Magpix system (Procartaplex Immunoassays, n.d.).

Histology Staining

Hematoxylin and eosin (H&E). The H&E stain is used for medical diagnosis for standard biopsies of suspected histological damage. Hematoxylin stains the cell nuclei blue and eosin stains the extracellular matrix and cytoplasm pink. This stain was used to visualize any physical signs of inflammation including lipid-laden macrophages, lipoid pneumonia, and lymphocytes. H&E stains were performed on the right lungs to mark the histological aspects of the tissue. H&E lungs that were processed in 10% formalin were paraffinized, cut, and placed on glass slides at Utah State University. Slides were then sent to Weber State for staining. Deparaffinization of the slides was done by 2 sets (5 minutes each) of Safe Clear Xylene substitute then 2 sets (3 minutes each) of 100% ethanol. Slides were then stained with Vector Laboratories H&E stain per their procedure (Hematoxylin and Eosin Stain Kit, n.d.). Slides were then analyzed by a pathologist for pathological identification.

Statistical Analysis

Statistical analysis was done by performing an ANOVA test on each cytokine to compare the averages of all 3 groups. Results are shown for each cytokine on Figure 2.1.

RESULTS

Cytokine Testing

With an alpha level of 0.05, none of the cytokines showed clinical significance after an ANOVA test was performed. However, IL-6 and IL-5 showed the most significance of the cytokines overall with a p-value of 0.17

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and 0.24 respectively. Though none of the cytokines between the groups were clinically significant, overall, the vaping with nicotine group seemed to suppress cytokine expression across the board. (Figure 2.1)

Histology Staining

Chronic vaping, both with and without nicotine was associated with a greater extent of lung damage, chronic inflammation, and hyaline membrane formation. (Figure 2.2-2.3)

DISCUSSION

H&E stains showed that the 30mg of nicotine a day and vaping fluid with no nicotine groups showed nonspecific pathologies including chronic inflammation, hyaline membranes, diffuse alveolar damage, and fibrinous exudates. However, the control mice showed overall healthy lung tissue. This supports the hypothesis of the link between vaping and inflammation of the lungs and further research should be performed to determine what specific component is linked to the inflammation.

The cytokine panel supports this hypothesis. With an alpha level of 0.05, Interleukin-6 (IL-1 β) had a p-value of 0.17, and interleukin 5 had a p-value of 0.24. Neither were enough to reject the null hypothesis that this situation increases the inflammatory state, however there is more work that can be done in this area with potentially larger groups and the addition of Vitamin E acetate.

Of the cytokines that were the most significant, IL-6 and IL-5, the nicotine group had lower levels of both. IL-6 is a cytokine that stimulates acute-phase protein production and is released from macrophages (Jain et al., 2011). This could potentially mean that the macrophages are dysfunctional if they are secreting lower amounts of IL-6 than the control mice. According to Gibeon et al., macrophages found in sputum with no eosinophilia seem to have impaired efferocytosis, which is the term describing phagocytosis of debris by macrophages (2013).

IL-5 serves to promote growth and differentiation in B-cells and eosinophils. It is secreted by T-cells. Low levels of eosinophils and T-cells are seen in heart failure and coronary death, which could be related considering the effects that have been seen from Vaping-Related Lung Disease. (Shah et al., 2016). The lack of eosinophilia is related to the reduced interleukin 5.

Overall, this study was meant to determine if there is inflammation linked to vaping, whether that be vaping fluid and nicotine, or just the vaping fluid itself. This was shown by the H&E slides to be found in both the nicotine group, and the vaping vehicle group. The cause of such inflammation is generally still unknown and should still be expanded upon in further research.

LIMITATIONS

- Two mice in the control group showed mild chronic inflammation with no known correlation.
- After starting this project new research came out correlating Vitamin E as being the most likely cause of inflammation and correlated Vitamin E to severe lung disease (Blount, 2020). Vitamin E acetate was not included in the vaping fluid used in this project.
- There were only 6 mice used per group which limits the data produced. Some of the results from the Magpix panel for specific cytokines had very limited data available due to some samples giving the results “not available” or “not a number,” which excluded them from being included in statistical analysis.

FUTURE TESTING

Future testing experiments on this subject should first, include larger groups for more accurate statistical data. This will also help to buffer any erroneous results gathered from the cytokine panel.

New research has correlated Vitamin E acetate to severe lung disease. This is a new development that was not included in this project and should be further expanded upon (Blount 2020). Including Vitamin E acetate in the vaping fluid given to the mice could increase the likelihood of increased cytokines and could also be a cause of inflammation related to vaping. Further study is needed in this area

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APPENDIX

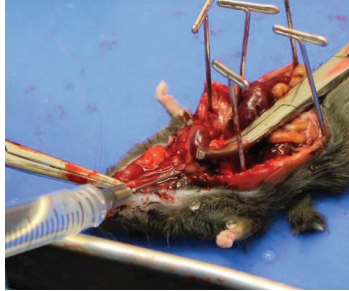


Figure 1.1: Mouse dissection at necropsy showing the insertion of the needle through the trachea to inject and fill the left lung with formalin.

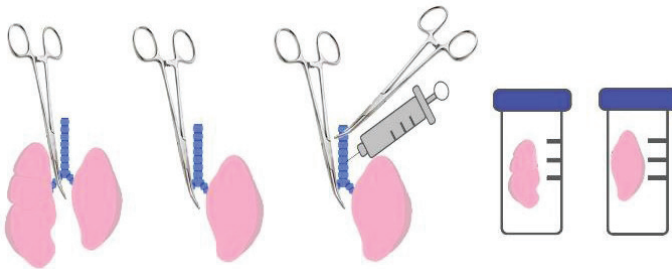


Figure 1.2: Process of lung tissue separation and preservation for further testing.

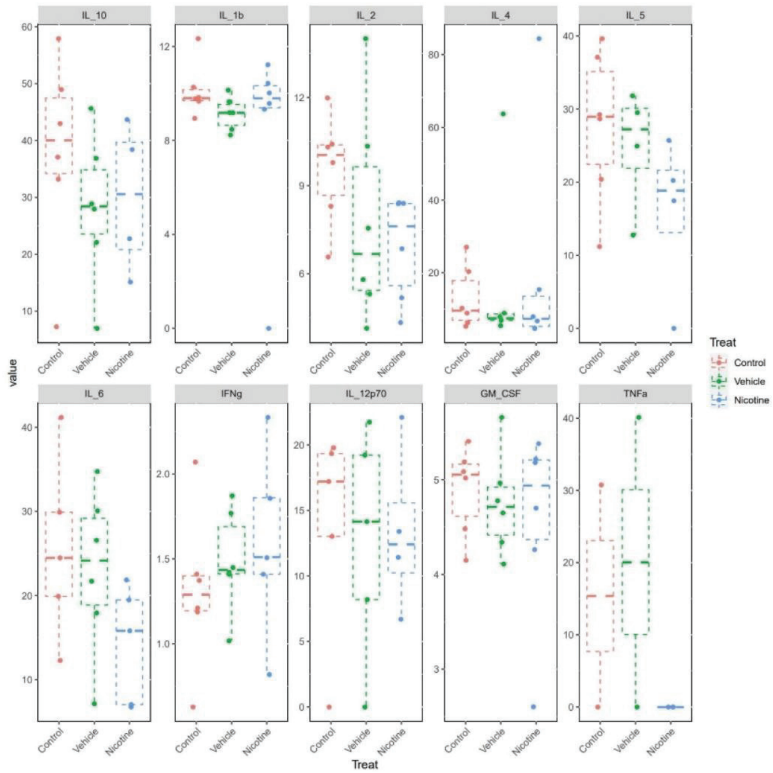


Figure 2.1: interleukins: Average concentration of for each mouse group. Orange: Nicotine, Yellow: Vape, Green: control. values are median +/- 1 standard deviation. Following a 28- day vaping cycle

IL-2 promotes the growth of regulatory T-cells (Pouliot et al., 2005).

IL-1 β is a proinflammatory cytokine that represents inflammation.

IL-6 stimulates acute-phase protein production (Jain et al., 2011).

IL-5 promotes growth and differentiation in B-cells and eosinophils (Gibeon et al., 2013).

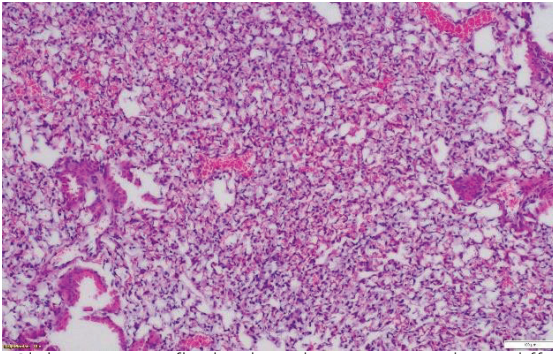


Figure 2.2: Slide 12 vaping fluid only with no nicotine: shows diffuse alveolar damage, hyaline membranes, and signs of chronic inflammation.

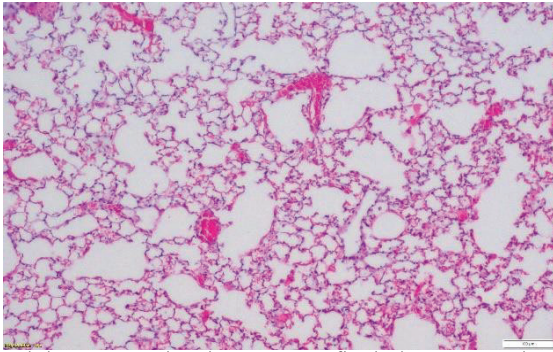


Figure 2.3: Slide 22 control with no vaping fluid: shows normal architecture with the occasional neutrophil..

Polyagglutination: Lectin Isolation for T-Activated Red Cells

Jesus Rebolledo, Alexander Fishburn & Arren Hill

Mentor: Justin Rhees

Department: Medical Laboratory Science

ABSTRACT

Polyagglutination (PA) is a rare condition that can occur during microbial infections where enzymes capable of modifying carbohydrates on the erythrocyte membrane are produced. These enzymes expose cryptantigens that react with naturally stimulated antibodies found in nearly all adult sera, except autologous sera (Klein et al., 2014; Beck, 2000). Certain lectins can agglutinate red blood cells (RBC) carrying these cryptantigens. The agglutination patterns of test RBCs in lectin panels can provide presumptive evidence to identify major forms of PA. Lectin testing kit manufacturers within the United States have discontinued their production. However, immunohematology reference labs (IRL) must continue offering PA testing under current AABB *IRL Standards* (AABB press, 2020).

Consequently, IRLs must adopt unapproved storage methods for expired lectin kits or create lectin reagents in-house. Quality control (QC) RBCs evaluating lectin reagents' performance are often from PA patients and are difficult to obtain. This study describes a method to produce a lectin reagent and QC RBCs in-house to efficiently and cost-effectively identify the T-activated form of PA. The quality control testing was successful because a 4+ (on a scale of 0 to 4+) hemagglutination reaction was seen in the positive QC and a non-hemagglutination reaction was seen in the negative QC for three consecutive months.

Additionally, we report the results of a national survey disseminated to evaluate the current status of lectin testing procedures in IRLs. The survey responses indicate that there is a need for a standardized and consistent method to test for PA.

INTRODUCTION

Although all forms of PA are relatively rare, the most common forms are due to exposure of the following cryptantigens via the action of bacterial enzymes: T, Tk, Th, and Tx (Klein et al., 2014; Beck, 2000). Rarer forms of PA (e.g., NOR, HEMPAS) are due to the inheritance of rare alleles that result in the formation of abnormal antigenic determinants that react with nearly all human sera (Klein et al., 2014). Most adult sera contain naturally occurring antibodies produced after exposure to common environmental substances. IgM antibodies are the primary isotype to cause agglutination by

binding to the cryptantigens, leading to in vivo RBC agglutination that can occlude blood vessels and lead to severe complications throughout the body (Horn, 1999).

Activation of the T-antigen was first observed when RBC suspensions were left at room temperature (RT) for several hours and then agglutinated when mixed with ABO compatible serum. It was hypothesized that enzyme-producing bacteria were responsible for this unexpected hemagglutination. (Hübener, 1925; Thomsen, 1927; Friedenreich, 1930). It is now known that several organisms, including pneumococci, streptococci, staphylococci, clostridia, *Escherichia coli*, *Vibrio cholera*, and the influenza virus, are capable of activating or exposing the T-antigen and thus rendering the RBCs polyagglutinable (Klein et al., 2014).

In vivo activation of the T-antigen is usually a transient condition, which resolves within weeks to months once the infection has cleared (Klein et al., 2014). Although the serum from nearly all adults contains anti-T antibodies capable of agglutinating RBCs with activated T-antigens, a lectin derived from the common peanut, *Arachis hypogaea*, is far more sensitive at detecting T-activated RBCs than the antibodies present in adult sera (Seeger et al., 1980).

MATERIALS AND METHODS

Lectin reagent from raw *Arachis hypogaea* seeds was prepared according to Judd's method (Judd et al., 2008). To create the QC RBCs, type O-negative whole blood was collected and treated with neuraminidase, an enzyme produced by *Streptococcus pneumoniae* known to expose the T-antigen. Once confirmation of the viability of the lectin and T-activated RBCs was obtained, the lectin and RBCs were stored for four months between 1-8°C and tested monthly to evaluate their long-term viability.

Enzyme Collection

S. pneumoniae was streaked onto a sheep blood agar (SBA) plate and incubated at 37°C in a 3-5% CO₂ incubator for 24 hours. Optochin susceptibility and catalase tests were performed to confirm the identity of the species. A glucose solution was prepared by mixing 0.5 g of dextrose with deionized water in a 100 mL volumetric flask. Four to five colonies were placed into six tubes, each with 25 mL of liquid containing 20 mL of TSB and five mL of a 0.5% glucose solution. The broth was incubated for 32

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24 hours to allow the *S. pneumoniae* to grow and produce neuraminidase. The broth was centrifuged at 1,400 rpm for five minutes. The supernatant was removed and filtered through a 0.45-micron filter.

Blood Preparation

Blood was collected into ethylenediaminetetraacetic acid (EDTA) tubes through venipuncture. The blood was washed three times to remove the EDTA. The RBCs were confirmed to be O-negative via the slide typing method. To activate the T-antigen to be used as QC cells for testing the lectin, Judd's method was followed (Judd et al., 2008). A volume of six mL of whole blood was mixed with the neuraminidase containing solution in a 1:1 ratio in a test tube and incubated at 37°C for 24 hours.

Lectin Preparation

Raw *A. hypogaea* seeds were weighed, and 1.0250 g were placed into 7.50 mL of phosphate-buffered saline (PBS) and soaked in the solution for 24 hours. The seeds were then ground into a paste using a mortar and pestle, including the 7.5 mL of PBS used for soaking the seeds. The test tubes were then filled with approximately one-third of the seed sediment and one-third of the PBS liquid. The tubes were centrifuged at 1,400 rpm for five minutes, and the supernatant was removed and placed into a sterile container. A 0.1% solution of sodium azide was added in a 1:1 ratio with the lectin to prevent microbial growth.

Testing of the T-activated Cells

After successful T-antigen activation, the blood was transferred to a 12 x 75 borosilicate tube, washed three times in normal saline, and made into a 3-5% cell suspension. The T-activated RBCs were used as the positive QC cells, and untreated type O reagent RBCs were used as the negative QC cells. Two drops of lectin were added to two labeled test tubes. One drop of positive QC cells was added to one tube, and one drop of negative QC cells was added to the other. Both tubes were incubated at RT for five minutes and centrifuged at 3,500 rpm for 15 seconds. The strength of the hemagglutination reaction was recorded. After successful positive and negative reactions were observed, the T-activated blood was separated into six equal aliquots. Alsever's solution was added in a 1:1 ratio and was stored in the refrigerator at 1-8°C.

Monthly Testing of the Lectin and QC Cells

The lectin and QC cells were tested at each four-week interval. To perform monthly testing on the positive QC cells, an RBC aliquot was washed three times in normal saline to remove the Alsever's solution and made into a 3-5% cell suspension. Untreated, type O reagent RBCs were used as the negative control. One drop of each of the positive and negative RBC suspensions were added to two drops of lectin into two appropriately labeled test tubes. The tubes were incubated for five minutes at RT, centrifuged at 3,500 rpm for 15 seconds, and the hemagglutination strength was recorded.

Survey Distribution

A survey was prepared and sent via e-mail to 75 immunohematology laboratories in North America. The survey's questions assessed current practices and procedures for PA testing. The survey link was accessed by 15 individuals, 13 of which responded. Of those 13 respondents, five did not perform PA testing. Of those five respondents, three had previously tested for PA but have since discontinued testing.

RESULTS

The T-activated cells used for positive QC produced strong hemagglutination reactions (4+, on a scale of 0 to 4+), and the negative QC cells demonstrated no agglutination for three months (Table 1). In the beginning of the fourth month of testing, the T-activated cells were hemolyzed, and a 3-5% cell suspension could not be created for testing.

The survey responses (Figure 1) indicated the majority of respondents must depend on non-FDA approved methods for PA testing. Of the three laboratories that used to perform PA testing, two have discontinued due to lack of kit availability (Figure 2).

DISCUSSION

The purpose of this study was to assess current practices regarding PA testing and to evaluate the need for lectins and QC cells to perform this testing. We determined that this method for *A. hypogaea* lectin extraction and T-activation of RBCs used for positive QC can be easily made in-house using reagents and supplies found in most clinical laboratories, and the QC cells can be used for up to three months if stored correctly.

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The survey responses indicate current testing methods for PA are not standardized. Our survey shows the majority of IRLs are using expired reagents to perform PA testing.

The stability of T-activated RBCs can be variable, depending upon the strength of the neuraminidase enzyme produced by *S. pneumoniae* strains, as well as the particular RBCs used for T-activation. Further studies should evaluate T-activated RBCs' stability to determine if the modification of various other carbohydrate antigens found on the RBC membrane decreases its overall stability and how this affects shelf life.

Judd's method requires a one-hour incubation of RBCs for the neuraminidase enzyme to activate the T-antigen (Judd et al., 2008). However, when we tested the cells at the one-hour interval, no agglutination was observed. After failed attempts with a one, two, and three-hour incubation, we successfully developed T-activated cells with a 24-hour incubation period. In further studies, the cells could be tested hourly during incubation at 37°C to determine the point at which T-activation can be reliably achieved.

Certain steps in Judd's method were adjusted in order to achieve our results. For instance, Judd's method does not specify the centrifugation time or rpm requirement stated when preparing the lectin reagent (Judd et al., 2008). Judd's method specifies a one-hour incubation time; we found this was insufficient to expose the T-antigen in order to produce positive hemagglutination reactions with the lectin. Our method requires incubation of the RBCs in the neuraminidase solution at 37°C for 24 hours. Lastly, there was no specified RT incubation time when performing the monthly lectin testing. Thus, IRLs can use our version of Judd's method to produce lectin reagents and QC RBCs in-house.

CONCLUSION

Our survey data illustrate the need for a reliable method to test for PA since the IRLs that continue to perform PA testing use expired reagents. Our results demonstrate that this method can be used to test for the T-activated form of PA, using equipment, supplies, and reagents found in most clinical laboratories. In this method, a potent lectin can be extracted, and positive QC cells can be produced and stored between 1-8°C for up to three months.

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Table 1. Monthly Hemagglutination Reactions for Positive and Negative Quality Control Cells.

	Month 1	Month 2	Month 3	Month 4
Positive Control	4+	4+	4+	NP*
Negative Control	0	0	0	0
*T-Activated positive QC cells were hemolyzed during the fourth month of testing, so a 3-5% cell suspension could not be made.				

NP= Not Performed

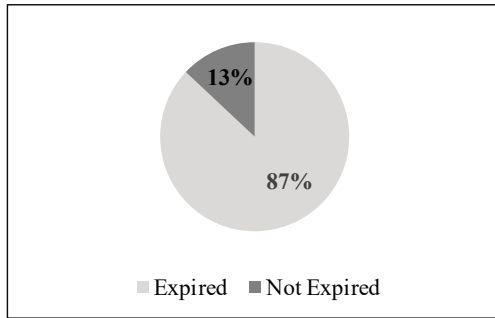


Figure 1. Percentages of IRLs using expired reagents to test for PA (n=8).

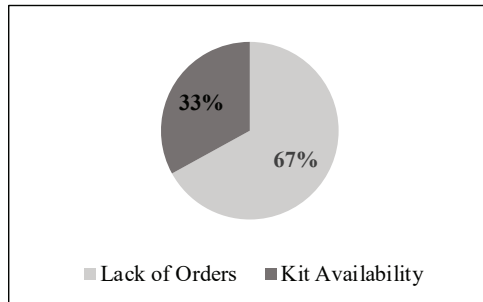


Figure 2. Percentages of IRLs that have ceased PA testing and reasons why (n=3).

Characterizing the Intestinal Microbiome of Fibromyalgia Patients

Bryant Stewart, Bradly Boman & Joshua Slagowski

Mentor: Kendal Beazer

Department: Medical Laboratory Science

ABSTRACT

Fibromyalgia (FM) is a painful and debilitating condition that affects an estimated 2 to 4% of American adults. It is characterized by diffuse bilateral chronic pain, fatigue, sleep disturbances, and impaired cognitive function. Interactions between the hypothalamic-pituitary-adrenal axis, communities of intestinal flora, and the central nervous system have been investigated as potential contributing factors to a variety of pathologies, including autoimmune, rheumatological, and psychiatric diseases. A recent investigation of the intestinal microbiomes of female FM patients and controls found characteristic alterations in intestinal flora at the genus and species levels. This study characterized the gut microbiomes at the genus level of nine FM patients, along with ten control-group individuals. Prepared stool samples were analyzed by sequencing the 16S rRNA genes of bacteria present using the MinION portable nanopore sequencer. Although there were no significant differences between the FM and control groups in the diversity of their intestinal microbiomes as measured by Shannon diversity scores (Mann-Whitney $U = 38$, $p = 0.596$), the control group's microbiota included three additional genera at an abundance greater than 1%.

INTRODUCTION

Fibromyalgia is a chronic syndrome of widespread body aches, fatigue, bilateral tender points, sleep disturbances, and cognitive dysfunction that negatively affects the quality of life of 2% to 4% of adults (Minerbi et al., 2019). Its causes are complex and not well-understood. A recent review of fibromyalgia research suggests various possibilities, including depletion of chemical messengers in the central nervous system, endocrine dysfunction, and increased oxidative stress (Singh et al., 2018). Among these depleted chemical messengers are the neurotransmitters serotonin, dopamine, and norepinephrine. Low levels of tryptophan and serotonin metabolites in the central nervous system are thought to be responsible for many of the symptoms of fibromyalgia. Individuals with a family predisposition and certain genetic mutations are at greater risk of developing this syndrome.

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Emerging interest in the bacterial communities living on and within the human body has opened new directions for understanding many pathological conditions, such as inflammatory diseases and mental health problems. These communities interact with the brain along a pathway dubbed the “gut-microbiota-brain axis” (Maqsood, R., & Stone, T. W., 2016), exerting significant influence on mental and physical processes. The National Institute of Health Integrative Human Microbiome Project recently characterized bacterial communities living in several body sites, including the gut, finding that a disruption of normal microbiomes was present in Irritable Bowel Disease patients, including Crohn’s Disease and Ulcerative Colitis (Proctor et al., 2019).

The possibility of a similar dysbiosis in fibromyalgia was explored by Minerbi et al. (2019). They studied the intestinal microbiomes of seventy-seven female fibromyalgia patients as well as seventy-nine control participants. They found significant alterations in microbiome composition between the fibromyalgia and control groups, including an absence of five beneficial bacterial species (such as *Faecalibacterium prausnitzii*), and the presence of thirteen species found only in the fibromyalgia patients (e.g. *Parabacteriodes merdae*). One of the limitations of the Minerbi study was the focus on Caucasian female patients. The present study investigated the intestinal bacteria of a group of nine FM patients and ten control patients by sequencing the 16S rRNA of bacteria within their stool samples. It was hypothesized that microbiome diversity and differential abundances of bacterial genera would be significantly different between the groups.

Although the composition of intestinal bacterial microbiomes can be sampled by sequencing the whole genomes of bacteria found in stool samples, this is costly and time-consuming. By targeting the gene for 16S rRNA (for which bacterial genera and species have unique DNA), this process can be accomplished more economically than by examining whole genomes. Additionally, multiple samples can be pooled and sequenced simultaneously in real-time by attaching unique “barcodes” to the primers used to amplify each sample’s DNA in a process called “multiplexing”. The pooled samples in this study were sequenced using a small device called the MinION, which was developed by Oxford Nanopore Technologies to make such sequencing available at a lower cost to small laboratories.

METHODOLOGY

Recruitment and Specimen Collection

Nine FM patients were recruited from various sources: flyers were displayed at clinics specializing in pain management, social media outreach was done by sharing posts to a Fibromyalgia support group and the Medical Laboratory Sciences department Facebook page, and participants were also recruited by word-of-mouth. In order for an individual with FM to participate in the study, they were required to have been diagnosed by a licensed physician. Ten additional control participants were recruited to match experimental demographics of gender and age. Exclusion criteria for both groups included the presence of infection or use of antibiotics within the last two months. Recruitment kits were assembled containing an informed consent form and questionnaire, a Parapak stool sample collection tube, a disposable commode to facilitate sample collection, and contact information for members of the research team. Participants filled out the forms and collected the sample at home. Once the samples were received by one of the researchers, they were stored at -80 C until preparation for analysis at the Weber State University Medical Laboratory Sciences department.

DNA Extraction and Library Preparation

Bacterial DNA was extracted from the samples using specialized spin column tubes and reagents from the Qiagen PowerFecal Pro kit, which removed substances and enzymes that could inhibit the barcoding and amplification process. Once the DNA was extracted and purified, it was processed for analysis using Oxford Nanoporetech's 16S Barcoding Kit. Sample DNA, along with nuclease-free water, was prepared and placed in PCR tubes along with Taq 2X Master Mix. Nucleotide barcodes were added to each patient sample. The DNA was amplified in a twenty-five-cycle process of denaturation at 90 C, annealing at 55 C, extension at 65 C, and finally held at 4 C. The samples were then transferred to 1.5 mL DNA LoBind Eppendorf tubes and purified using AMPure XP beads on a magnetic rack. 10 µL of the eluate was then preserved in LoBind tubes. 2 µL of each sample were analyzed on an Epoch 2 microplate spectrophotometer to establish purity and concentration. The barcoded samples were then pooled to a total concentration of 50 - 100 fmoles along

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with 1 μL of Oxford's Rapid Sequencing Adapter as per the manufacturer's protocol.

MinION Analysis

After library preparation, the pooled samples were subsequently analyzed on the MinION device. A specialized flow-cell was primed using a flush buffer, while the pooled sample library was mixed with a sequencing buffer, loading beads, and nuclease-free water in preparation for analysis. After pipetting 200 μL of the priming mix into the flow cell, 75 μL of sample was then injected. The sample was drawn through the MinION's nanopores and the base-pair sequence of each barcoded 16S rRNA gene was determined and identified in real-time using Oxford's Guppy algorithms. The resulting data was uploaded into the EPI2ME cloud-based bioinformatics tool where the number of reads of each bacterial genus was broken down for each sample. A resulting taxonomic tree of each participant's intestinal bacterial microbiome was visualized, along with the reads and taxonomic trees of the FM group and control group.

Data was further analyzed through the creation of a density plot (Figure 2), stacked bar graphs (Figure 3), and heat map (Figure 4) by utilizing the statistical package, ggplot2, through Rstudio software. The density plot was used to compare Shannon Diversity scores, a parameter that expresses ecological diversity by considering relative abundance and evenness within an ecosystem. In this study, relative abundance was understood to be the proportion of sequence reads of a specific genus within a particular group compared to the total sequence reads within that group expressed as a decimal between 0 and 1. Ecological evenness was understood to be a measure of how close in number the sequence reads within each genus were within a particular group. The Shannon Diversity Score increases with an increase in ecological diversity and was interpreted as an index of the likelihood sequence reads from different genera would be selected from the sequence pool of a particular group if they were selected at random multiple times.

RESULTS

Nineteen people participated in the study, with nine fibromyalgia patients and ten control individuals. Eight participants were male and eleven were female; the fibromyalgia group included three males and six females, while

the control group consisted of five males and five females. The average age of the participants was approximately 39 years old; in the fibromyalgia group it was 43, and in the control group it was 37. The pooled sample library resulted in 99,710 sequence reads with an average accuracy of 88%.

A comparison of the taxonomic trees of the two groups (Figures 1a. and 1b.) highlights three genera present in the control group that are not present at over a 1% relative abundance in the fibromyalgia group: *Oscillibacter*, *Clostridium*, and *Romboutsia*. This finding suggests a more diverse gut microbiome in the control group than the Fibromyalgia group.

A comparison of Shannon Diversity Scores (Figure 2) of the groups using the Mann-Whitney U Test found no significant difference between the fibromyalgia group and the control group ($U = 38$, $p = 0.596$). Though no statistically significant difference between the two groups was found, Figures 3 and 4 make some of the differences more easily visible, allowing the generation of future research questions.

DISCUSSION

This study compared the relative abundance of intestinal microbiota of FM patients compared to healthy controls at the genus level. Though no statistically significant difference was observed between the diversity of the intestinal microbiota seen in the FM and control groups, three additional genera, *Ocillibacter*, *Clostridium*, and *Romboutsia spp.* were detected in the control group that were not detected in the FM group above a 1% relative abundance. Additionally, this study prompts questions as to factors that may influence the intestinal abundance of *Blautia spp.*, as broader differences in the abundance of this genera among individual participants, independent of FM or control status, are noted in Figure 4 compared to other genera mentioned in this study.

The major limits of this study included difficulty in recruitment and limited funding, resulting in a limited number of participants. Further, the participant pool only consisted of Caucasians, as was the case with the Minerbi (2019) study. Considering the difficulty of recruiting the necessary number of participants, as well as the technological barriers present, future studies should secure additional funding in order to incentivize participants and ensure access to more sensitive testing methods. The relative paucity of

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male participants in FM studies must also be overcome, and representation of a more racially and ethnically diverse sample should be met.

The impact of diet on the microbiome of FM patients, including the use of probiotics and long-term broad-spectrum antibiotic use, should also be investigated. The 2019 Minerbi study used detailed measures to track the diet of participants, and a similar method should be employed in future studies. Additionally, the impact of medications such as psychotropics, which have been implicated in the alteration of the microbiome, should also be considered (Bretler, T. et al., 2019). With acknowledgement of the importance of ongoing research into better understanding and treating this problematic condition, further efforts will continue to be necessary.

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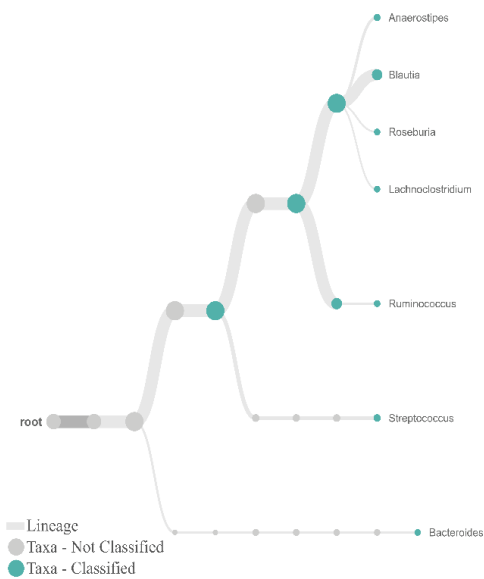


Figure 1a. Taxonomic Trees of the Control and FM Group - Fibromyalgia Group

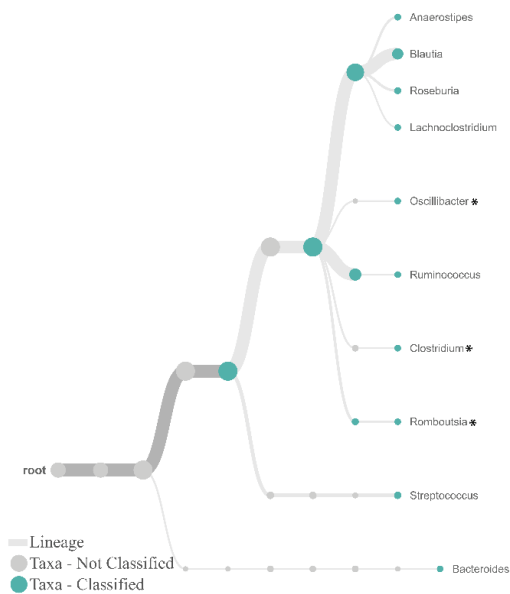


Figure 1b. Taxonomic Trees of the Control and FM Group - Control Group

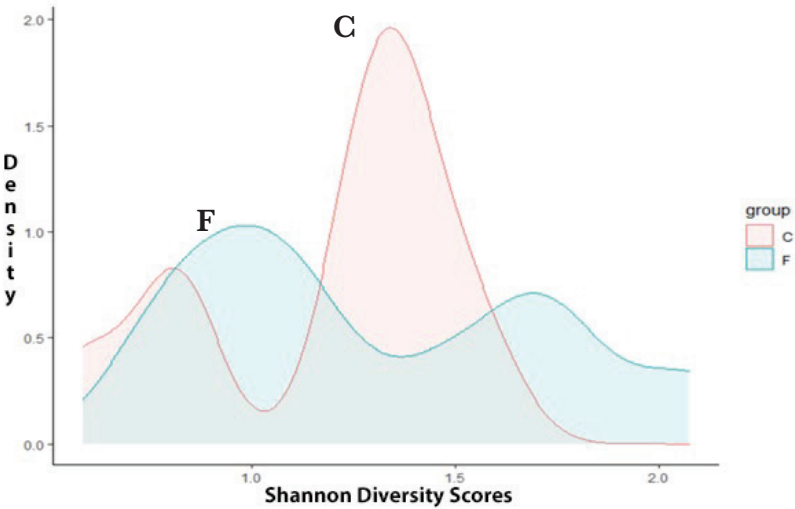


Figure 2. Density Plot of Shannon Diversity Scores for Fibromyalgia Group and Control Group. NOTE: F- Fibromyalgia group, C-Control group

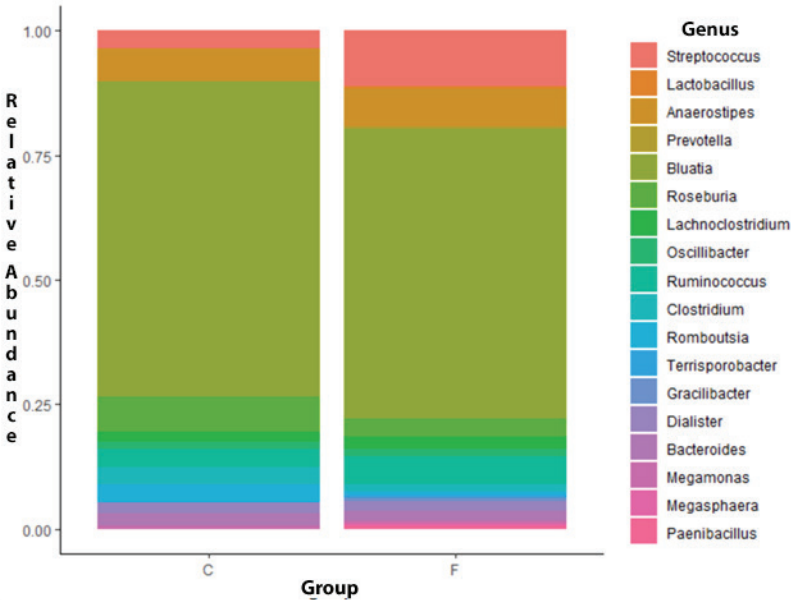


Figure 3. Stacked Bar Graph of Bacterial Relative Abundance by Group. NOTE: The genus of bacteria, listed from top to bottom, correspond with the vertical axis of the bar graph for both the control and FM group.

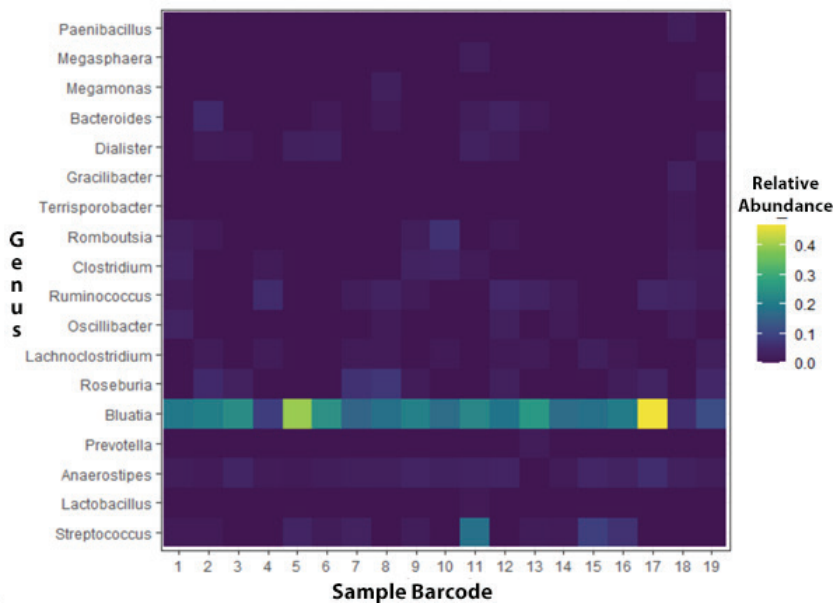


Figure 4. Heat map of relative abundance data. Note: Barcodes 1-10 represent the control group, 11-19 represent the Fibromyalgia group. A lighter gradient represents higher relative abundance of that genus.

Effectiveness of eccentric exercise in anterior cruciate ligament (ACL-R) reconstruction in rehabilitation protocols: A Literature Review.

Lucas Venegas

Mentor: Matthew Donahue
Department: Athletic Training

ABSTRACT

Injuries to the structures of the knee complex can be classified as one of the most common impairments within the musculoskeletal system. As a part of this complex, the anterior cruciate ligament (ACL) is an essential structure that provides stability and is fundamental in restraining translational forces. However, this ligament is commonly susceptible to being injured leading to functional alterations that can cause atrophy and chronic weakness in other knee muscles, such as the quadriceps. To minimize these possible consequences eccentric exercise, although controversial, has been implemented as a part of a rehabilitation protocol. Recent research suggests that eccentric exercise has been beneficial in increasing muscle volume and muscular strength, compared to other regimens of strengthening in post ACL reconstruction. (ACL-R).

INTRODUCTION

The ACL is one of the soft tissues with the greatest capacity to provide stability at the knee joint. Its primary function is to provide stability against anterior translational forces on the tibia as well as to provide restraint to internal and external rotation, and hyperextension of the knee.^{1,2}

Common ACL injury mechanisms as related causes include valgus/external rotation, hyperextension, internal rotation, direct medial valgus load, and hyperflexion (rare) of the knee.³ Injuries to the ACL, and its adjacent structures, are common and significant knee injuries, potentially resulting in limitations in muscular strength and muscular atrophy.⁴

Post ACL-R, an adequate development and implementation of a rehabilitation protocol is fundamental in the person's ability to return to daily, functional activities and to previous levels of athletic performance. Therefore, the effectiveness and success of a rehabilitation protocol lies in an optimal ACL rehabilitation framework, supported mainly by having into consideration the stages of soft tissue healing, coupled with the successive development of the appropriate physical qualities necessary to prevent loss of muscle mass, as well as the significant loss of muscle strength.

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Traditionally, the application of strengthening strategies through resistance exercise involves different types of muscle actions such as: concentric resistance exercise and eccentric exercise. Concentric resistance exercise - where the muscle is shortened, and an external force is less than that produced by the muscle. This type of muscular action has been crucial to reduce quadriceps atrophy, weakness, and to restore muscle strength. Eccentric exercise is used alternatively - whereby the muscle is lengthened, and an external force exceeds that produced by the muscle.⁵ Every resistance exercise involves the use of concentric and eccentric phases. However, eccentric exercise has been traditionally not indicated, as there is potential for injury to the ACL graft, articular cartilage, or surrounding soft-tissue structures.⁶ However, recent research has shown that eccentric exercise is more effective than the traditional concentric exercise at minimizing muscle atrophy, improving muscle force production, muscle volume^{7,8} and strength in ACL reconstructed subjects.^{8,9} Therefore, the aim of this literature review is to provide current clinical research evidence on the effectiveness and benefits of eccentric training in post ACL- reconstruction.

METHODOLOGY

Literature search

A comprehensive English language literature search was performed in June 2020 using MEDLINE/PubMed, Cochrane Collaboration Database, Scopus, ScienceDirect, and Google Scholar. The keywords used in this search include eccentric contractions, eccentric exercise, ACL, rehabilitation protocol, and strength training.

Study selection

Selection criteria: language of publication (English), type of study (level I to level IV, *Oxford Centre for Evidence-Based Guidelines*), year of publication (from January 1, 2005, up to July 31, 2020), the title of study, treatment methods involving eccentric exercise - alone or in combination with other therapies. Relevant studies were selected after reading the abstract, results, discussion, and conclusions.

REVIEW

Eccentric training in muscle strength, muscle volume, and performance in ACL-R individuals:

Literature before 2005 has created a negative association in implementing eccentric exercise as a part of a standardized rehabilitation protocol. Previous research suggested that evidence regarding muscle damage is routinely reported to a greater extent when eccentric contractions are completed.^{10, 11} However, in recent years, new scientific evidence has emerged in relation to the effectiveness and benefits of eccentric exercise in diverse conditions such as rehabilitation, specifically in ACL-R.

To illustrate the effectiveness of eccentric exercise in rehabilitation, updated scientific literature has been reviewed out to evaluate the effects of eccentric isokinetic training on the sagittal and coronal knee movements during gait.

¹² In this paper, Coury et al. (2006) assessed, 5 subjects, 9 months after ACL-R of the right knee (involved knee) and left knee (uninvolved knee) were recruited to be part of the study as well as 10 healthy male controls (normal). Knee torque and movements, differences between pre- and post-training values, for both the involved and uninvolved knees were assessed in this study. A primary result in this study suggested that isokinetic eccentric exercise increased quadriceps torque by 25% in ACL-R patients after the eccentric intervention in the involved limb, and a corresponding increase of 7% for the uninvolved limb which was not significant. The difference in extensor torque, between the involved and the uninvolved limbs decreased from 36% pre-training to 24% post-training. There were differences regarding knee flexion/extension during gait in the involved limb before training, such as considerable improvement in walking more uniformly and increased similarity to control group. Finally, this study concludes that eccentric exercise is important to the strengthening of the quadriceps muscle after ACL-R, to prevent loss of strength that could alter functionality and performance in the involved limb.

However, the greatest limitation of this study is the sample size; only 5 individuals were part of the study risking the efficacy of the intervention.

It is considered that studies involving smaller sample sizes rather than the ideal numbers, increase the margin of error and decrease the statistical power, putting in doubt the effectiveness and efficacy of a therapy. Thus, the importance of the study size itself. Based on the previous limitations, a randomized clinical trial (RCT) was conducted to evaluate the short-term safety and efficacy of adding a progressive eccentric exercise program via eccentric ergometry early after ACL-R.⁸ Thirty-two participants were selected to be part of this study. Subjects were randomly assigned into

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either a 12-week traditional (TRAD) or eccentric muscle contraction program (ECC). The results in this study supported the hypothesis that adding a 12-week focused on ECC resistance training program 3 weeks after ACL-R, would be equally safe, and more efficacious than current TRAD rehabilitation. Results also evidenced that the ECC group showed a significant improvement after 2 weeks of ECC ergometry, values of eccentric work output increased almost 3 times at the end of the program. Quadriceps strength of the knee injured increased significantly after 26-week ACL-R in the ECC group. No significant changes in strength in the TRAD therapy group were reported. Performance results showed a significant increase in the ECC therapy group in the hopping distance test 26 weeks after surgery. In relation to muscle atrophy, the magnitude of quadriceps atrophy of the involved thigh approached 25% to 30% in just 3 weeks in the eccentric group. No significant changes in atrophy were reported in the TRAD group after 12 weeks. Notwithstanding, the main limitation of this study is not to determine the effectiveness and long-term safety of eccentric training after ACL-R in the two most common types of grafts used (hamstring or bone-patellar tendon-bone autograft) including the long-term effects of eccentric exercise in ACL-R individuals.

Responding to the lack of sizeable observations on the long-term safety of eccentric exercise in the two most common grafts on previous studies, Gerber et al. (2007)¹³ performed a study evaluating the efficacy of eccentric exercise in variables such as strength and muscle volume in ACL-R individuals. In this latter study, the purpose was to investigate and evaluate the effects of progressive eccentric exercise on thigh muscles in individuals with ACL-R. The working hypothesis of the study is that, when compared with standard rehabilitation, eccentric exercise resistance training results in greater quadriceps muscle and gluteus maximus volume and peak cross-sectional area in the affected leg. A second hypothesis would suggest that no differences in muscle volume and peak cross-sectional area are significant in gracilis and hamstring muscles between rehabilitation groups and anticipates greater improvements in muscle volume and peak cross-sectional in the uninvolved limb. A total of 40 patients with ACL-R were selected and randomly assigned to a program of 12-weeks of eccentric weeks or standard rehabilitation protocol. The final samples were two groups of 20 participants each. The results in this study support the hypotheses addressed in the present paper. The quadriceps and gluteus muscle volume and peak cross-sectional area showed a significant increase of more than

double in the eccentric training group, compared to participants in the standard rehabilitation group. In the second hypothesis, results supported the prediction that there would be no difference in the improvement in the hamstring or gracilis volume in the involved thigh between rehabilitation groups. On the other hand, these results are evidence that the volume and peak cross-sectional area in the quadriceps and gracilis muscles in the uninvolved limb increase in both groups. These structural changes were greater in the eccentric exercise group. Finally, the limitation of the study can be attributed to the short-term benefits of eccentric training, as it remains unknown if such benefits as muscle volume, strength, and performance can be observed in the long-term.

Based on results and limitations of previous research studies, Gerber et al., (2009)⁹ conducted a RCT where the effects of early progressive eccentric exercise on muscle volume, and function at 1 year after ACL-R. The authors hypothesized that, compared with standard rehabilitation, an eccentric rehabilitation program would result in greater improvements in quadriceps femoris and gluteus maximus muscle volume in the injured leg, when assessed 1 year after injury. Participants were divided in two groups, eccentric exercise, and standard rehabilitation. In this study, results suggested that including progressive eccentric exercise, implemented 3 weeks after ACL-R, resulted in muscle and strength gains in key muscles group 1-year after surgery. Quadriceps and gluteus maximus showed an increase of 50% in muscle volume, greater in the eccentric group compared to the standard group. In relation to functional assessment, this study provides evidence supporting an increase in quadriceps muscle strength and hopping distance in the eccentric therapy group. Based on previous findings, it is suggested that individuals who were part of the eccentric exercise group achieved quadriceps femoris muscle volume of 23% whereas the standard rehabilitation group reported an increase of 9%.⁸ The findings in this study are relevant and highlight the importance of implementing eccentric exercise resistance training during the early stages of rehabilitation after ACL-R. The implementation of these exercises is crucial to maintain chronic morphological and physiological adaptations.

In another study by Brasileiro et al. (2011)⁷ the purpose was to investigate the contributions of functional and morphological factors in the recovery of the quadriceps muscle after ACL-R. The hypothesis is that the use of eccentric training would improve neural activity and force production. In

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this investigation, 9 sedentary ACL- R men were recruited. Subjects were between 9 to 10 months post-reconstruction, and all were part of the same rehabilitation protocol, which began immediately after surgery. The training protocol was maximal eccentric exercise, with an isokinetic dynamometer, twice a day, for 12 weeks. Changes and improvements in neural activation were recorded using electromyography (EMG). The primary results in this study supported the hypothesis mentioned above. Quadriceps peak torque improved significantly while using eccentric exercise especially in the 6th and 12th week of the intervention. There was also an improvement in quadriceps peak torque observed in the eccentric evaluation, compared to isometric contraction after the intervention. This study suggested that the application of eccentric training can generate neural and morphological changes that contribute to improving knee extensor torque at the early stages of a rehabilitation protocol. Finally, the authors concluded that when applying a rehabilitation protocol, the maturity of the graft, and secondary effects such as swelling, pain, and joint effusion should be taken into consideration.

Giving continuity to the effectiveness of eccentric exercise researchers worldwide have investigated the effectiveness of concentric and eccentric exercise in ACL-R subjects on muscle strength, as well as variables such as joint range of motion (ROM) and pain.¹⁴ The latter variables had not been included in previous studies. In this study, 24 subjects were selected 4 weeks after ACL-R, and were randomly distributed to one of two groups, the concentric group, or the eccentric group. Results in this study concluded that concentric and eccentric exercise groups increased quadriceps strength and hamstring strength. However, eccentric exercise showed a greater increase in strength in both muscles. In relation to ROM, both groups reported significant increases during extension and flexion of the knee. Finally, while assessing pain in this study, there was not a decrease or increase in pain reported for the eccentric group, but a significant decrease in pain for the concentric group. Pain remained relatively steady throughout the intervention for both groups in the study.

CONCLUSION

The present scientific review of the literature allows the authors to establish a consensus regarding the effectiveness and benefits of eccentric exercise in rehabilitation settings, and specifically in musculoskeletal injuries with high incidence in the population, such as rupture of the ACL. Despite its controversial application, eccentric exercise has been suggested to be more

effective in generating long-term adaptations in quadriceps muscle strength and muscle volume, compared to concentric training. However, further research is necessary to consolidate not only the effects and benefits of this intervention but also to consolidate its importance in the athletic training practice.

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Travel Abstracts



Volume 15

Rainbow versus Cutthroat Trout effects on Predatory Invertebrate Assemblages

Amber Bell

Mentor: Christopher Hoagstrom | Department: Zoology
Desert Fishes Council 2019 | Alpine, Texas

ABSTRACT

Input and output subsidies link aquatic and terrestrial ecosystems. Non-native trout occur at higher densities in streams where they replace native trout and can disrupt key ecosystem functions that cross ecosystem boundaries, such as aquatic-insect emergence. The increased biomass and behavioral differences of non-native trout can influence other aquatic predators such as predatory stoneflies (Perlidae) and water striders (Gerridae), as well as riparian predators such as spiders (Tetragnathidae). Our study sites were in six streams along the northern Wasatch Front, Utah. We hypothesized three streams with non-native rainbow trout would have fewer aquatic and riparian predators than three others with native Bonneville cutthroat trout. We found mean rainbow trout biomass (598.96 ± 277.2 SE mm/m²) was higher than cutthroat trout biomass (202.09 ± 87.5 SE mm/m²). Water strider densities were higher in cutthroat streams than in rainbow streams (1.07 ± 1.02 SE m³, 0.18 ± 0.13 SE m³, respectively), as were perlid stonefly densities (0.25 ± 0.14 SE m³, 0.12 ± 0.05 SE m³, respectively). In contrast, tetragnathid spider horizontal-web density was lower in cutthroat streams than in rainbow streams (1.53 ± 1.20 SE m³, 3.07 ± 1.30 SE m³, respectively). Differences in habitat could account for some of our findings. Rainbow streams were wider with higher aerial-wood and submerged-wood biomass. Aerial wood could provide web-building sites for tetragnathid spiders and submerged wood could elevate in-stream productivity. On the other hand, cutthroat streams were deeper and had larger substrates, possibly better habitat for perlid stoneflies. In any case, evidence suggests non-native rainbow trout do interact differently with other predators compared to native Bonneville cutthroat trout.

TRAVEL ABSTRACTS

Bay Area Women's Theatre Festival's "Amplify! 24-hour Performance Marathon"

Cassidy Biehn

Mentor: Karen Moloney | Department: English

Bay Area Women's Theatre Festival 2020 | San Francisco, California

ABSTRACT

AMPLIFY is a 24-hour marathon performance theatre festival held in San Francisco that represents the unique voices of women playwrights and celebrates diversity in theatre. I was selected to perform in a staged reading of Dr. Karen. M. Moloney's play, WATERMARKED. Participating in this festival will provide an invaluable opportunity to grow my writing and performing career as a creative writing student and aspiring librarian. It will allow me to form professional connections with other writers in my field and experience new voices in the theatre world. I would like the opportunity to attend this festival and represent the Weber State University English and Creative Writing Department.

Weight

Zac Bliss

Mentor: Erik Stern | Department: Performing Arts
American College Dance Association 2020 | Gonzaga University,
Washington

ABSTRACT

“Weight”, choreographed by Zac Bliss in collaboration with student dancers, is a movement study investigating how the body can extend past its kinesphere, and how costume choices influence this extension. The dancers met with the choreographer for bi-weekly rehearsals, and were guided by Zac in how their exploration of different movement qualities, such as weight, suspension, focus, and extension. Colorful, long shawls, designed by dance costume designer Diane Neri, served to embellish movement. Movement research led to the development of choreography that highlights the shawls, and suggests varied mental states. Throughout this process Zac and the dancers have begun to learn the process of being adaptable to each choreographic investigation and problems. Continued research and questions are needed to explore the full potential of the work.

TRAVEL ABSTRACTS

Interharmony International Music Festival

Vanessa Bott

Mentor: Shi-Hwa Wang | Department: Performing Arts
Interharmony International Music Festival 2020 | Sulzbach-Rosenberg,
Germany

ABSTRACT

I am attending the Inter-Harmony International Music Festival to further my education as a String Performance major and as a group performer. I am going to teach music and perform with other musicians throughout my music career and attending this festival will boost my experience and educational knowledge and skill tremendously. The music festival provides Master Classes (which are where teachers give constructive criticism on your performances), discussions, private lessons, new music reading sessions, and more. I will attend these while I'm there. I will also have the opportunity to connect with skilled string musicians and teachers from around the world. After attending the festival, I will have made connections and gained teaching and performing skills that will help me in my career as a string teacher and performer now and in the future.

Scenic Design: WSU's The House of Edgar Allan Poe

Alina Cannon

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
KCACTF 2019 Conference | Los Angeles, California

ABSTRACT

The Weber State University theatre department presented the world premiere of *The House of Edgar Allan Poe*, a new musical by Morgan Hollingsworth. In the show, Edgar is visited by his childhood sweetheart Sarah Shelton, and together they reflect on his life. As they go through these moments of his life, the lines between his life and his stories become blurred, leaving Poe unable to discern between fact and fiction. For this production, I worked as the Scenic Designer, creating my first realized design. This summer I was able to visit the cottage where Poe lived in the last few years of his life, and using this primary research gathered from the cottage, and art elements such as texture, line, and shape, my design helped to create the world of the play.

TRAVEL ABSTRACTS

Kennedy Center American College Theatre Festival

Christian Clarke

Mentor: Andrew Lewis | Department: Performing Arts, Theatre
Off Broadway Experience 2019 | New York, New York

ABSTRACT

The annual Irene Ryan competition is held at the Kennedy Center American College Theatre Festival, which brings together college theatre students and educators from different parts of the country to collaborate, share work with others, participate in workshops, and compete for scholarships. I was nominated to compete in the Irene Ryan competition for my role as Edgar Allan Poe in Weber State's production of *The House of Edgar Allan Poe*. Being able to compete in the Irene Ryan competition and participate in the rest of the festival would be an enriching experience where I could learn from accomplished theatre professionals in workshops, experience the art of other theatre students, further my craft, and work with other students who share my interests. I would like the opportunity to participate in this performance opportunity, experience the festival, and represent the Weber State University performing arts department.

How the Russo-Japanese War Affected U.S Naval and Marine Corps Policy, Strategy, and Tactics 1904-24

Houston Crudele

Mentor: Brandon Little | Department: History

Society for Military History 87th Annual Meeting 2020 | Arlington, Virginia

ABSTRACT

Scholars have mostly overlooked the effect of the Russo-Japanese War on the United States, however it was pivotal to U.S. Naval and Marine Corps policy, strategy, and tactics. The Russo-Japanese War was the first instance where the U.S. Navy and Marine Corps paid attention to Japan because Japan's naval and amphibious forces had defeated a major western power. After 1904 the United States Navy had to consider Japan a viable threat to her interests. The U.S. Navy's war planning activities in relation to Japan have attracted considerable attention by historians. Scholars have published elaborate studies about the development of War Plan Orange detailing how the United States might fight Japan and on the Great White Fleet, wherein President Theodore Roosevelt dispatched the Navy on a global cruise to demonstrate to Japan the United States' peaceful intentions and U.S. capacities for defense. Scholars have not acknowledged that Japan's conduct in war with Russia awakened the U.S. Navy to the urgent threat its armed forces posed to American national security in the Pacific. I have researched the archives at the Naval War College in Newport, Rhode Island. Those materials I investigated include: papers from the General Board, lectures by senior officers, and student papers by junior officers. The personnel at the college influenced policy and strategy in the decades preceding WWII. My research into the pivotal but misunderstood role of the Russo-Japanese War will become the basis of my oral presentation.

TRAVEL ABSTRACTS

Symbolic Warfare and Justice: Disrupting Dominant Discourses about Schizophrenia

Aubrielle Degn

Mentor: Bobbi Van Gilder | Department: Communication
Western States Communication Association Undergraduate Scholars
Conference 2020 | Denver, Colorado

ABSTRACT

This paper utilizes an autoethnographic method to critique and disrupt dominant discourses surrounding schizophrenia. Specifically, I share and analyze my own experience as someone who has been labeled “schizophrenic” to deconstruct cultural myths about what psychosis is, and to critique the misinformation psychiatry has sustained through its practices. The purpose of this autoethnography is threefold: (1) To designate schizophrenia and all forms of psychosis as a deeply emotional, transitional phase. It is a critical opportunity for growth which has strong cultural, spiritual, religious, medical, and existential meanings and implications. (2) To discredit the usefulness of traditional psychiatric paradigms for caring for individuals undergoing psychosis. (3) And to advocate for intensive therapy in care for individuals undergoing psychosis.

Whiteness, Marginalization, and Exclusion

Kailee Edwards

Mentor: Bobbi Van Gilder | Department: Communication
International Communication Association Annual Convention 2020 | Gold
Coast, Australia

ABSTRACT

According to Teranishi et al. (2010), Tongan students are among the least likely to earn a bachelor's degree of all major ethnic groups in the United States. And, given the documented effects associated with low educational attainment, it is essential that researchers focus their attention on the cultural and ethnic groups that are most academically disadvantaged. As such, this study aimed to uncover how communication hinders Tongan students' success in higher education. In-depth interviews were conducted with 30 Tongan students who had either (a) graduated from college or (b) began college but did not complete their degrees. Findings revealed that, in regard to higher education, normative Whiteness is communicatively constructed and maintained via programmatic, structural, and interpersonal communication. The discourse of normative Whiteness, and the exclusionary communicative practices that reinforce this discourse, foster a sense of un-belonging for Tongan students in institutions of higher education, which hinders their academic success.

TRAVEL ABSTRACTS

CEC SELS

Shana Fannin

Mentor: Shirley Dawson | Department: Teacher Education
CEC Legislative Session | Washington D.C.

ABSTRACT

The role of federal appropriations for education research is to “sustain programs of research, statistics, and evaluation to study and provide solutions to the challenges faced by schools, teachers, and learners” (Budget Summary- U.S. Department of Education, 2018, pg 40). Without sustained support for education research such programs are at risk for funding cuts. Effective advocacy approaches include meeting with congressional decision-makers to tell personal stories of the impact of appropriations. This project seeks to ensure future investment in education research by advocating for continued and sustained federal funding for education research. Using narrative qualitative research methods a case study of one university’s student involvement in a funded research project to tell her story to US policy makers is explored to determine if university students can influence appropriations through targeted advocacy. The goal of the project is to impact efforts to produce and support education research opportunities for university and school students.

Investigating the Inhibition of APEH in Disease

Shelby Geilmann

Mentor: Tracy Covey | Department: Chemistry and Biochemistry
American Chemical Society Midwestern Regional Meeting 2019 | Wichita,
Kansas

ABSTRACT

Acyl Peptide Enzyme Hydrolase (APEH) is an exo-peptidase involved in the catabolism of N-acetylated proteins and peptides. Additional functions of APEH include degrading damaged proteins and resisting oxidative stress. Previous studies have demonstrated that in the presence of diseases such as Type II diabetes and Alzheimer's, there is a reduction in the activity of APEH. The enzyme expression in these diseases is not significantly decreased, suggesting the presence of post-translational modifications or inhibitory regulators that decrease enzyme activity. We hypothesized that inflammatory mediators, which are high in disease states, downregulate APEH activity. Using online prediction programs and molecular modeling, we proposed a reactive cysteine near the active site that may be susceptible to chemical modification. Using cell lysates and purified protein, we have confirmed several inflammatory mediators that inhibit APEH activity. We are using molecular docking programs to predict the binding sites of these inhibitors and the involvement of the predicted cysteine residue. This work is important as it illustrates a mechanism of APEH downregulation in disease states.

TRAVEL ABSTRACTS

Costume Design for WSU's Production of Sense and Sensibility

Caitlynn Gramer

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Orlando,
Florida

ABSTRACT

As costume designer for Weber State Department of Performing Art's production of *Sense and Sensibility* adapted by Kate Hammil (2016) and directed by Jenny Kokai, I worked closely with a faculty production team and staffed costume studio to design a production which worked to build a connection between our modern audiences and the 18th-century characters of the play. For costumes specifically, I wanted to approach the production in a way that could connect the young heroines of the Jane Austin novel to young women of today, while building a visually interesting and energetic production that could match the energy of the script. The opportunity for me as a student designer to work on such a high level of production taught me vast amounts of the process of taking a show from a concept to a realized design on a near-professional level. This production created unique demands leading me to explore the challenges such as; of a small cast of actors rapidly changing to fulfil a large number of characters or building gowns and tailcoats that still allowed the actors to fulfil the physically dynamic choreography, or how the ultimate question of how to change the 18th-century fashions tell the stories that modern people can relate to. To meet these challenges I collaborated with the directors, choreographers, and the rest of the design team to create a cohesive concept that solved all of these problems and allowed for fast, funny, and flashy storytelling. The costumes in this production used design elements like line, texture, and colour in a way that referenced the 18th century and made it accessible to modern audiences so that each costume displayed things like class, social status, and age for the many characters that each actor would play.

Self

Jonathan Guerra

Mentor: Erik Stern | Department: Performing arts
American College Dance Association 2020 | Gonzaga University,
Washington

ABSTRACT

Jonathan Guerra's Choreography Practicum (DANC 3520) creative project, titled "Self" explores the interactions between a central dancer's thoughts of past struggle, present self, and future help. The documentary "Fallen After Newton" (1987) that was assigned as part of Improvisation (DANC 2410) led to working on Contact Improvisation creative methods and kinesthetic techniques. Tactics such as trust, sharing centers of gravity, flow of contact point, breath, and eye contact were supported by *Sharing the Dance: Contact Improvisation and American Culture* by Cynthia Novak. The author states, "[t]hus improvisation allowed for highly individualized dancing, and at the same time that dancers became more individualized, they participated in a collective experience" (Pg. 36). Self focused on choreography as a guided collective endeavor, where each dancer has the opportunity to work hand in hand with Jonathan Guerra on the creative process. The piece resolves as everyone leaves except the central dancer, who experiences the resonance of the interactions with other bodies.

TRAVEL ABSTRACTS

Stonefly Assemblages vs Trout in Low-Order Creeks Along the Northern Wasatch Front

Blake Hansen

Mentor: Christopher Hoagstrom | Department: Zoology
Desert Fishes Council 2019 | Alpine, Texas

ABSTRACT

A previous study in Northern Utah suggested there is competition between large predatory Perlid stoneflies and trout. We examined stonefly abundance in two small Wasatch Front creeks, expecting fewer perlids to co-occur with trout. Each creek system had a trout (lower Strong's Creek and Steed Creek) and troutless (upper Strong's Creek and Davis Creek) reach. We sampled 24 pools with trout and 27 troutless pools. We electrofished each pool to confirm the presence or absence of trout and mini-Surber sampled for two common families of stoneflies: Chloroperlidae (Sweltsa) and Perlidae (Hesperolperla, Ectopecten, Neoperla). Mean number of Perlidae per pool was lower in reaches with trout than without (Strong's Creek: 0.46 ± 0.22 SE with trout, 1.80 ± 0.51 SE troutless; Davis-Steed Creek: 0.00 ± 0.00 SE with trout versus 2.75 ± 1.12 SE troutless). This fit our prediction. The opposite trend was seen with the Chloroperlidae mean numbers (Strong's Creek: 0.85 ± 0.42 with trout versus 0.30 ± 0.15 SE troutless; Davis-Steed Creek: 6.08 ± 2.04 SE with trout versus 2.94 ± 0.77 SE troutless), but their abundance difference was not statistically significant. Competition or predation by trout may limit perlid abundance, whereas chloroperlids might not compete with or be preferred food for trout because they are much smaller than perlids.

Costume Design for Weber State's Production of The House of Edgar Allan Poe

Monica Hansen

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

As the Costume Designer for the world premier production of Morgan Hollingsworth's musical, *The House of Edgar Allan Poe*, I sought to tell the story of the grief and loss that inspired Poe's writings and poetry through the color, texture, line, and details of the show's costumes. By rooting the designs in the shapes, lines, and proportions of the historical setting of the early Victorian era of the 1840s, the costumes clearly established the time and setting of the play, drawing the audience into the historical context of the story. The colors of each character's costume were used to illustrate their familial, social, and emotional relationships to Poe as the main character, also expressing the attributes of each character. The fabrics chosen included taffetas, velvets, sateens, and canvas, creating a variety of visual textures that enhanced the characters dreamlike quality and place in Poe's fuzzy memories of the people in his past. The evolution of the three main characters of the play was expressed in evolving costumes which included Poe's mental devolution, Virginia's descent into illness, and Sarah's transformation into the symbolic Raven from Poe's stories. In addition, the dye and painting techniques applied to the costumes mirrored the way in which Poe's madness seeped into each of his memories of the people who shaped him into the mad creative genius he was. In employing these techniques, I used the costumes to express the individual identities of each character while also enhancing the cohesive themes that wove through the entire production and story line.

TRAVEL ABSTRACTS

Kennedy Center American College Theater Festival

Jaycee Harris

Mentor: Andrew Lewis | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

The Kennedy Center American College Theater Festival is an annual festival that brings together Performing Arts students and faculty from all over the country to see one another's work and share ideas. This year, I have been nominated to compete in the Irene Ryan Scholarship Competition for my performance as Mrs. Jennings in Weber State University's production of *Sense & Sensibility*. This is an incredible opportunity for me to work with staff and educators I wouldn't normally get to work with as well as gain performance experience. With this festival, I am interested to see how preparation for a performance in this setting differs from a performance or audition here at Weber State; when I'll be performing for an entirely new set of people that don't know my skill set and don't see me perform everyday in classes. I would like to be able to attend the festival to expand my knowledge and experience and represent Weber State University's Performing Arts Department.

Water Chemistry Changes in a Mixing Zone of Bear River Bay

Lilian Hart

Mentor: Marek Matyjasik | Department: Earth & Environmental Science
American Geophysical Union: Fall Meeting 2019 | San Francisco, California

ABSTRACT

This study examined the diel nutrient levels in the mixing zone between the predominantly fresh water of Bear River Bay and the saline water of Great Salt Lake. The impetus for this research is a scarcity of data reflecting the seasonal and diel changes of complex water mixing systems in the Great Salt Lake. Monthly measurements of specific conductance, pH, mercury, and nutrient concentrations in the study area have historically ranged from 1000 to more than 200,000 uS/cm, pH 6.9 to 9.4, 3 to 40 ng mercury per liter, and between >1 mg/L to above 20 mg/L of nutrients (such as nitrogen). Similar studies in the wetlands located along the southern coastline of Great Salt Lake indicated significant diel fluctuations in Se and As concentrations. The need to collect additional baseline data is particularly pressing at this time, as the Bear River is being assessed for a dam project that would likely change flow dynamics. Our study utilized a microwave digester to prepare samples and ICP-MS to analyze samples. The field parameters were measured using a Troll 9500 probe.

TRAVEL ABSTRACTS

Irene Ryan Nomination for ‘The House of Edgar Allan Poe’

Eliza Haynie

Mentor: Andrew Lewis | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

The Kennedy Center American College Theatre Festival is where the annual Irene Ryan competition is held. I was nominated for the Irene Ryan competition for my work as Sarah Shelton in the world premiere of ‘The House of Edgar Allan Poe’. I would like to attend this festival to compete in the Irene Ryan competition for a chance at scholarships, and to learn and grow as a performer and artist. This gives me an opportunity to learn from educators and other artists that I would normally never get the chance to work with, work with fellow peers, and further my craft. I would like the opportunity to take workshop classes and perform to expand my knowledge, and to represent Weber State University’s performing arts department.

Medical Therapy and Clinical Outcomes in Ulcerative Colitis Patients

Zachary Herbert

Mentor: Barbara Trask | Department: Microbiology
Western Medical Research Conference 2020 | Carmel, California

ABSTRACT

Ulcerative colitis (UC) is an idiopathic inflammatory bowel disease characterized by inflammation of the colon and rectum with periods of exacerbation and remission. The exact etiology of ulcerative colitis uncertain, but it appears to stem from various genetic, environmental, and immune system factors. The aim of this study was to understand the clinical course, medical treatment, and clinical outcomes of ulcerative colitis patients to identify gaps in treatment and plan for future outcome studies. Over a one-year period (1/2017 to 1/2018), 119 UC patients were seen in an outpatient gastroenterology clinic totaling 317 visits. Using clinic EHR software, a retrospective chart review was conducted for demographic information as well as surgical and treatment history, including biologic and corticosteroid use and outcomes. Patients with Crohn's disease or indeterminate colitis were excluded. A total of 119 patients were reviewed with a mean age of 45 years (12-85) and mean UC duration of 9.8 years (1-41). The majority of patients had pancolitis phenotype (73/119, 62%). Ten patients (8.4%) underwent colectomy/j-pouch surgery at an average 75 months from diagnosis of UC. Extraintestinal manifestations (EIM) occurred in 13 patients (11%). Musculoskeletal EIMs were most frequent (7/13, 53.8%). UC patients were treated with mesalamine (54/119, 45.4%), azathioprine/mercaptopurine (36/119, 30.2%), and biologic (48/119, 40.3%) therapies. Six patients (6/119, 5%) became corticosteroid dependent (prednisone > 10 mg per day for > 60 days). Biologic treated patients (41.6%) were more likely to receive treatment with prednisone than patients not treated with biologics (14.1%, $p=0.001$). Remission was achieved in 88.8% of patients. This cohort of patients in a community gastroenterology practice were older with more extensive disease phenotype (pancolitis) and had disease with durations longer than expected. Extraintestinal manifestations of UC occurred in 11% of patients and were likely underreported. Forty percent of UC patients were treated with biologic therapy. Corticosteroid use was common with nearly 1 in 4 patients receiving at least 1 course of treatment and corticosteroid dependent patients were uncommon. Remission was achieved in 89% of patients. No conclusions can be made comparing the effectiveness of different medical therapies due to small patient sample size.

Evaluating the Rewarding Properties of Electronic Nicotine Delivery Using Sensitization in Mice

Sarah Honeycutt

Mentor: Todd Hillhouse | Department: Psychology
Society for Neuroscience 2019 Conference | Chicago, Illinois

ABSTRACT

Repeated vaporized nicotine administration induces behavioral sensitization in C57BL/6 mice Honeycutt SC, Garrett PI, Maloy AM, Barraza AN, Hillhouse TM Department of Psychology & Neuroscience, Weber State University, Ogden, UT 84408 Nicotine administration via tobacco products (e.g. cigarettes, chew tobacco, etc.) has been well established as a drug of abuse. Preclinical experiments have used various methods of administration to evaluate the abuse-related and behavioral effects of nicotine (e.g. intravenous, injection, smoke-inhalation); however, there are limited data on the abuse-related effects of vaporized nicotine in rodents. The present study sought to evaluate the abuse-related effects of vaporized nicotine in male and female mice using a behavioral model of nicotine sensitization. Mice were habituated to locomotor activity chambers for three days. Following habituation, mice were administered with nicotine (0.5 mg/kg, i.p.) or vaporized nicotine (0-10.0 mg/ml) for five consecutive days and locomotor activity was measured for 30 mins each day immediately after nicotine administration. An e-VapeTM system was used to administer vaporized nicotine in which a three second puff was delivered every two mins for 10 mins (6 puffs total). A nicotine challenge test was conducted following a seven day withdrawal period. Additionally, body temperature was assessed each day. The positive control 0.5 mg/kg nicotine (i.p.) produced sensitization by significantly increasing locomotor activity on days 3-5. Vaporized nicotine produced a dose-dependent (0-3.0 mg/ml) sensitization effect with the most significant sensitization found at 3.0 mg/ml. Treatment with 3.0 mg/ml vaporized nicotine decreased body temperatures on days 2 and 4 for male mice, but has no significant effect on female mice. Treatment with 1.0 mg/ml vaporized nicotine produced sensitization and significantly lower average body temperatures on day 1 for both genders. Treatment with 10.0 mg/ml vaporized nicotine and vehicle vapor (0.0 mg/mL nicotine) had no effect of sensitization or body temperature changes. No significant gender effects were found on behavioral sensitization for injected or vaporized nicotine. Treatment with 0.5 mg/kg (i.p.) and 3.0 mg/ml vaporize nicotine produced a significant increase in locomotor activity on the nicotine challenge day, while the other doses failed to alter locomotor activity on the challenge day. These results suggest that vaporized nicotine produces abuse-related effects in an inverted U-shaped curve for male and female mice that is similar to other routes of nicotine administration. Additionally, the nicotine doses and administration regimen use in the present study provides a foundation for future studies to evaluate the abuse-related, behavioral, and health risk effects of vaporized nicotine.

Water Consumed from Total Water Intake Influences Metabolic Syndrome Parameters

Tilisa Howell

Mentor: David Aguilar-Alvarez | Department: Nutrition Education
Food & Nutrition Conference & Expo 2019 | Philadelphia, Pennsylvania

ABSTRACT

Recent studies show that water intake plays a major role in the development of chronic diseases such as type 2 diabetes, cardiovascular disease, and kidney disease. The aim of this study was to determine if the percentage of total fluid intake from water influences Metabolic Syndrome (MetS) and identify significant associations between water, dairy, soft drinks and juice consumption with MetS parameters in college students. Methods We measured MetS parameters and collected diet records from 364 college students, ages 18-65 years. Participants were grouped by gender (Male: 112; Female: 252) and by percentage of total fluid consumption from water. Groups were defined as high (>70%) percentage of total fluid intake from water (HPW) and low percentage (<30%) of total fluid intake from water (LPW). T-test was used to determine mean differences in MetS parameters between HPW and LPW, and Pearson correlations to determine associations between MetS and specific fluids. Results HPW participants showed lower diastolic blood pressure when compared with their LPW counterparts ($\mu=78.51 \pm 8.28$ vs $\mu=81.2 \pm 9.28$, $p=0.05$). Men's dairy fluid consumption was associated with increased fasting blood glucose ($r=0.242$, $p=0.01$). In women, Juice consumption was associated with increased LDL-Cholesterol ($r=0.205$, $p=0.02$). Conclusion Consuming non-water fluids showed negative effects on blood pressure. Contrary to previous studies, dairy fluid consumption in men was associated with increased blood glucose. It is possible that high glycemic foods tied to dairy consumption modulate this association. Our results in women are consistent with previous studies where juice consumption increases triglyceride production and VLDL-Cholesterol.

TRAVEL ABSTRACTS

Irene Ryan Nominee for Sunday in the Park with George

Sarah Jensen

Mentor: Andrew Lewis | Department: Performing Arts
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

Based off of my performance last spring in Sunday in the Park with George, directed by Andrew Barratt Lewis, I have been selected as an Irene Ryan Nominee to compete at the Kennedy Center American College Theatre Festival in California. At this festival I have the opportunity to present two scenes, one monologue, and one song all which best represent me and what I have to offer as an actress. At this conference, I will compete against hundreds of the best young actors in the region and learn from highly educated, qualified, and passionate judges. This is an opportunity to find my own material and to develop performances which suit me best while still pushing my own comfort zone. Every chance an actor gets to read plays, rehearse, and perform strengthens their chances of someday using those skills to create a career for themselves and that is exactly what KCACTF is giving me a chance to do.

Makeup and Hair design for WSU's Sense and Sensibility

Cynthia Johnson

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

Weber State University's Production of Sense and Sensibility, written by Kate Hamill, was produced in the Fall of 2019 with the Performing Arts Department, in the Allred Theatre, at the Browning Center. I was the Hair and Makeup designer for this 'classic reimagined' production. This play was directed by WSU Professor Jennifer Kokai and Costume Designed by fellow student Caitlynn Gramer. My mentor for this project was Professor Catherine Zublin from the Performing Arts Department. Using the WSU costume shop resources, together with the production staff, we created a beautiful and energetic interpretation of Jane Austin's, Sense and Sensibility. The goal of the Costume and Hair/Makeup design team was to make the lives of Elinor and Marianne Dashwood relatable to the audience of today, and highlight the fact that dealing with human relationships are universal and timeless. I plan to use my designs to compete in the 2020 Kennedy Center American College Theatre Festival competition for Region VIII, hosted by Cal State Fullerton. I will show my artwork, and design concept paperwork, then speak about my experience with the design process. For this production I performed research, created renderings, attended rehearsals, production meetings, and mentor sessions. I created designs for the Makeup, Hats and Hair for the characters. I did millenary work, made hair accessories, hair pieces and prepped actor looks for photo shoots and trained the wardrobe crew to implement my makeup and hair designs during the run of the show. The objectives of my designs were to accommodate quick costume/character changes, coordinate the color and style of the hair, makeup and hat designs with the costumes and action of the play. I used modern design elements, intertwined with touches of the Regency period, so that the audience could feel more connected to the characters.

Parent-Child Interaction in the Context of Informal Learning Environments

Jenni Klein

Mentor: Cade Mansfield | Department: Psychology
Rocky Mountain Psychological Association 2020 | Denver, Colorado

ABSTRACT

When looking at the study of child development and parent-child interaction, many people would first think of traditional contexts—the home, a formal educational setting, or even a controlled laboratory. Children’s museums, a type of informal learning environment, offer children a unique opportunity to interact with both the learning environment and others, creating a naturalistic ‘learning laboratory’ (Knutson & Crowley, 2005). How parents engage with their children in this unique context likely deeply affects the child’s experience. According to a large body of research, parents who are more verbally elaborative with their children (i.e., asking leading questions that push the child to add new details to the subject being reminisced about) have children with more robust autobiographical memories. In addition, the pretense and possibility that exist as a key feature of pretend play is thought to foster overall cognitive development (Walker & Gopnick, 2013). Together these bodies of research suggest that rich conversation between parent and child and pretend play, readily afforded by Children’s Museums, may lead to developmental gains for children. However, there is little research on how parent-child interactions manifest in this unique informal learning environment. Thus, we don’t know how parents engage with their children in this potentially important developmental context. In collaboration with The Children’s Treehouse Museum in Ogden, Utah, we are observing parent-child dyads to fill this gap in the scant literature on the benefits of Children’s Museums. We have used a coding sheet to record and describe different qualities of parent-child interaction around exhibits in the Museum. Using a high, medium, and low scale we record verbal elaboration, type of language used in the interaction with the child, parent affect, and parent engagement (such as playing v. observing). Early analyses of these data indicate that parents interact in ways that reflect different goals such as being a teacher, guardian, playmate, or agent (a combination of these). This information may help museum staff better understand how to structure exhibits to encourage positive parent-child interaction, and how the conjunction of two different contexts (museum environment and parenting behaviors) influences children’s opportunities to learn and grow.

Effects of Parenting Styles on Child Delinquency and Bullying

Amanda Leavitt

Mentor: Daniel Hubler | Department: Family Studies
Society for Research in Human Development 2020 | Jacksonville, Florida

ABSTRACT

Effects of Parenting Styles on Child Delinquency and Bullying How a child is parented can influence their success socially, mentally, physically, and emotionally. Agarwal (2017) states that “Parenting plays the most important part in any child’s life, it can help a child by teaching them to deal with people, situations and adapt to a better living standard” (p.1335). Parents help form worldviews, shape a child’s attitude towards personal achievement, teach how to approach adversity in life, and satisfy their needs whether it be psychological and/or physiological. Much is known about how the base of one’s childhood is built upon one’s primary caregivers’ parenting style, however, less is known about the intergenerational transmission of parenting philosophies. The current study was designed to assess how parenting styles affect child delinquency and bullying. Through social media invitations and snowball sampling, 200 people accepted invitations to participate in an online survey incorporating both open-ended and quantitative items. Participants were asked to reflect on how they were parented and then state what they have maintained or changed in their own parenting styles. Considering the rich nature of the responses to the qualitative items, a corroborative narrative came together through personal stories. Through thematic analysis, several themes emerged. When participants reported being parented with: open communication, flexibility, love, trust, and higher expectations they wanted to keep those traits. When asked what participants carried on from their parents one participant stated, “Cherish the family and the moments we have together.” Additionally, 28% (n = 113) of our participants shared the importance of spending quality time together. However, when participants’ parents did not display those traits, most participants indicated that similar traits, namely communication, flexibility, love, quality time, trust, and higher expectations were desired in their homes. The findings from the current study can be used to inform future parenting research assessing influence on subsequent generations.

TRAVEL ABSTRACTS

Hair & Makeup Design of WSU's The House of Edgar Allan Poe

Kierian Lockwood

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

Kierian Lockwood will be attending The Kennedy Center American College Theatre Festival (KCACTF) February 10th - 16th. While at the festival she will be presenting her hair and makeup designs for The House of Edgar Allan Poe presented for the first time by Weber State University. This dark and fantastical musical written and composed by Morgan Hollingsworth regales the life of Edgar Allan Poe using his poems and stories to twist and show the inner workings of his mind. The work on this show tried to blend the line of realism and abstract ideas of insanity as Edgar Allan Poe's mental state spirals into the abyss which Kierian Lockwood desired to capture within her designs.

Delivery of Vaporized Nicotine: Effects of Gender, Dose, and Weekly Nicotine Exposures on Behavioral

Clarissa Marston

Mentor: Hillhouse Todd | Department: Psychology
Society for Neuroscience 2019 | Chicago, Illinois

ABSTRACT

Over the last decade, usage of electronic nicotine delivery systems (ENDS), has seen a substantial increase with approximately 15.4% of the American adults had tried ENDS products and that 3.8% of adults (5.5 million people) were regular users. Moreover, approximately 20.8% of all teenagers (middle school and high school) reported regular ENDS use. Unlike combustible cigarettes, ENDS provides a discretionary amount of nicotine to the user that has made establishing a clear relationship between the amount of vaporized nicotine ingested and behavioral changes difficult to measure. The present study sought to understand how vaporized nicotine dose and number of nicotine exposures per week would differentially impact behavioral and physiological changes between male and female mice. An e-Vape™ system was used to administer vaporized nicotine in which a three second puff was delivered every two mins for 10 mins (6 puffs total). Body temperature was measured before and after administration of vaporized nicotine. Immediately after nicotine administration mice were placed in a standard open field arena and locomotor activity was measured for 20 mins. Overall, we found effects of gender and nicotine exposure. Specifically, male mice with once a week exposure to nicotine had significantly less distance traveled at all doses and significantly less time spent in the center of the open field at 3.0 and 10 mg/ml vaporized nicotine as compared male mice with twice a week exposure. Additionally, once a week exposure significant increased body temperature in male mice at 1.0, 3.0, and 30.0 mg/ml nicotine doses. There was not a significant effect in distance traveled for female mice; however, female mice with once a week exposure to nicotine had significantly more time spent in the center of the open field at 30 mg/ml of vaporized nicotine. Overall, vaporized nicotine dose-dependently increase body temperature in female mice. These results indicated dissociable behavioral and physiological effects following administration of vaporized nicotine in mice that vary based on gender, nicotine exposure per week, and nicotine dose.

Body Composition and Iron Related Biomarkers are Influenced by Years of Cross-Country Collegiate Participation

Danielle McCormick

Mentor: David Aguilar Alvarez | Department: Nutrition
Rocky Mountain Athletic Trainers Association 2020 | Online

ABSTRACT

It has been previously observed that iron deficiency anemia is associated with low skeletal muscle mass (SMM). In addition increases in adipose tissue resulting in obesity has been linked with elevated leptin levels. Participating in collegiate cross-country (CC) can result in physiological adaptations such as changes in body composition. Look at the effects of years of collegiate cross-country training on body composition and iron biomarkers

Methods: The study design was cross sectional design. Body composition and blood samples were taken during pre-season. The study included 34 subjects, age 19-25 from a NCAA Div I CC team. The independent variables were years of collegiate participation and body composition. Participants were grouped as upper division class (UDC) consisting of juniors and seniors and lower division class (LDC) consisting of freshmen and sophomores. Blood samples were collected during pre-season. Body composition was measured using electrical impedance on an InBody 770. CBC and sFer levels were analyzed through enzymatic spectrophotometry. Leptin was measured through Luminex® MAGPIX® multiplex assays. T-test was used to compare upper and lower classes metabolic biomarkers. Pearson correlations were used to establish associations between biomarkers and body composition. Statistical analysis was completed with IBM® SPSS Statistics 25 software.

Results: LDC ferritin levels were significantly lower than their UDC counterparts (34.57 ± 27.36 vs 76.76 ± 65.69 pg/mL, $p = 0.04$). Conversely, leptin (3498.99 ± 2099.56 vs 1567.77 ± 1356.93 pg/mL, $p = 0.01$) and body fat mass (23.76 ± 8.17 vs 17.53 ± 6.08 lbs., $p = 0.04$) were significantly higher on the LDC group when compared with the UDC athletes. SMM was leptin ($r = -0.466$, $p = .00$) and positively associated with hemoglobin ($r = 0.725$, $p = 0.00$). Additionally, percent body fat (PBF) was positively associated with leptin ($r = 0.853$, $p = .00$) and negatively associated with hemoglobin (HB) ($r = -0.447$, $p = .00$) and HCT ($r = -.580$, $p = 0.00$)

Conclusions: Years of collegiate CC training participation resulted in lower PBF, increased ferritin, decreased leptin. Continuous aerobic training on elite athletes commonly results in increase body fat oxidation and PBF reduction. Since, leptin is produced primarily in the adipocytes it was expected to observe lower levels of this appetite-regulating hormone on the population with lower BFP. It is likely that the increased ferritin observed in the UDC was due to the university protocols established to address iron deficiency anemia in CC athletes. The strong correlation between muscle and hemoglobin may be mediated by hematopoietic effects of testosterone. Increased hemoglobin may also result in increased ability to deliver oxygen to the working muscle resulting in increased SMM.

**National Communication Association 105th Annual
Convention: Communication for Survival Presentation**

Aulola Moli

Mentor: Michael Ault | Department: Communication
Nat'l Communication Association 105th Annual Convention 2019 |
Baltimore, Maryland

ABSTRACT

Despite the number of American students achieving bachelor's degrees reaching record highs, some ethnic groups are falling further behind in educational achievement. Among the lowest achieving groups are Tongan Americans. This paper uses Kramer's (2011) multilevel model of volunteer socialization to investigate how multiple and overlapping group and organizational memberships influence the progress of Tongan-American students as they progress from organizational entry to metamorphosis, or premature organizational exit. Our findings suggest that these multiple memberships are both complementary and contradictory with achieving full membership in universities. Implications for universities seeking to assist Tongan-American students, parents of Tongan-American students, and for Tongan-American students are discussed.

Acute Effects of Heat Application and Dynamic Warmup on Knee Range of Motion

Blayne Morris-Kato

Mentor: Saori Hanaki | Department: Exercise & Nutrition Sciences
American College of Sports Medicine 67th Annual Meeting 2020 | San Francisco, California

ABSTRACT

Dynamic warm-ups (DWU) and modality treatments such as heat application are commonly utilized to increase range of motion (ROM) and prevent musculoskeletal injuries. Both moist heat pack application (MHP) and DWU potentiate the effect of stretching on improving ROM in a variety of muscle groups. However, comparison of these two methods used for ROM improvement has not been completed. **PURPOSE:** To compare acute effects of DWU to MHP application on knee flexion ROM. **METHODS:** Twenty healthy participants (12 males; 8 females; 23.2 ± 3.4 yrs) completed three treatments (MHP, DWU/stationary cycling, no-treatment) lasting 20 minutes in a randomized order with a 48-hour washout period. MHP ($10'' \times 12''$) was applied on the anterior thigh of the right leg. Active (AROM) and passive (PROM) knee flexion ROM were measured pre- and post-treatment on the treated leg. Skin temperature on both legs were also monitored throughout treatment. The effects of treatment and time (pre- vs. post) on each type of ROMs were determined using 2×3 ANOVA with repeated measures. **RESULTS:** There was a significant treatment*time (pre-/post) interaction on both AROM and PROM ($p < .005$). Pair-wise comparisons revealed that both AROM and PROM improved from pre- to post-treatment with MHP (AROM: $137.5^\circ \pm 5.4^\circ$ vs $140.4^\circ \pm 5.4^\circ$; PROM: $146.6^\circ \pm 5.0^\circ$ vs $148.4^\circ \pm 4.9^\circ$), and DWU (AROM: $137.4^\circ \pm 6.1^\circ$ vs $139.8^\circ \pm 5.4^\circ$; PROM: $146.2^\circ \pm 147.5^\circ$ vs $147.5^\circ \pm 4.9^\circ$), but not for no-treatment (AROM: $138.1^\circ \pm 5.7^\circ$ vs $138.3^\circ \pm 5.8^\circ$; PROM: $146.4^\circ \pm 4.9^\circ$ vs $146.5^\circ \pm 5.1^\circ$). Although PROM increased with DWU, it was not statistically different from PROM post-rest ($147.5^\circ \pm 4.9^\circ$ vs $146.5^\circ \pm 5.1^\circ$). Significant increases in skin temperature were only associated with post-MHP application (pre-treatment: $30.6 \pm 1.8^\circ\text{C}$ vs post-treatment: $37.9 \pm 2.0^\circ\text{C}$ for AROM, similar change with PROM trials). **CONCLUSION:** MHP application and DWU both effectively increased AROM and PROM on knee flexion. When comparing effects between treatment methods, MHP application increased both ROMs and skin temperature, whereas dynamic warm-up resulted in similar effects on ROMs without skin temperature change. Heat sensitive individuals may benefit from DWU rather than MHP in acute improvement in ROMs.

Can Automatic Hand Dryers Serve as a Microbial Reservoir for Contamination?

Hyrum Packard

Mentor: Craig Oberg | Department: Microbiology
American Society for Microbiology 2020 | Chicago, Illinois

ABSTRACT

Automatic electric high-speed hand dryers are considered an environmentally friendly alternative as they reduce paper waste and are considered more sanitary than the paper towel dispensers since they eliminate direct contact with the dispenser and towels. Increasingly, these hand dryers are the only option in public restrooms. Our purpose for doing this research was to determine if high-speed automatic electric hand dryers in public restrooms are antiseptic or if they can serve as a source of contamination to hands during drying. Initially, university restrooms were selected for sampling that have variable degrees of foot traffic. Sampling was then done in men's and women's restrooms in three buildings with four bathrooms tested in each building. Testing was conducted by swabbing a 5 cm² area of the top, middle, and bottom of each hand dryer using 3M Quickswabs. Pour plates containing TSA were used to enumerate swab samples with plates counted at 48 hours after incubation at 37° C. Results showed the bottom of dryers in both the men's (average of 311 CFU/5 cm²) and women's (average of 299 CFU/5 cm²) restrooms had the most contamination. The middle section was the second most contaminated for both men's and women's restrooms averaging 144 CFU/5 cm² and 145 CFU/5 cm², respectively. The top was the least contaminated for both men's (average 107 CFU/5 cm²) and women's (average 51 CFU/5 cm²) restrooms. Presumptive plating on mannitol salt agar (MSA) and violet red bile agar (VRBA) of bottom dryer sections showed *Staphylococcus* and *coliforms* were present. Overall there was no difference between the two brands of dryers (Dyson Airblade vs Mediclinics Dualflow Plus) and no statistical difference between men's and women's restrooms. Differences were observed based on sampling location inside the dryer and for restrooms in higher traffic areas which had a higher level of microbial contamination, probably based on increased use. Results showed that high-speed automatic electric hand dryers can serve as a source of contamination during hand drying. Since the use of swabs for sampling only recovers between 1 and 10% of the total organisms present, the actual level of microbial contamination in restrooms was at least a log greater than actual plate counts. As a preventative measure, the inside of these dryers should be cleaned on a daily basis to prevent people from contaminating their hands immediately after washing them.

TRAVEL ABSTRACTS

Research Funding Advocacy

Heather Pappas

Mentor: Shirley Dawson | Department: Teacher Education
Council for Exceptional Children Legislative 2019 Summit | Washington
D.C.

ABSTRACT

The need for teachers has not abated in the last twenty years but continued to increase to the point of critical shortages. Measures to stem the tide of chronic and critical shortages include supporting paraeducators to become teachers in targeted preparation programs that provide financial and academic support. While such programs are well known and touted in education and academia realms, they are less known to policy makers who have the power to appropriate federal dollars to ensure the ongoing financial stability of teacher preparation programs. An effective advocacy method is to meet with elected officials who have the power to determine funding for education programs. By giving personal voice to the need for federal support the power of a lone constituent can influence the opportunities for an entire state. This project seeks to explore the impact of how university student presence during congressional advocacy meetings impacts the preparation of the future teacher and the appropriations of future education budgets. Such opportunities for advocacy can enrich education for those currently in higher education as well as future students who will enter public K-12 classrooms.

Scenic/Projection Design of Sunday in the Park with George

Dustin Pike

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

DJ Pike will be attending The Kennedy Center American College Theatre Festival (KCACTF) February 11th - 16th. While at the festival he will present his Scenic and Projection design portfolio for Weber State University's production of Sunday in the Park with George with the intent of building strong presentation skills and representing Weber State.

TRAVEL ABSTRACTS

American String Teachers Association National Conference

Clarissa Prigmore

Mentor: Shi-Hwa Wang | Department: Performing Arts
American String Teachers Association National Conference 2020 |
Orlando, Florida

ABSTRACT

I am attending the ASTA (American String Teachers Association) National Conference to further my education as a String Performance major and as a violin teacher. I am going to teach music throughout my music career and this conference will provide tools to succeed and be the best teacher I can be. ASTA is a national organization that provides string and orchestra teachers, as well as performers, support in their careers. They provide teaching resources, professional education, insurance for instruments, national and local conferences, as well as access to the national and statewide string community. I am a member of WSU's chapter of ASTA and currently serve in the position of Vice-President. The 2020 National Conference provides Master Classes (which are where fellow teachers give constructive criticism on your performances), labs, panel discussions, talks, demonstration groups, new music reading sessions, and more. I will attend these while I'm there. I will also have the opportunity to connect with hundreds of string musicians and teachers from around the country. There will be performances from well-known performers that cover a wide range of styles, as well as the winners of the National Orchestra Festival. After attending the conference, I will have made connections and gained teaching skills that will help me in my career as a performer and string teacher now and in the future.

Concepts of Trust in Comparison/Contrast From Students in America, to that of Students in Finland

Diane Read

Mentor: Natalie Williams | Department: Special Education

ABSTRACT

We rely on relational trust every day, with all of whom we encounter. Through my research I would like to identify different perceptions of relational trust between students and teachers, as well as the ways in which they perceive to be extending and fostering an environment of trust in the Finnish lower secondary classroom and school environment, and compare and contrast those types of relational trust with students in the United states, and look for ways to help us improve and form bonds of relational trust. The study of trust in a classroom and school environment is of value because of its many benefits, including positive effects on academic performance and behavior; increased communication, motivation, risk taking and a feeling of belonging. The Finnish context gives added interest in the study of trust, as it boasts of the highest levels of trust between people and social institutions as well as between individuals. It has also been praised for being one of the most highly successful school systems in the world. This is why it is important to observe and learn from their practical applications of relational trust, and study the ways it is fostered and extended in a school environment. This is why I would like to observe, and survey these students and their teachers and guardians regarding perceptions of relational trust, and to triangulate data, as to how and why their bonds of relational trust, seem to be so effective. This information is crucial to us as a society, because without these bonds, we would have a hard time making it through the day. It is my hope to gain an understanding of how to develop more areas of relational trust with individuals, families, and so we can continue to form lasting bonds with those around us, and provide conversations of ways to improve our relational trust with one another.

TRAVEL ABSTRACTS

Tongan Students Cope with Cultural and Higher-Educational Structures

Shireen Rezaei

Mentor: Michael Ault | Department: Communication

International Communication Association Annual Convention 2020 | Gold Coast, Australia

ABSTRACT

For many American college students, college attendance conforms to multiple conducive structures. College graduation represents an expectation and comes with a variety of cultural benefits. For Tongan-American students the structural expectations of their culture often conflict with the expectations of higher education requiring them to navigate different expectations as they attempt to graduate from college. This study finds that this intersection of conflicting structures creates a crisis of belonging in Tongan students in the form of internalized inferiority, a lack of structural osmosis, latent perceptions of success, and membership fragility. These hindrances to college graduation lead Tongan students to employ a variety of strategies to cope with the conflicting structural prescriptions of behavior. Tongan students would choose a side, code switch, or achieve cultural fusion. The first two strategies maintain the rules and resources that make up each structure, while the final strategy seeks to fundamentally change the structures present in both settings to more effectively accommodate the needs of the student.

Dramaturgy for WSU The House of Edgar Allan Poe

Samantha Rust

Mentor: Catherine Zublin | Department: Performing Arts, Theater
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

As a student of dramaturgy in theater here at Weber State University, my job is to ask the big questions and know the big answers about a script. I did this for our world premier of The House of Edgar Allan Poe, and I will be presenting my work at the Kennedy Center American College Theater Festival this February. This is the first time I will be formally presenting my work, and am very excited for this very educational opportunity. This production has meant so much to me over the past eight months, and I am so proud to be able to represent all that we have accomplished. I am the only theater major in the college with an emphasis in dramaturgy, which means that I have the unique opportunity of figuring out what exactly my role is in the department with the help of my mentor. Generally, undergraduate dramaturgs don't get many opportunities to do work on their own, which is why I feel so lucky to have worked on such an impressive production, with the added bonus of being able to work face to face with the playwright. Representing my school and this musical at the festival will be an excellent experience of learning how to present my work, and I will be able to learn from my own presentation, as well as the presentations of other dramaturgs from the surrounding area. I hope to learn a lot, and to be able to bring back what I have learned in order to better myself as a dramaturg and future productions I work on.

Assessing Rapid Antidepressant Effects of Dextromethorphan using Novelty-Induced Hypophagia

Jesus Saavedra

Mentor: Todd Hillhouse | Department: Psychology

International Communication Association Annual Convention 2020 | Gold Coast, Australia

ABSTRACT

Major Depressive Disorder (MDD) is among the most common mood disorders and is a leading cause of disability in the United States. Traditional pharmacological treatments (SSRIs, MAOIs, and tricyclic antidepressants) work to increase monoamine concentrations in an attempt to regulate depressive states. However, only about 50% of depressed patients find these treatments effective, highlighting the need for novel approaches in the treatment of depression. Recent treatments have examined the glutamatergic system as a novel pathway for treating depression and have shown promise in the clinical population. However, despite the effectiveness of glutamatergic drugs like ketamine, whose rapid antidepressant effects are credited to its role as a N-methyl-D-aspartate (NMDA) glutamate receptor antagonist, drugs with similar receptor affinities have failed to replicate ketamine's effectiveness, suggesting that there is still much to understand about the glutamatergic system. Dextromethorphan (DM), is a compound that shares a similar affinity for antagonizing NMDA glutamate receptors as ketamine. Preclinical research has found that DM (30 mg/kg) produces similar antidepressant effects relative to ketamine in animal models of depression that use acute dosing such as the forced swim test (FST) and tail suspension test (TST); however, DM has not yet been tested in an animal model of depression that can evaluate its potential rapid antidepressant effects. The present research seeks to evaluate the rapid antidepressant effects of DM using the novelty-induced hypophagia (NIH) assay in mice, a test capable of distinguishing between acute and rapid antidepressant effects of drugs. The limited clinical data available for DM provides inconsistent results with some research suggesting no clinical efficacy and others citing 300 mg or 60 mg DM as effective doses. Additionally, previous research has found increased rates of locomotor activity in mice assessed via open field tests concomitant with antidepressant effects in FST and TST assays following a single therapeutic dose of DM, calling DM's supposed antidepressant effects into question. The current research has found that the pharmacological control, imipramine, increases latency to drink in the NIH assay, corroborating previous research findings. Interestingly, it seems this effect is too found in DM, as DM (10 and 32 mg/kg) was found to significantly increase latency to drink relative to saline and DM (3.2 mg/kg) in the NIH test. To the best of our knowledge, this research is the first to evaluate DM's potential rapid antidepressant effects using the NIH assay.

Blood Biomarkers for Bone Remodeling are Expressed Differently Between Collegiate Cross-Country Athletes

Ryosuke Sakai

Mentor: Conrad Gabler | Department: Athletic Training
Rocky Mountain Athletic Trainers' Association 2020 | Albuquerque, New Mexico

ABSTRACT

Blood biomarkers for bone remodeling are expressed differently between collegiate cross-country athletes with and without a history of lower extremity stress fracture Sakai RS, Gabler CG, McCormick DM, Aguilar DA. Weber State University, Ogden, Utah. Context: Lower extremity stress fractures are prevalent among cross-country runners, and a previous history of these fractures places individuals at higher risk of subsequent stress fractures. Blood biomarkers related to bone formation and resorption can be used to further understand this subsequent injury risk. However, the expression of these biomarkers in individuals with a history stress fracture has not been explored. The purpose of this study was to determine if there are differences in the blood biomarkers for bone remodeling between cross-country athletes with and without a history of lower extremity stress fracture. We hypothesize that those athletes with a history of stress fracture will express different blood biomarker levels than those without a history of stress fracture. Methods: A cross-sectional study conducted at a University biomedical laboratory. A total of 34(males=16, females=18, age=20.5±2.1 years, height=171.5±8.6 cm, weight=60.3±8.2 kg). NCAA Division-1 cross-country athletes participated in this study. A stress-fracture history survey was given to the participants at the beginning of the season. The results of this survey were then used to divide the participants into two groups; those who reported a history of lower extremity fracture(SFX; n=12, male=7, female=5), and those who reported no history of lower extremity stress fracture (nSFX; n=22, male=10, female=14). Blood samples were also taken from each participant at the beginning of the season. A human bone panel and Magpix instrument were used to analyze the blood samples for biomarkers of insulin, DKK1, osteocalcin, osteopontin, PTH, and TNF?. The independent variable was group, and the dependent variables were the blood biomarkers. A Mann-Whitney U test was performed to detect differences in blood biomarker levels between the groups. Results: There were significantly higher levels of DKK1 in the nSFX group compared to the SFX group(834.11±184.42 pg/mL vs. 681.66±201.05 pg/mL, p=0.029). Conversely, insulin levels were significantly lower in the nSFX group compared to the SFX group(328.75 pg/mL±276.23 vs. 747.35±88.60 pg/mL, p<0.001). There were no significant group differences observed with the other bone biomarkers(p>0.05). Conclusions: A lower level of DKK1 and a higher level of insulin were found in cross-country runners who had a history of lower extremity stress fracture compared to

TRAVEL ABSTRACTS

those with no history. Elevated DKK1 levels represent inhibition of bone formation, whereas elevated insulin levels represent anabolic activity, such as bone formation. These results suggest that bone remodeling is active in athletes with previous lower extremity stress fractures, and at a resting state in those without a history of stress fracture. Further research is needed to determine whether there are ramifications of ongoing bone formation activity in cross-country runners, and if blood biomarkers related to bone turnover can be used to predict lower extremity stress fractures in cross-country athletes.

Organizational Socialization of Faculty Newcomers: A Case Study

Austin Schaper

Mentor: Alexander Lancaster | Department: Communication
International Communication Association Annual Convention 2020 | Gold Coast, Australia

ABSTRACT

In any organizational context (Jablin, 1987), a common need is to find a manner of preparing new members to eventually become integrated into the culture and practices that are normative for employees at the workplace. Faculty members at universities enter into positions with unique skills and training, having often just emerged from a graduate (i.e., MA, MS, MFA, or Ph.D.) program that includes instruction in research or creative activity and teaching skills. Colleges and universities face a critical need in not only attracting but retaining quality faculty members who will dedicate decades to the instruction of students and production of research and/or creative works. In the present study, the new faculty retreat at a large, Western, public university, was selected for inclusion as a single case examination of faculty perceptions of fit and inclusion from a newcomer perspective. A group of 28 new faculty members served as the sample for this case study.

The Effects of Peristaltic Pulsed Pneumatic Compression on DOMS Recovery in Active Individuals

Brandon Shapiro

Mentor: Matthew Donahue | Department: Health Promotion & Human Research

World Federation of Athletic Training and Therapy Conference 2019 | Tokyo, Japan

ABSTRACT

The Effects of Peristaltic Pulsed Pneumatic Compression on DOMS Recovery In Active Individuals Miller C, Shapiro B, Evans G, Donahue M: Weber State University Ogden, UT Context: Delayed onset muscle soreness (DOMS) is associated with the exercise induced muscle damage that results from repetitive eccentric muscle contractions. Active recovery is known to be an effective form of recovery to reduce the effects of DOMS but it is unknown if peristaltic pulsed pneumatic compression (PPPC) will have the same effects as a recovery modality for DOMS in the hamstring muscles. To examine the effects of PPPC treatment on pain, pressure to pain threshold (PPT), hamstring flexibility, circumference and performance results on DOMS in the hamstring muscle group. Methods: This randomized control trial was performed in a research laboratory within 21 volunteers between the ages of 18-40 who were physically active, generally healthy and had no history of hamstring injuries in the last 6 months. After the induction of DOMS by Nordic hamstring curls exercise participants were randomized into one of three treatment groups (PPPC, active recovery, control). Each group received 15 minutes of treatment followed by the measurement of PPT, completion of the McGill Pain Questionnaire (SF-MPQ), measurement of hamstring flexibility, limb circumference, vertical jump and timed t-drill. Participants were asked to refrain from utilizing any other form of recovery outside the study (stretching, foam rolling, NSAIDS, ice, heat). Participants returned to the lab 24 hours after the first visit to receive treatment and measurements and then again 48 hours after the first visit. Results: Subjects reported a significant increase in pain on both VAS($F(4, 72)=20.62$ $p=0.01$ $ES=0.53$, Power=1.00) and SFMPQ($F(4, 72)=26.52$ $p=0.01$ $ES=0.6$, Power=1.00) from the first time point to the remaining 4 time points (VAS: $T1*T2$ $p=0.00$, $T1*T3$ $p=0.01$, $T1*T4$ $p=0.01$, $T1*T5$ $p=0.01$ SFMPQ: $T1*T2$ $p=0.01$, $T1vT3$ $p=0.01$, $T1vT4$ $p=0.00$, $T1vT5$ $p=0.00$). No significant differences were found for PPT, Vertical Jump, T-Drill, circumference or ROM measurements. Conclusions: The DOMS protocol created subjectively measured pain on day one and remained through day 3. Active recovery and PPPC failed to alter pain as measured by PPT, flexibility, circumference of the hamstring muscle group. Subjects performed similarly in all performance measures before and after the induction of DOMS; these results suggest there was no effect on performance. Although active recovery and PPPC had no effect on PPT, flexibility, and circumference a patient may still find value in all three approaches to DOMS recovery. Word Count: 401

Performing at 2020 Coeur d'Alene Symphony Concerto Competition Winners' Concert

Chia-Ying Shen

Mentor: Yu-Jane Yang | Department: Performing Arts

2020 Coeur d'Alene Symphony Concert 2020 | Coeur d'Alene, Idaho

ABSTRACT

I participated at the 2020 “Coeur d'Alene Symphony National Young Artist Concerto Competition” in Spokane on January 6th 2020. I was selected as the first place winner of the College Piano Division (ages 19 to 27). The finalists of the competition in this division included graduate students from renowned music schools in the U.S. such as the Eastman School of Music and Indiana University. As the winner of the Collegiate Piano Division at this concerto competition, I will have the opportunity to perform at two concerts with the Coeur d'Alene Symphony in Coeur d'Alene Idaho on March 13-14, 2020. I will be performing the Rhapsody on a theme of Paganini, Op.43 by Sergei Rachmaninoff as the featured soloist in the concerts with the Coeur d'Alene Symphony. In addition to the two concerts, there will also be two rehearsals for me to rehearse with the Coeur d'Alene Symphony on March 11 and 12, 2020 before the concerts. To be able to perform with a symphony orchestra is a crucial element and a critical high-impact experience in the training of a concert pianist. I am very excited that I can represent WSU in this capacity to perform on the concert stage out of state!

Fermentation of Plant-based Extracts by Dairy Lactic Acid Bacteria

June Smith

Mentor: Craig Oberg | Department: Microbiology
American Society for Microbiology 2020 | Chicago, Illinois

ABSTRACT

Plant-based alternatives to fermented dairy products are growing in popularity and economic importance. Most of these products are produced using dairy processing facilities and dairy cultures. However, the qualities of fermented dairy products are difficult to recreate with plant-based extracts and little is known about the metabolism of lactic acid bacteria (LAB) in plant extracts (milks) like almond, coconut, and oat. In this study, we evaluated the ability of LAB, individually and in mixtures, to cause a pH change in almond, coconut, or oat-derived beverages through fermentation. Cultures used included single strains of *Streptococcus thermophilus*, *Lactobacillus rhamnosus*, *Bifidobacterium animalis*, and *Lactobacillus casei*, and mixtures of *Lactobacillus* sp., *S. thermophilus*, and *Bifidobacterium* sp. that are commercially added to dairy products for fermentation or for probiotic supplementation. Carbohydrate use by individual LAB cultures was first evaluated using API 50 CH panels. All cultures were able to use galactose, glucose, fructose, mannose, esculin, and tagatose. Most cultures could also use ribose, sorbitol, maltose, and amygdalin. The most fastidious organisms were *S. thermophilus* YFL01 and YFL02, which were not able to use ribose, sorbitol, maltose, or amygdalin. The ability of these LAB to ferment carbohydrates commonly found in plant extracts supports our hypothesis that these organisms can actively ferment substrates present in the plant extracts. Three commercial plant-based beverages, oat, almond, and coconut, were incubated with these commercial LAB cultures at three inoculum levels, 0.5, 1, and 2% w/v, and the pH monitored during incubation at 37°C over 7 hours. Acid production in coconut and almond extracts was only observed at the highest inoculum level with *S. thermophilus* YFL01 and YFL02. However, three of the LAB strains, *S. thermophilus* YFL01, *Lb. casei* 431, and *Lb. rhamnosus* LGG produced acid in the oat extract at all inoculum levels. The pH dropped from 7.5 to 5.75 within 240 minutes, and continued to decrease over the course of the experiment. When inoculated into oat extract, the *Lactobacillus* sp. survived 5 hours of incubation with little change in the CFU/ml. We also tested the ability of *B. animalis* subsp. *lactis* BB12, a probiotic culture, to survive or grow in plant-based beverages. We observed that a lower pH (5.5) improved survival of BB12 in oat extract by 155% over 14 days. Results showed that fermentation (acid production) is LAB strain dependent based upon the type of plant extract being fermented.

The KCACTF Conference

Sibley Snowden

Mentor: Andrew Lewis | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

The Kennedy Center American College Theatre Festival is a national program that gives hundreds of students the amazing opportunity to present their talents and are given the chance to work on and improve their art. KCACTF has done wonderful work in making immense progress within the quality and execution of college theatre as well as encouraging the education throughout the nation. The Kennedy Center website states the following: “The Irene Ryan Acting Scholarship provides recognition, honor, and financial assistance to outstanding student performers wishing to pursue further education”. Annually, there are 16 regional and 2 national scholarships offered by the Irene Ryan foundation. I am so honored and excited for the chance to attend the upcoming Kennedy Center American College Theatre Festival as an Irene Ryan nominee in Los Angeles, California. I was nominated for the Irene Ryan scholarship for my performance in Weber State University’s production of *Sense and Sensibility* portraying the character Margaret/Anne. At the festival, I will be accompanied by my partner Liberty Lockett. We will be performing two scenes and I will be performing one song in replacement of a one minute monologue. In *Sense and Sensibility*, directed by Jennifer Kokai, my character Margaret was an absolute joy to portray. Her curiosity and genuine love for those around her inspired me as an actress as well as a human being. She kept those around her young and warmed the stage with her bubbly and youthful personality. Although Margaret’s thoughts and opinions were often at times brushed off by the people around her, she never stopped trying to make things right despite her young age. She truly wanted her sisters to be happy and she constantly spoke her mind in hopes that she would be heard to help everyone somehow. My character Anne was a joy to portray as well because as a character, she is extremely ditzy, witty, and a bit arrogant. This particular performance was a challenge for me because I had to present two different characters and have a specific contrast that audiences could differentiate. I wanted to be sure that both characters possessed individuality, different personalities, and traits. As an actress, I sometimes struggle to portray roles that are very different from the other. Playing two different characters in one show and being able to differentiate the two was a major breakthrough for me. Being versatile is an important quality that I can continue to use and carry with me going into the festival. This will especially be a great skill to workshop as I will be portraying different characters in my two scenes and my song. I plan to approach the KCACTF festival with the intention of creating and inspiring.

Gluconate Metabolism by *Lactobacillus wasatchensis* WDC04 Causes Late Gas Defect

Kate Sorensen

Mentor: Craig Oberg | Department: Microbiology
American Society for Microbiology 2020 | Chicago, Illinois

ABSTRACT

Lactobacillus wasatchensis, a nonstarter lactic acid bacteria, can cause late gas production, and splits and cracks in aging cheese when it metabolizes 6-carbon sugars, particularly galactose, in cheese to a 5-carbon sugar, resulting in the release of CO₂. Previous studies have not explained late gas production in aging cheese when no galactose is present. Based on the genome sequence of *Lb. wasatchensis* WDC04, genes for potential metabolic pathways were mapped using Knowledgebase Predictive Biology software (KBase). This metabolic modeling predicted *Lb. wasatchensis* WDC04 could metabolize gluconate. Gluconate contains 6 carbons and *Lb. wasatchensis* WDC04 contains genes to decarboxylate it to ribose-5-P and CO₂ using phosphogluconate dehydrogenase. The goal of this study was to determine if sodium gluconate, which is often added to cheese to reduce calcium lactate crystal formation, could result in gas production when metabolized by *Lb. wasatchensis* WDC04. Carbohydrate restricted MRS (CR-MRS) was mixed with varying ratios of ribose, sodium gluconate and/or D-galactose (total sugar content of 1%). Oxyrase (1.8%) was also added to create an anaerobic environment similar to aging cheese in the CR-MRS tubes. Tubes were inoculated with a 4-day culture of *Lb. wasatchensis* WDC04, incubated at 30°C and results recorded over 8 days. Of the ten ratios used, *Lb. wasatchensis* WDC04 produced gas in six with the most gas production resulting from the ratio of 1% sodium gluconate with no added ribose or galactose followed by the ratio of 0.3% ribose/0.7% gluconate (total sugar content of 1%). Results showed that *Lb. wasatchensis* WDC04 can metabolize sodium gluconate to produce CO₂ gas, which could cause late gas formation in aging cheese. Sodium gluconate addition during cheese manufacture thus becomes another risk factor for unwanted gas production resulting in the formation of splits and cracks in aged cheese.

Irene Ryan Audition at Kennedy Center American College Theatre Festival

Jacob Stubbs

Mentor: Andrew Lewis | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2019 | Los Angeles,
California

ABSTRACT

As a theatre artist, it sometimes feels difficult to fit into one category. One thing the theatre department at Weber State puts an emphasis on is creating the most well-rounded, adaptable theatre artist they can in the time you are a student. Although my major is acting and directing, I have experience in designing costumes, working backstage, lighting, and writing. Writing is an area I have always had interest in exploring, and I believe that writing is a vital tool for artists who want to pursue a career in performing. I have been lucky enough to be presented with the opportunity to compete in the Irene Ryan Scholarship competition at the Kennedy Center American College Theatre Festival. This is my second time competing, and this time around I would like to approach the competition a little differently. I will be performing a self-written scene with my partner, Gabriel Priest, an avenue that is open but not often explored within the competition. This adds another layer of pressure into the competition, as it reflects your ability as a performer and as a writer. This 'high risk, high reward' aspect will certainly present its own unique set of challenges, but I believe that ultimately in doing so I will grow as a performer and as a writer; thus allowing me to further achieve the overall goals of the theatre department, which is to be the most well rounded and malleable theatre artist I can be.

Microbial Load Reduction in Athletic Locker Rooms Using Ozone Treatment

Kawika Tupuola

Mentor: Craig Oberg | Department: Microbiology
American Society for Microbiology 2020 | Chicago, Illinois

ABSTRACT

Staphylococcus aureus and *Escherichia coli* can be found in athletic settings, residing on uniforms, training tables, playing fields, practice mats and dressing lockers. Bacterial contamination in locker rooms can lead to teamwide infections. Ozone producing machines are often used in an attempt to decrease microbial load on fomites in athletic environments. This research was conducted to determine if a commercial ozone generator was effective in reducing *S. aureus* and *E. coli* in an athletic locker room and to determine its limitations. Petri plates (TSA) inoculated with a nonpathogenic strain of either *S. aureus* or *E. coli* were put in strategic locations (in triplicate) in collegiate locker rooms. Lids were removed from the inoculated petri plates and two ozone generators (Extreme Ozone Co.) were run for 120 minutes (trial 1) for the two football locker rooms, while in trial 2 they were on for 180 minutes. Inoculated plates were placed from 3 to 70 feet from each ozone generator. Distance from the ozone generator, height of the plates, time exposed to ozone, and whether the plates had obstructed airflow were measured. Additionally, uninoculated control plates were placed in each room to control for airborne contaminants that might fall on plates during the experimental protocol while inoculated plates not exposed to ozone served as controls. After ozone infusion, petri plates were incubated for 48 hours at 37°C. Two hours into the run cycle, ozone measurements were made (Ozone Monitor InDevR Model 205). Average ozone readings increased from a background of 17 ppb to 1042 ppb at ground level and 1344 ppb 1.5 m above ground level. Results for trial one showed an overall *S. aureus* reduction of $78.7 \pm 8.3\%$, while trial two showed an increase in the overall reduction to $93 \pm 1.8\%$. There was a modest correlation between *S. aureus* survival and distance from the ozone generator in trial one ($R^2 = 63$) but not in trial 2. In trial 2, results for *E. coli* survival showed an overall reduction of $89.6 \pm 3.0\%$. On average, a plate in an obstructed location such as a cabinet or foot locker had a 24% decrease in kill rate compared to similar plates, which increased to 38% when looking exclusively at *E. coli*. Plates at a higher elevation trended toward higher kill rates than those at low elevations. These results show that ozone can reduce *S. aureus* and *E. coli* in locker rooms and that increasing the run time from 2 hours (recommended by manufacturer) to 3 hours significantly decreases survival rates regardless of distance. We recommend opening lockers and cabinets to ensure ozone can reach all locations.

Exploratory Narrative Processing of Relational Victimization Experiences

Katie Turner

Mentor: Cade Mansfield | Department: Psychology
Western Psychological Association 2020 | San Francisco, California

ABSTRACT

Narration of life events is a principal method used for defining one's self-identity. This narration is sometimes done to make meaning of an event. One way that one can make meaning of a negative event is through exploratory narrative processing, a type of narrative processing that involves deep exploration of an event with particular regard for how the event impacts one's self. The way one makes meaning of negative events has effects across multiple modalities, including stress-related growth, maturity, and well-being. However, the potential benefits of meaning-making may differ for men and women. Since victimization events can have lasting negative consequences, the way one makes meaning of these events is important for long-term outcomes. The present study seeks to examine the relationship between exploratory narrative processing of relational victimization events and adaptive functioning. Data were collected from both undergraduate students ($n=125$) in the lab and the general community using Amazon's Mechanical Turk online platform ($n=141$). Participants were prompted to recall a relational victimization event, then answered questions in order to anchor their memory about the event. Participants then completed adaptive functioning measures in random order including the Generalized Self-Efficacy Scale, the Perspective-Taking subscale of the Interpersonal Reactivity Index, the UCLA Loneliness Scale, and the Avoidance Motivation subscale of the Transgression-Related Interpersonal Motivation Scale. Participants then provided a narrative account of the victimization event. I hypothesize that higher levels of exploratory narrative processing of relational victimization events will be correlated with higher levels of adaptive functioning in loneliness, avoidance motivation, empathy, and self-efficacy. I also hypothesize that women will engage more in exploratory narrative processing than men. Narrative coding is ongoing. I applied a valid and reliable coding system (Syed & Nelson, 2015) to score narratives for the presence of exploratory narrative processing. Once reliability coding is complete, I will conduct linear regression models for exploratory narrative processing and each adaptive functioning measure to determine if levels of exploratory narrative processing are significantly correlated with higher levels of adaptive functioning. I will also use an independent samples t-test to compare differences in extent of exploratory narrative processing for men vs. women.

How Religious Affiliation Affects Trauma-related Beliefs Among Sexual Trauma Survivors

Katie Turner

Mentor: Theresa Kay | Department: Psychology
Society for the Psychological Study of Social Issues 2019 | San Diego, California

ABSTRACT

Despite progress in recent years in the treatment of the lesbian, gay, bisexual, and transgender (LGBT) community, many people within our society still have negative feelings towards LGBT persons and act negatively on these feelings via discrimination, harassment, and/or aggression. This can be especially true in the context of religion, with many religious ideologies having direct conflict with LGBT identities. This pervasive pattern of marginalization has observable effects on how the LGBT population experiences trauma, especially sexual trauma. Sexual trauma by itself often has severe consequences for physical and mental health. LGBT individuals are far more likely to experience sexual trauma than non-LGBT individuals, and are also more likely to suffer worse outcomes post-trauma (i.e., feelings of shame, self-blame, and stigmatization). It is likely that past or present religious affiliation could influence these outcomes due to general beliefs of sexual conservatism, encouragement of guilt/shame concerning sexual transgressions, and higher rates of endorsement for stereotypical gender norms and rape myth acceptance. This is especially likely for the LGBT population as religion is more often a source of stigma than of resiliency for this population. The present study seeks to examine the relationship between religious affiliation and trauma-related beliefs among sexual trauma survivors, and how this relationship may differ for LGBT vs. non-LGBT individuals. Participants are being recruited through WSU psychology 1010 classes and through Ogden Pride. Participants will complete a survey in which they report on past and present religious affiliations, LGBT status, sexual trauma history, and complete a trauma-related beliefs questionnaire (Hazzard, 1993). We hypothesize that past and present religious affiliation will be correlated to worse trauma-related beliefs, and that this relationship will be stronger for LGBT than non-LGBT. We also hypothesize that LGBT individuals will have generally worse trauma-related belief scores, and that the number of traumatic experiences and the number of different perpetrators will have a moderating effect. Once data collection is complete, we will conduct Pearson's correlation tests, an independent samples t-test, and a linear regression model to test these hypotheses.

Testing APEH Enzyme Activity as a Biomarker of Stress in a Mouse Model of E-cigarettes

Natalie Twogood

Mentor: Tracy Covey | Department: Chemistry and Biochemistry
American Chemical Society Midwestern Regional Meeting 2019 | Wichita,
Kansas

ABSTRACT

Acyl Peptide Enzyme Hydrolase (APEH) is a protease involved in the hydrolysis of N-acetylated amino acids from proteins and polypeptide chains. This protease also plays a role in degrading oxidized proteins. Excess oxidative stress occurs frequently in disease states and may play a role in the development and progression of that disease. We sought to investigate how APEH activity levels are affected in a mouse model associated with high oxidative stress. E-cigarettes and other electronic nicotine delivery systems have become increasingly popular over traditional cigarettes, but there are studies showing that this alternative method still results in high levels of oxidative stress. Using an E-cigarette model in mice, we have measured significant changes in APEH activity levels in various organs. This change may contribute to detrimental physiological effects caused by oxidative stress and E-cigarettes.

Tracking Glacial Retreat in the Peruvian Andes: Geologic Mapping in the Cordillera Blanca Documents

Analeah Vaughn

Mentor: Elizabeth Balgord | Department: Earth and
Environmental Geosciences

Geological Society of America 2019 | Phoenix, Arizona

ABSTRACT

The Cordillera Blanca in north central Peru, contains the largest collection of tropical glaciers in the world, the highest elevations in the northern Andes Mountains of South America, and provides a natural laboratory to assess the impact of climate change on high alpine ecosystems. The low latitude of the Cordillera Blanca means that the glaciers are vulnerable to the overall warming trend over the past few decades and the region has experienced rapid deglaciation as a result. The extreme topography of the Andes Mountains also generates a rain shadow making the western, much more populated portion of Peru, a desert. Therefore, glacial runoff and snowmelt from the mountains are the primary source of freshwater for the western portion of Peru during the dry season, so water quality and quantity coming out of the mountainous region of central Peru is crucial both locally and nationally. As the glaciers recede in the Cordillera Blanca, a zone of heavily mineralized rock is being exposed. This rock contains pyrite and other sulfide minerals, which when exposed to atmospheric oxygen cause water contamination. The most recent 1:100,000 scale geologic maps of the Cordillera Blanca were published in the mid-1990s, and used base maps from the late 1960s, meaning large areas of the newly exposed, sulfide-bearing units are not mapped on them, causing mismatches between the location of expected and actual water contamination in streams draining the range. Over the past four years groups of students and faculty from multiple institutions have worked to map drainages within the Cordillera Blanca to identify the extent of the mineralized zone and assess the control of bedrock geochemistry on water chemistry. This mapping has allowed us to predict where water contamination may get worse as the glaciers continue to recede.

Predatory Interrallations in Weber & Davis County Streams

Jackeline Wilkinson

Mentor: Christopher Hoagstrom | Department: Zoology
Desert Fishes Council 2019 | Alpine, Texas

ABSTRACT

Studies of aquatic-riparian ecosystems suggest that trout can impact associated invertebrate predators, like aquatic larvae of perlid stoneflies, water-surface dwelling water striders, and riparian tetragnathid spiders. We studied 100 m reaches in seven small streams along the northern Wasatch Front (Weber and Davis counties, Utah). In each stream, we counted water striders, horizontal spider webs (characteristic of tetragnathids), and used kick nets to sample perlid larvae along 10 evenly spaced transects. We also measured wetted width and water depth. We made pebble counts every 0.2 m across transects and measured all submerged and aerial branches (stem width). We sampled trout through each reach with a backpack electrofisher and calculated habitat volume as median width x median depth x reach length to calculate biomass based on trout total length. We used Pearson correlations to explore potential relationships of depth, width, substrate, submerged branch, aerial branch, and trout biomass with the densities of water striders, spider webs, and perlid larvae. We found most significantly that water-strider and spider-web density were inversely correlated with depth and spider-web density was positively correlated with median width and with submerged-branch density. Interestingly, perlid density correlated positively with trout biomass. Overall, this suggests trout abundance is not necessarily the primary driver of abundance in other aquatic or riparian predatory invertebrates and that habitat features can be important. For instance, in streams with higher productivity, multiple predator populations might increase. Also, streams with greater width may have a higher diversity of habitats, with more opportunities for different predators.

TRAVEL ABSTRACTS

TOSH Opioid Hisk-Risk Patient Home Monitoring Study

Madison Wilkinson

Mentor: Paul Eberle | Department: Respiratory Therapy
American Association for Respiratory Care Congress 2019 | New Orleans, Louisiana

ABSTRACT

Opioid related deaths have been rapidly increasing. Utah legislation has acknowledged the issue of the opioid crisis in our county, as well as, the need for further studies to collect more data regarding the effects of opioids after surgery. Due to the request from the state legislation, Intermountain Healthcare has taken strides to implement safer protocols and further research regarding opioids taken postoperatively. Currently, The Orthopedic Specialty Hospital (TOSH) has instituted a larger study consisting of 500 patients. This study monitors opioid high risk patients in home by discharging patients with a machine that monitors capnometry and pulse oximetry. I am fortunate to be a member of the team working on this study.

Properties Designer: WSU's The House of Edgar Allan Poe

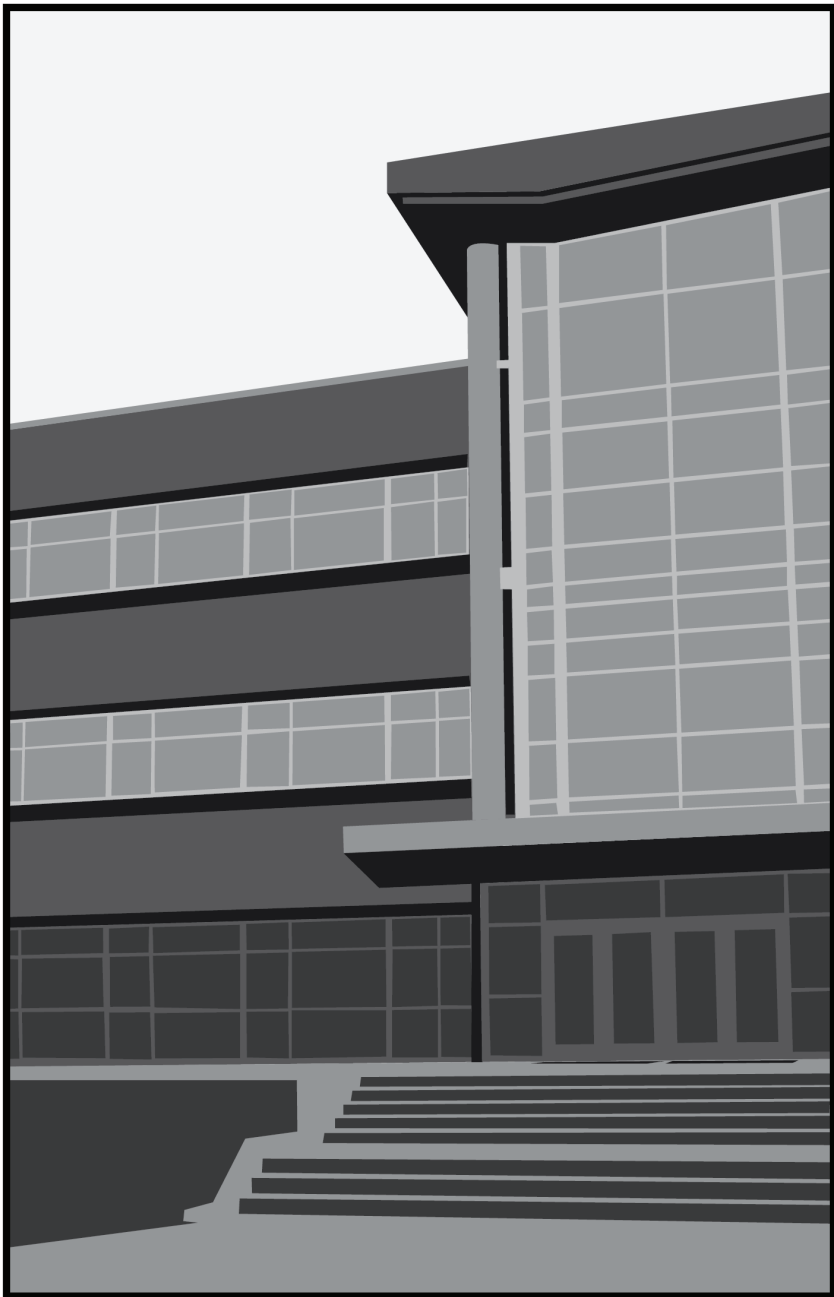
Victoria Wood

Mentor: Catherine Zublin | Department: Performing Arts, Theatre
Kennedy Center American College Theatre Festival 2020 | Fullerton,
California

ABSTRACT

Victoria Wood will be attending The Kennedy Center American College Theatre Festival (KCACTF) February 10th-16th. While at the festival she will present her work as the Properties Designer for Weber State University's production of The House of Edgar Allan Poe. This production is a deep dive into the intricate workings of Edgar Allan Poe's mind and is intertwined with multiple stories that he was most noted for.

Research Articles



Volume 16

Relative Deprivation Theory: Reconstruction Perceptions on Graffiti

Rebecca Baggett

Mentor: Mark Galaviz

Department: Communication

ABSTRACT

During the year 2020, after the death of George Floyd and the events surrounding the Derek Chauvin trial, the Smithsonian documented a significant increase in street art across the United States and internationally. These events bring to light an important discussion of graffiti as a form of peaceful protest. Research by Ohio University and the Harvard Political review finds a link to protest art in multiple Black Lives Matter Movements as it plays a significant role in building community and connection. The connotation surrounding the term “graffiti” in a negative context holds demographically exclusive roots. This paper seeks to highlight the importance of recognizing the beneficial elements of graffiti. Additionally, this research emphasizes the needed changes in the art industry to validate forms of accessible free speech such as street art.

RELATIVE DEPRIVATION THEORY: RECONSTRUCTING PERCEPTIONS OF GRAFFITI

Bare, artless, empty, crude, obscene, barbarous, black, these are words often used to describe graffiti. This is calculated using the algorithm of the most searched words associated with graffiti from reversedExceptionary.org. The way we frame words has a major impact on society. Graffiti is particularly interesting because of what it does: it conveys a sense of community, of art, and challenges the viewer to think beyond their own experiences. It is with that in mind we must ask the following research question: “how does the Black Lives Matter Movement rhetorically reconstruct the perception of graffiti?” To answer this question we’ll turn to Samuel Stouffer’s (1949) relative deprivation theory. This theory is appropriate because it clearly shows that people who are deprived of things deemed valuable in society often join social movements in hopes of correcting these deprivations. After examining this theory we will apply it to protest graffiti used in the Black Lives Matter Movement, before finally drawing some critical implications.

First we will examine our theory. According to Stouffer, relative deprivation is the idea that one determines his status based on comparison with others. Our modern understanding of this theory largely comes from the research of Walter G. Runciman (1966). In his book *Relative Deprivation*

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and Social Justice, he provided further evidence that this theory applies to a wide variety of deprivations, including economic disadvantage and employment inequality. The theory presents the idea that people who experience systematic setbacks, unfair treatment, lack of accessibility, unequal rights, and otherization are more likely to participate in social movements than those who do not believe they are at a disadvantage. The University of Chicago states that “the relative deprivation theory posits when an individual or group compares itself with a salient individual or group and finds themselves lacking or disadvantaged, this leads to anger and frustration.” This anger and frustration that arises fuels the engine of social change. The disparities lead people to action, which is why this concept is a key element of protest theory—it explains the “why” behind social movements. We can apply this theory by looking at social movements and evaluating the reason for the call to action--what rights are being withheld, what inequalities does the group experience, what exists to motivate a group to push for action and change.

An example of this is women’s employment initiatives. The article “Perceptions of relative deprivation and women’s empowerment” published November 2020 Kosec et al. provided research focused on relative deprivation and perspectives of women in the workforce. They found “that both women and men primed to feel relatively poor are more likely to support [women] engaging in paid employment, which suggests that feelings of relative deprivation and the salience of inequality can prompt support for women’s economic participation. In contrast, households that are relatively well-off may not feel compelled to increase their income through women’s work.” Those who would be most impacted by women working are more likely to support women’s employment because they experience the deprivation that results from gender-related pay inequalities. The people who are affected by the deprivation are more likely to take an active and positive stance on women’s equal opportunities in the workplace. Those who are not as heavily impacted by a woman working, such as those of a higher economic status, are less likely to support women in the workplace because they don’t consider it a need. In other words, they do not perceive the deprivation. These higher income households are less likely to be invested and involved in women’s economic movements such as the wage gap and glass ceiling effect.

Now that we have some context, we will apply this theory to protest art

within the Black Lives Matter Movement. The Harvard Political Review published an article in October 2020 titled “Street Art Activism: What White People Call Vandalism.” As the title suggests, the article compares two perspectives of street art and graffiti. One, a compelling form of activism, the other, a city-devaluing crime. Although the concept of graffiti in social movements isn’t new, we must recognize its significant role in the Black Lives Matter Movement.

In June of 2020 the Smithsonian publicly launched the George Floyd and Anti-Racist Street Art database. “we [soon found ourselves] playing an important part of documenting what might be the largest global explosion of street art addressing one single event or subject in history. It was an amazing artistic expression of rage, pain, mourning and trauma.” The street art and graffiti response to the death of George Floyd was not only across the U.S., but also internationally. A BBC article titled “The street art that expressed the world’s pain” published December 2020 states “Graffiti is [a] contemporary statement about society. [There] is righteous fury in BLM-inspired graffiti, and also beauty in its details: the names of great thinkers, creators and activists; the image of unity, strength and potential. Black experience cannot be encapsulated as trauma alone; its celebratory, inspirational range must be wholly acknowledged.” We cannot choose to only acknowledge graffiti that is beautiful, we need to also validate the expression of trauma. As the article from the University of Chicago suggests, the theory posits this situation because the members of the black community compared the way members of their community are treated by police to other groups, for example the white population, and find themselves disadvantaged. The increase in street art and graffiti was a statement that called attention to this deprivation.

The response to George Floyd’s death isn’t the only time street art and graffiti have been used in BLM protests. Ohio University published a research article in 2017 “Defining and Understanding Street Art as it Relates to Racial Justice in Baltimore, Maryland” The article reviews the street art increase in Baltimore after Freddie Grey died in police custody. “street art associated with the Black Lives Matter Movement in Baltimore speaks to culturally sensitive, justice themed works, the bonding of community members, and healing after loss and trauma.” It provides a space for people in the community to mourn together.

“Protestors for the Black Lives Matter Movement are aiming to change

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the dialogue about race by taking to the streets and making known the sentiments of people who are affected by injustice, these actions were not a response to only Gray's death. They were reactions to years of discrimination and dissatisfaction with institutional systems."

Social Deprivation Theory suggests that those who are more impacted by social deprivation are more likely to be actively involved in social movements. A Pew Research article in September 2021 found that 83% of Black Americans support the Black Lives Matter Movement, compared to only 47% of white Americans support the Black Lives Matter Movement. Those that are less likely to be impacted by social deprivation are less likely to be involved in the process of social change. City walls are canvases for those who are suffering from social injustice and social deprivation to create a sense of community, but also to convey their experiences to those of us who have not felt this deprivation.

Finally, What are the critical implications of this? One of the most prevalent challenges of free speech is equal access to platforms. In this discussion of street art we are including graffiti, tagging and unsanctioned pieces. By labeling graffiti and street art as "obscene" or "empty" we disqualify yet another method of accessible free speech. Unsanctioned art and unknown artists tell valuable narratives. To become an artist who is awarded opportunities to create sanctioned pieces is a process that is not equitable or equally accessible. If we only value the free speech of those that are highly educated and have formal artistic training, we need to take into consideration the current demographics of university classes.

According to the Postsecondary National Policy Institute, "In 2019, 29% of the Black population aged 25 to 29 held a bachelor's degree or higher, compared to 45% of the white population in the same age range." Due to long lasting effects of systematic racism, our country is still trying to achieve equity in academics. The insufficient equity in academics is a social deprivation. This dilemma of inequity extends to the art community itself. The Art Newspaper in July 2020 stated "It is one of the art market's most uncomfortable truths that, although black and minority artists are enjoying greater representation, it remains white people who predominantly sell—and buy—their work" Therefore, if we limit artists to only express themselves through the formal art industry, there will be a continuance of systemic oppression because of the lack of equal accessibility and value.

Platforms such as graffiti are important because they eradicate the hurdles that usually exist in our inequitable systems and grant equal access regardless of race, education, economic status, gender or sexual orientation. Returning to the Harvard article, “If you are a street artist, there’s a higher chance of you being low-income, a person of color, female, or part of the LGBTQIA+ community.” By stigmatizing street art, we push marginalized groups further into the background instead of bringing them front and center. Rather than creating a safe space for groups and individuals who experience social deprivation to thrive and express themselves through activism art, we are devaluing their attempts to peacefully illustrate their struggles. In reference to the burst of protest art after George Floyd’s death, the BBC adds, “In a year when history is being emphatically questioned, and where a global pandemic has shut conventional galleries and museums, street art also highlights a diversity of viewpoints.” The pandemic closure of galleries benefited in the increase of artistic diversity. If we only value street art that are sanctioned pieces or created by acclaimed artists such as Banksy, we are reaffirming the narrative that the only art of value belongs to those of a certain economic standing, art style, demographic, or those with opinions that match the majority. We need diversity in our street art as it creates an accessible platform for artists who have experienced social deprivation to share their insights.

We have addressed Stouffer’s imperative protest theory of relative deprivation, applied it to current events of Black Lives Matter, and brought to light the critical implications of excluding graffiti from valued societal recognition. Graffiti is not bare or artless. Please note, we are not only talking about murals, sanctioned pieces and “pretty art.” We are discussing the importance of the tags, the unknown artists, the statements of protest and pain, the expression of exasperation and frustration, resulting from systematic deprivation.

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Review: SHERLOCK Point-of-Care Genetic Test for *Mycobacterium tuberculosis* complex

Brittany Basham, Taygun Loader & Joshua Tay

Mentor: Matthew Nicholaou

Department: Medical Laboratory Science

ABSTRACT

Nucleic acid testing (NAT) has become the gold standard for the identification of microorganisms but current methods have significant disadvantages: cost, complexity, specificity, and sensitivity. The Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) system is a recent advance in the understanding of genetics in microorganisms that has fundamentally altered the field of organic science. Our present understanding of how the CRISPR system works allows us to further specialties such as agriculture, biology, chemistry, and medicine. One such advance is the utilization of the CRISPR system in NAT, specifically for the detection of *Mycobacterium tuberculosis* (MTB) complex. Given that the current testing methodologies for MTB complex can be generally limited, time-consuming, or expensive, CRISPR provides a path forward to quick and inexpensive diagnostic genetic testing. This review highlights the need for better MTB complex testing and summarizes the evidence in favor of implementation of CRISPR technology as a diagnostic tool for tuberculosis in point-of-care settings based on lower cost, higher sensitivity, and lower testing procedure complexity when compared to current alternatives.

METHODS

Scholarly research articles were compiled from various online repositories of medical journals. A summary of the methods used during article search is summarized in Figure 1. Researchers were tasked with independently gathering relevant articles on different topics (Fig. 1). On Google Scholar, the search term “History of CRISPR” returned 88 results, two of which were used in the review. The two articles were written by: Ishino et al., 2018 and Torres-Ruiz & Rodríguez-Perales, 2016. Four sources from the Ishino et al. article were chosen to provide more details. The four sources from the Ishino et al. article were: Barrangou et al., 2007; Jansen et al., 2002; Mojica et al., 1993; Mojica et al., 1995. The search term “Jennifer Doudna CRISPR gene editing” returned 46 results on Google Scholar, two of which were used. The two articles were written by: Jinek et al., 2012 and Ledford & Callaway, 2020. On PubMed, the search terms “History” AND “*Mycobacterium tuberculosis*” AND “test” returned 797 results. Ten sources were included in the review. An additional four reports were sourced from the Centers for Disease Control and Prevention and the World

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Health Organization for a total of fourteen sources. Pricing for the tests referenced in Table 1 was calculated using CPT codes acquired from the ARUP website (ARUP Laboratories, 2020) which were then inputted into FairHealthConsumer.org. Prices listed are average for Salt Lake County, Utah, which should be a fair estimate for most metropolitan areas. On MEDLINE, the search terms “CRISPR” and “Diagnosis” returned 411 results. Results were then refined to only include scholarly, peer reviewed articles relevant to the topic of interest with available full text. From these, six articles were selected that detailed the SHERLOCK testing method and different applications of the SHERLOCK testing method.

INTRODUCTION

History of Tuberculosis

Tuberculosis is one of the oldest diseases known to mankind. According to a study published in *Clinical Infectious Disease* in 2001, MTB was positively identified in prehistoric bison in the area known as the Natural Trap Cave located in Big Horn County, Wyoming (Rothschild et al., 2001). Many cases have appeared throughout history, such as a “wasting disease” in the King James Bible (Daniel & Daniel, 1999), confirmed tubercles found in 7000-year-old Egyptian mummified bones (Zink et al., 2003), and evidence of *Mycobacterium* infections in South America as recent as 1200 CE (Konomi et al., 2002).

It was not until the late 19th century that Robert Koch elucidated the bacterium *M. tuberculosis* as the root cause of disease. Koch was inspired to find the causative organism of tuberculosis when he attended the Seventh International Medical Congress in 1881. His development of tuberculin would become a vital component of the tuberculin skin test which is still used as a screening test to identify latent tuberculosis infections (Sakula, 1982). Koch’s work on tuberculosis became the foundation for subsequent research to build upon. Shortly after Koch gave up finding a cure, a pair of scientists in France made attempts to develop a preventative vaccine for MTB which resulted in the development of the bacille Calmette-Guérin (BCG) vaccine. The BCG vaccine began to be distributed shortly after the outbreak of World War I and was adopted worldwide after the end of World War II. The last major advancement of 20th century tuberculosis research lies in the discovery of the antibiotic, streptomycin, by Albert Schatz under Selman Waksman on October 19, 1943. Streptomycin was

the first antibiotic to show any significant effect on *M. tuberculosis* pathogens and was lauded as the cure that the world had been waiting for (Nobel Prize Outreach, 2021). However, antibiotics effective against MTB are becoming harder to find; drug-resistant strains are becoming prevalent, making early detection a vital effort. According to the World Health Organization's (WHO) 2019 Tuberculosis Report, there are still an estimated 10 million tuberculosis cases per year. Of these cases, approximately 14%, or 1.4 million, result in death (including patients co-presenting with HIV), making tuberculosis one of the top 10 causes of death worldwide in 2019. Conversely, an estimated 60 million patients were saved in the same year due to accessible treatment and testing (World Health Organization, 2020).

Current TB Testing

The Tuberculin Skin Test (TST), also known as the Mantoux Test, was based on Koch's Old Tuberculin and was first described as a viable test by Felix Mendel in 1908. Mendel's research was based upon several experiments that had been attempted by the test's namesake, Charles Mantoux, the year prior (Sakula, 1982). Decades later, Florence Seibert and Esmond Long made a vital discovery: the active agents in tuberculin were specific proteins synthesized by MTB. Seibert spent several years perfecting a process to extract these proteins from MTB which resulted in Purified Protein Derivative (PPD) which is still in use worldwide today (Goldstein et al., 2002). According to the CDC, 0.1mL of PPD is administered to a patient intradermally on the forearm with a tuberculin syringe, bevel up. If done correctly, the injection should produce a wheal—a pale and elevated patch of skin—that is approximately 6 - 10 mm in diameter. The wheal is analyzed between 48 to 72 hours later, and a diagnosis is then made using the results of the skin test in conjunction with a patient's history. While the TST is the most common MTB test worldwide, it has a few downsides. Critically, the test is very susceptible to false-positive tests as it is not specific for MTB: non-tuberculosis *Mycobacteria* infections, BCG vaccination, and incorrect dose administration of the PPD injection can cause false-positive reactions (Centers for Disease Control [CDC], 2020).

The next most common MTB test worldwide is the cellular response assay. Many of these tests rely on the same principles to test for MTB infection, with the most prevalent being the QuantiFERON-TB Gold Test (QFT) and the T-SPOT.TB test. While both tests utilize different antigens and testing methodologies, they both measure the release of Interferon- γ (INF- γ) from

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lymphocytes collected from peripheral whole blood. As the QFT is the most commonly used in the United States, we shall describe it in further detail. The QFT, approved by the FDA in 2005, was specifically developed to be a successor to the TST and utilizes portions of PPD to stimulate the release of INF- γ . When peripheral whole blood is collected for QFT testing, it must be immediately sent to the lab and processed within 16 hours of collection. The blood is then aliquoted into tubes containing one or more of the following TB proteins: ESAT-6, CFP-10, and/or TB7.7 (CDC, 2011). INF- γ is then quantified from each of the tubes utilizing an enzyme-linked immunosorbent assay (ELISA) technique. This method is highly specific, and unlike the TST, can be performed on samples from patients that have been immunized with the BCG vaccine (Taggart et al., 2004). Potential downsides to INF- γ assays are that false positives are still frequent due to protein impurities. These assays are also less accessible compared to other assays due to high cost and the need for laboratory equipment.

Finally, the last modern testing methodology is the culture method. This entails taking a sample from the patient, preferably a deep-lung aspirate, and inoculating a specialized media to see if any MTB develops; samples from other bodily regions such as peripheral blood or CSF may be indicated if a physician suspects a case of extrapulmonary MTB. The most common culture media for MTB is the Lowenstein-Jensen medium, though it is possible to develop good colonies on a standard 5% sheep blood agar (Drancourt et al., 2003). In combination with culture growth, several confirmatory and supplementary tests may be done as well, such as an acid-fast stain and microscopy, fluorochrome microscopy, nucleic acid amplification, and Polymerase Chain Reaction (PCR). Being the most sensitive and specific assay out of current testing methodologies, culture is the gold standard for MTB identification and classification at time of writing. However, there are serious disadvantages to the culture method. First, cultures may take between 4 to 84 days to produce identifiable colonies suitable for chemical analysis and NAT, making it very difficult for physicians to treat patients in a timely manner. Second, sampling must be done in a contained and isolated location, especially for sputum samples, to prevent the spread of infectious particulates. Laboratory culturing and testing is usually done in a negatively pressurized biosafety level 3 laboratory with technicians outfitted with respirators, due to the prolonged period that MTB will be culturing on-site. These disadvantages increase the price of the procedure tremendously (CDC, 2021).

CRISPR

The CRISPR system is an important tool used in biomedical research. Bacteria and archaea evolved the CRISPR/Cas systems as an RNA-mediated adaptive immune defense system that relies on short RNA strands for sequence-specific detection and silencing of foreign genes (Jinek et al., 2012). The CRISPR-Cas9 system was developed as a genome engineering tool in 2012 (Torres-Ruiz & Rodriguez-Perales, 2016). The development of CRISPR is credited to Emmanuelle Charpentier and Jennifer Doudna, who received the 2020 Nobel Prize in Chemistry (Ledford & Callaway, 2020).

History of CRISPR

The short palindromic repeat sequences of CRISPR were first discovered within *Escherichia coli* in 1987 during an analysis of the gene responsible for isozyme conversion of alkaline phosphatase (Ishino et al., 2018). Repeats similar to what was found in *E. coli* in 1987 by Ishino et al. were found in *Haloferax mediterranei* by Mojica et al. in 1993 who, at which time, noted the short tandem repeats and their similarity to short tandem repeats found in *E. coli*, but stated their significance was unknown at that point. In 1995, Mojica et al. found tandem repeats in *Haloferax volcanii* and analyzed the similarities between *H. mediterranei* and *E. coli*. The conclusion that Mojica et al. came to was that the tandem repeats may have a universal function of replicon binding sites. In 2002, Jansen et al. coined the term “Clustered Regularly Interspaced Short Palindromic Repeats” which is abbreviated as CRISPR. Short sequence repeats (SSRs) can be separated into two classes: contiguous repeats and interspersed repeats (Jansen et al., 2002). Interspersed repeats are commonly found in bacteria and are non-coding, intergenic, and widely dispersed throughout the genome (Jansen et al., 2002). To ease classification, Jansen et al., in collaboration with Mojica et al., decided to name the family of repeats: CRISPR. A key characteristic found only in CRISPRs, and not other classes of repeating DNA, is that the repeats of CRISPRs are interspaced by similarly sized nonrepetitive DNA (Jansen et al., 2002). Barrangou et al. discovered CRISPR’s function in 2007 when cultures of *Streptococcus thermophilus* showed that its adaptive immune system had the ability of phage resistance when a phage sequence was introduced to *S. thermophilus*’s CRISPR spacer region. It is hypothesized that prokaryotes evolved a nucleic acid-based immune system that is dictated by the CRISPR spacer content, and resistance is provided by Cas enzymatic machinery (Barrangou et al., 2007). CRISPR utilizes trans-activating

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CRISPR RNA (crRNA), which assists in target recognition to silence foreign genetic sequences by forming a complex with crRNAs (Jinek et al., 2012).

CRISPR diagnostic testing

A CRISPR/Cas9 system was developed in 2015 to precisely tag chromosomes with fluorescent markers on specific genetic sequences to aid in the analysis of chromosomal structure and resultant gene expression (Deng et al., 2015; Ma et al., 2015). The ability to target precise genetic sequences is a key asset of CRISPR diagnostics (CRISPR-Dx). Two important advances in CRISPR-Dx have reduced its overall expense and technique complexity. First, the development of programmable crRNA sensors that can be coded to detect any target genetic sequence, and second, the development of lyophilized, paper-based testing materials that make CRISPR-Dx testing accessible in areas with limited resources (Pardee et al., 2014; Pardee et al., 2016).

CRISPR-Dx

CRISPR-Dx systems have been developed to be used for rapid NAT using a system termed Specific High-Sensitivity Enzymatic Reporter UnLOCKing (SHERLOCK). SHERLOCK utilizes the Cas13a nuclease (formerly known as C2c2) which induces cleavage at the surrounding base pairs adjacent to the target sequence. This is termed collateral-cleavage and results in detectable *in vivo* cell death or *in vitro* non-specific degradation of labeled RNA and indicates genetic sequence recognition (Gootenberg et al., 2017). When developed as a diagnostic test for malaria, the SHERLOCK method gave hope that the newly developed assay would make more possible the total eradication of the disease (Lee et al., 2020). A diagnostic assay for a disease like malaria requires a high level of specificity, portability, and affordability because the patient treatment plan changes depending on the species of *Plasmodium* causing the infection, and many malarial hot spots are in resource-limited settings (RLS) which do not have access to the necessary laboratory equipment (Lee et al., 2020).

Critical challenges to PCR, the “gold standard” of molecular genetic testing, are cost and complexity. In a broad sense, testing procedures commonly used for MTB detection can be complicated and usually necessitate a skilled technician for testing and interpretation. Normally, transcription and translation media (i.e. PT7) used to amplify nucleic acid concentration

in preparation for PCR require storage at -80 degrees Celsius (Pardee et al., 2014). The SHERLOCK method does not require such demanding laboratory practices yet it shares in the PCR method's ability to detect genetic sequences with both sensitivity and specificity. Strains of Zika and Dengue virus have been successfully differentiated using the SHERLOCK method with sensitivity to an in solution nucleic acid concentration as low as 2 attomolar. Further, the SHERLOCK system is resolvable down to individual nucleotides and has been shown to be capable of differentiating homozygous and heterozygous alleles and detect single base pair differences (Gootenberg et al., 2017).

Paper-based SHERLOCK testing

SHERLOCK testing reagents benefit from being amenable to lyophilization and rehydration, and are stable at room temperature (Pardee et al., 2014; Pardee et al., 2016). The lyophilized reagents can be imbibed into a paper-based platform which eliminates the need for complicated laboratory equipment and transforms the genetic testing process from a labor-intensive assay that can only be performed using specialized laboratory equipment into a simplified point-of-care assay. Paper-based SHERLOCK testing is apt in addressing the worldwide need for more accessible NAT, both in general and for MTB. According to Gootenberg et al., a paper-based SHERLOCK test can be redesigned and synthesized to be as low as \$0.61 per test. By use of the SHERLOCK testing method, a highly sensitive, diagnostic nucleic acid sequence test can be administered for a low cost and can be distributed in populations that do not have access to PCR or other commensurate technology. Given the threat that MTB poses for vulnerable populations worldwide, the development of a low-cost, readily available molecular diagnostic assay would help to control, or potentially eradicate, MTB.

SHERLOCK as a portable point-of-care test

With SHERLOCK imbibed on a paper-based platform, interpretation of test results is another challenge to be addressed. The SHERLOCK paper test can be interpreted by an electronic reader that can produce quantitative results derived from the colorimetric changes (Pardee, et al., 2016). Given the exacting nature of much laboratory work, easing the difficulties of test interpretation reduces the demand on laboratorians and medical facilities. A CRISPR-Dx MTB test would open doors to both resource-laden and resource-limited settings by expanding the availability of a low-cost

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MTB test that could help to reduce both morbidity and mortality rates in populations throughout the world.

CONCLUSION

CRISPR-Dx is an ideal candidate for a new diagnostic MTB test. It is relatively low-cost compared to current alternatives, and short assay run-times (Table 1) are desperately needed in point-of-care settings across the world, especially in resource-limited geographic areas. A more rugged and dispersible form factor, and having equal caliber sensitivity and specificity as PCR (Fig. 2) for genetic sequence recognition, make SHERLOCK a viable replacement for existing methods (Deng et al., 2015; Ma et al., 2015; Gootenberg et al., 2017; Lee et al., 2020). Critical challenges to PCR are cost and complexity which are solved by the many advantages of SHERLOCK-based assays. The estimated cost is \$23 for a TST, \$250 for a TB culture, and \$190 for a QFT. A paper-based SHERLOCK assay can cost as low as \$70 (Table 1). Thus, the cost of performing a SHERLOCK assay is less expensive than most testing alternatives. The comparison between MTB complex diagnostic tests indicates that the SHERLOCK method is a better alternative for three reasons: (1) lower materials cost which aids in increasing availability to a wider range of markets, (2) higher sensitivity allowing for a greater true positivity rate for low concentration cases, and (3) the advantage of SHERLOCK testing reagents being amenable to lyophilization and rehydration on a paper-based platform compatible with electronic test interpretation equipment enabling it to be freed from the confines of traditional, and costly, laboratory settings. Current testing methods for MTB complex have reached their limit of utility. A SHERLOCK point-of-care test is the next logical step in the effort to control/eradicate tuberculosis.

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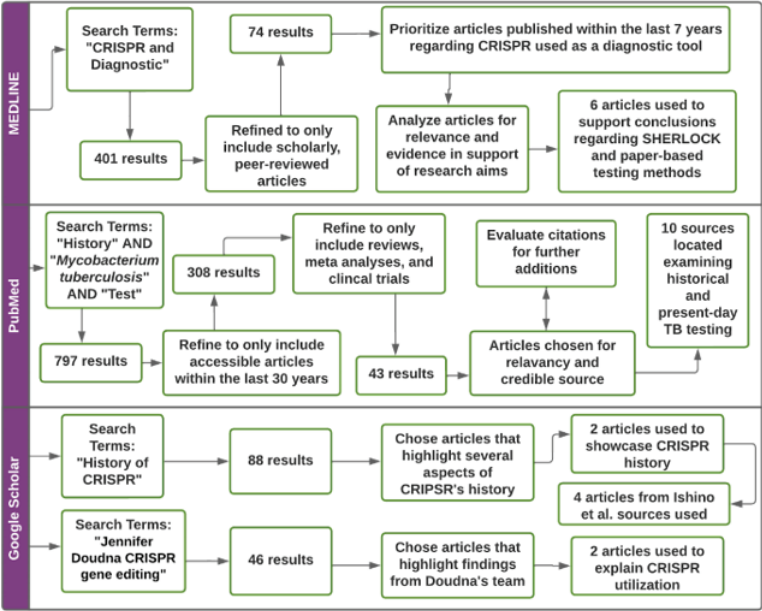


Figure 1. Research methodology for obtaining sources by category. (Note: three reports from the Centers for Disease Control and Prevention, and one report from the World Health Organization were also used.)

Table 1. Comparative analysis of test time frame and average cost per test.

Test	Time Frame	Approximate cost
TST (Mantoux)	48-72 hrs	\$23
QFT-G	2-16 hrs	\$190
Culture (Lowenstein-Jensen)	4-84 days	\$250
SHERLOCK (CRISPR)	2-3 hrs	\$70

Cost is based upon quoted current procedural testing (CPT) pricing for uninsured patients in the Salt Lake City, UT region collected from

FairHealthConsumer.org. The cost for SHERLOCK was estimated based on material costs and average clinical laboratory labor costs in the United States.

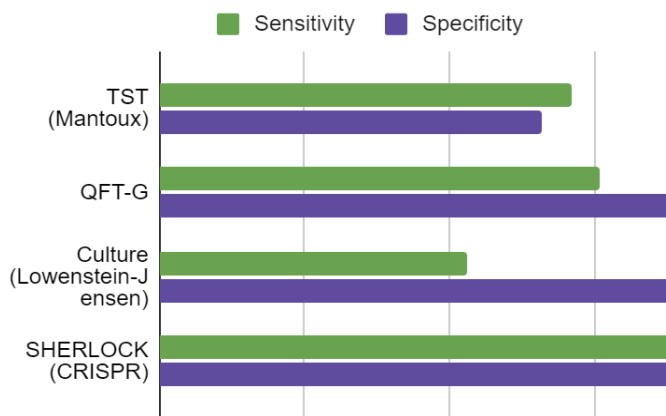


Figure 2: Cross-comparison of sensitivity and specificity for diagnostic tuberculosis tests. SHERLOCK shows the greatest levels of specificity and sensitivity (**SHERLOCK was 100% sensitive to target genetic sequence concentrations of at least 2 attomolar).

College Student Stress Levels and Their Willingness to Communicate

Tracy Compton

Mentor: Sarah Steimel

Department: Communication

ABSTRACT:

While many researchers have examined the impact stress has on college students, those studies have not yet fully examined how stress levels in college students might affect their ability/willingness to communicate with faculty and/or in their university courses. This study surveyed 223 Weber State College students to explore how undergraduate students' levels of stress (and reported causes of stress) affect students' willingness to communicate and motives for communicating in their classrooms and with their instructors. This pilot study revealed important findings about the relationship between stress and communication and offers interesting future paths to support the communication between college students and their professors.

RATIONALE

While many researchers have examined the impact stress has on college students (e.g., Edwards, Hershberger, Russell, & Market, 2001; Misra, McKean, West, & Russo, 2000), those studies have not yet fully examined how stress levels in college students might affect their ability/willingness to communicate with faculty and/or in their university courses. In addition, the contemporary context (e.g., global pandemic, conversations around police violence/BLM, economic recession, etc.) may provide a unique time point to better understand college student stress. Our Communication Research Methods class led by Dr. Sarah Steimel, decided to conduct a pilot study of how stress in currently enrolled Weber State University (WSU) students might affect their ability and/or willingness to communicate with faculty. This topic is germane because we are students living through the Covid-19 pandemic. Many of us have stressors in our lives from this unparalleled time. It's highly probable that students across the world are having similar experiences. Thus, this question is timely and is worth exploring. Pandemic related anxiety has recently been reported in the media. In the spring of 2021 anxiety levels among students at Ohio State University increased from 39% to 43% (Mozes, 2021). Also, half of the 33,000 students at Boston College reported having depression and anxiety in the Fall of 2020. 83 percent of those students reported that this negatively

affected their educational experiences (McAlpine, 2021). These reports indicate the need for further research. I will discuss our pilot study model and the results we found that show how pandemic related stress is affecting the communication of students at WSU. We hope that our research leads WSU university faculty to find workable solutions and policies to mitigate any unparalleled stressors that hamper communication between students and faculty.

HYPOTHESIS

I have chosen to analyze three hypotheses in this paper. They are as follows:

H1: As students' self-reported total stress increases, their excuse-making motives for communicating with their instructors will also increase.

I believe when people are under stress, they seek empathy from others and want to be given leeway. Excuse-making (e.g., explaining late or poor-quality work and absences) is an effective way to garner empathy from professors and obtain leniency in grading and/or deadline extensions. Students may feel that this reduces their school related stress.

H2: Differences in gender (male and female) will relate to differences in students' self-reported worry.

Many of the women in my college classes seem to be more engaged learners than my male peers. This trait could translate into women being more worried about their grades than their male counterparts. I want to see if my assumption is correct.

H3: Increases in students' self-reported empowerment correspond to increases in students' self-reported relational motives for communicating with their faculty members.

My assumption is that when individuals feel a sense of control, they will confidently communicate their needs and seek for a better relationship with their professors. Conversely, those who feel powerless, often won't discuss challenges with their professors. I want to see if empowerment increases communication.

METHOD

Data collection

As a class, we generated a list of topics we wanted to include in the study and found survey instruments (detailed below) to collect the data of interest.

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Dr. Steimel collated these instruments into a survey and requested approval from WSU's Institutional Review Board (IRB) for human subject's research. The IRB ensured that the welfare and rights of our participants were protected, and that we followed all University, State, and Federal guidelines (Weber State University, 2014).

After we received approval, each class member recruited a minimum of five WSU students through network sampling, to take our anonymous online survey. The purpose of the survey, the informed consent document, and the survey link were emailed to these students.

Though network sampling is a nonrandom form of data collection, for this pilot study we were hoping to target students currently enrolled at WSU to start to develop an understanding of the relationship between college student stress and communication during the Fall 2021 semester. As a result, this sample provided an interesting, albeit limited, introduction to this topic.

Participants and Procedures

We had 223 total participants ($N=223$) in our sample size. 214 students or 96% of those surveyed specified their gender. Nine (.4%) did not report theirs. 102 (45.7%) identified as male, 103 (46.2%) identified as female, four (1.8%) identified as nonbinary, four (1.8%) as other, and one (.5%) preferred not to identify their gender. Additionally, 211 participants identified their age. The ages ranged from 18 to 77 ($M=22.98$, $SD=6.655$).

The next set of questions asked the participants to identify their class formats. The results showed that for those who answered these questions, a majority (65.9%) of participants, were enrolled in at least one entirely online class. The fewest number of students (34.1%) were enrolled in a Face-to-Face class.

Instrumentation

To assess the stress and communication of students Dr. Steimel merged four existing surveys. First, we used Feldt's (2008) survey of College Student Stress. This Likert scale survey asks participants to rank their stressor frequency from Never to Very Often. Another survey we used was Kelly's (2004) College Student Worry survey. This interval survey helps participants identify their worry patterns by selecting answers from eleven options. The College Student's Learner Empowerment (Weber, Martin, & Cayanus,

2005) was also used. This eighteen-question Likert survey asks participants to rate from “Strongly Agree” to “Strongly Disagree” how they feel about their participation in class and their sense of empowerment. Finally, we used Martin, Meyers, and Mollet’s (1999) Student Classroom Motives survey. This survey asks participants to rate themselves on several communication scenarios with their instructors. Options include building relationships, clarifying assignments, gathering information, or asking questions about grades. Participants were also asked to identify their demographic traits. These included questions relating to age, race, gender, and employment, and current enrollment status at WSU. We also asked whether participants were first generation or non-traditional college students.

RESULTS

The results for each of the three hypotheses are discussed in this section.

H1: As students’ self-reported total stress increases, their excuse-making motives for communicating with their instructors will also increase.

A Pearson Correlation test was conducted to assess the linear relationship between total stress and excuse-making motives for communication. There was a positive relationship between total stress and excuse making, $r = .170$, with a significance level of $p = .019$. Thus, the test confirms my hypothesis because the significance level of .019 was less than .05. This significance level indicates that there is a positive correlation between a student’s self-reported increasing total stress and their increasing excuse-making. The correlation is weak because it is less than .30, but a slight relationship exists between these two variables.

H2: Differences in gender (male and female) will relate to differences in students’ self-reported worry.

An Independent Samples t Test for differences in the mean worry level among males and females in this sample reveals a value of $t = 3.593$ with a significance level of $p \leq .001$. Mean expressed level of worry on a scale of 1=None/Not at all and 11=Very Much/Continuously for males was ($x = 6.58$) and for Females was ($x = 7.85$). Again, this hypothesis is confirmed because the significance level of .001 is less than .05. This shows that males and females have different levels of worry, and that on average, females in this sample are reporting higher levels of worry. The results do not indicate

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why females worry more than males. Further research into the causes is needed.

H3: Increases in students' self-reported empowerment correspond to increases in students' self-reported relational motives for communicating with their faculty members.

A Pearson Correlation test was conducted to assess the linear relationship between total empowerment and relational motives for instructor communication. There was a positive relationship between total self-reported empowerment and relational communication, $r = .271$ with a significance level of $p \leq .001$. Thus, my hypothesis is confirmed because .001 is less than .05. This means that when students feel empowered, they are motivated to communicate more openly with faculty members.

DISCUSSION

The results of this pilot study indicate that the global Covid-19 pandemic has likely affected the students at WSU in negative ways. Particularly, as stress in WSU students has increased, their willingness to communicate with faculty has been negatively affected. Particularly, as WSU students feel stress, they are more likely to make excuses for late or poor-quality work. We also learn that female WSU students worry a bit more than their male counterparts. Another key finding is that the more empowered a student feels, the more willing they are to communicate with their professors. This suggests that open and honest communication cannot occur when mental health challenges, like anxiety and stress, overwhelm a student.

Though this study provides a meaningful snapshot into student stress and communication at one particular university during Fall 2021, this study should be replicated in other contexts (other students, other semesters, etc.) in order to more fully understand the relationship between college student stress and communication. Yet, this pilot study results can give WSU faculty members tools to help their students succeed, despite the stress they feel. If professors notice that students are making more excuses than normal for missed or late work or begin to disengage while in class, they might recognize these behaviors as signs of increased stress, rather than signs of laziness. To mitigate student stress, faculty may want to reach out individually to students who exhibit these behaviors and offer extra help. This can be done by inviting students to meet during office hours or on Zoom calls. Faculty can also be prepared to change individual or class due

dates or revise assignments to ease the general anxiety level of their students.

It would be extremely beneficial to understand what factors cause students to feel empowered. We know from this study that when students feel empowered, they communicate more clearly and effectively with faculty. Just what causes a student to feel empowered is not identified in this study. This is something that should be studied further because, according to our survey, this is the key to unlocking communication between students and faculty.

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Validation of a Laboratory Developed Test for the Detection of Polyagglutination

Ryan Kohli, Braxton Campbell & Victoria Jones

Mentor: Matthew Nicholaou & Justin Rhees
Department: Medical Laboratory Science

ABSTRACT

The T-activated form of polyagglutination (PA) is a rare condition caused by certain microorganisms that cause abnormal agglutination of red blood cells (RBCs). This occurs when the microorganisms produce enzymes that modify the surface antigens on RBCs. These modified antigens, called cryptantigens, can react with antibodies found in human sera that occur naturally. Adult sera containing the naturally occurring anti-T antibody will react with T-activated RBCs. This is harmful as PA can cause in vivo hemolysis, especially during plasma transfusion. Currently, there are no commercial testing kits available in the United States to test for PA if the patient is suspected of having the condition. Previous researchers at Weber State University produced a Laboratory Developed Test (LDT) kit that can be used to detect T-activated PA. This study validates the LDT they developed as a viable test that can be adopted by clinical labs for the detection of T-activated PA after the replication and successful T-activation and agglutination of 60 samples using the lectin isolate. Further, this study provides confirmation that seven of the eight major blood types can be used for the creation of the T-activated control cells for the LDT and demonstrates that the various anticoagulants or preservatives the cells have been collected and stored in does not inhibit the T-activation process.

INTRODUCTION

The blood condition polyagglutination (PA) is a rare disorder in which red blood cell (RBC) surface antigens are modified by bacterial enzymes. These modified antigens reveal cryptantigens to which the body has naturally occurring antibodies that cause agglutination of the modified, or activated, RBCs (Roseff, 2017). The most common form of PA is the T-activated form, which includes the modification of the M, N, and S antigens found on human RBCs by the enzyme neuraminidase (Luban & Ramasethu, 2001). Students at Weber State University have produced a Laboratory Developed Test (LDT) lectin kit that can be made in-house and used for accurate testing of T-activated PA for three months, if stored in proper conditions (Rebolledo, Fishburn, Hill, 2019). This is important as commercial testing kits are not currently available for purchase for clinical labs to use if they suspect a patient has PA. Because of this, they must use expired reagents, create their own kits, or simply not test for the condition.

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The LDT includes the T-activation of red blood cells (RBCs) using neuraminidase, a bacterial enzyme obtained from cultures of *Streptococcus pneumoniae* (Beck & Judd, 1980), and the isolation of a lectin from *Arachis hypogaea* seeds that accurately detect the exposed T cryptantigen via agglutination (Judd, Johnson, & Storry, 2008). These T-activated RBCs are a positive control that confirms the lectin isolate accurately detects the exposed T cryptantigen while non-activated RBCs are used as a negative control. While creating the LDT, the previous researchers used Group O Rh-negative RBCs from Ethylenediaminetetraacetic acid (EDTA) whole blood to create the positive control RBCs. This study provides validation of the LDT with the testing of 60 samples that were successfully T-activated and agglutinated when exposed to the lectin isolate. To provide additional options to create the kit, seven of the eight main ABORh blood types of RBCs underwent T-activation and lectin testing. Further, the anticoagulants and preservatives used in the collection and storage of the RBCs were recorded to confirm if the anticoagulant or preservative used inhibited the T-activation. The anticoagulant includes EDTA while the preservatives include AS-1 (Adsol), and AS-3 (Nutricel), hereafter referred to as “additives”.

MATERIALS AND METHODS

To replicate and validate the LDT, we followed the methods as described in the LDT to collect the needed enzyme, T-activate the RBCs, isolate the lectin, and perform the test. With little modification and scaling to produce sufficient volumes of enzyme and lectin for testing, we were able to successfully replicate the LDT as outlined below.

Lectin Isolation

To isolate the lectin, 8,2000 g of *A. hypogaea* seeds were soaked in 60 mL of phosphate saline buffer (PBS) for a period of 24 hours. The seeds were then removed from the PBS and ground into a paste using a mortar and pestle, which was then centrifuged with the remaining PBS at 1400 rpm for 5 minutes. Following centrifugation, the supernatant was removed and stored at 4 degrees C in a sterile bottle along with a 0.1% sodium azide solution to prevent microbial growth.

Enzyme Collection

A Streptococcus pneumoniae ATCC 49619 strain was isolated on a sheep blood

agar (SBA) plate and incubated in a 5% CO₂ incubator at 37 degrees Celsius for 24 hours. Testing of catalase and optochin susceptibility were performed to confirm the species. To obtain the neuraminidase enzyme, forty isolated colonies were mixed with a solution of 160 mL of tryptic soy broth (TSB) and 40 mL of a prepared 0.5% dextrose solution then incubated again in an air incubating mini-shaker at 37 degrees Celsius for 24 hours to allow for neuraminidase production. After the second incubation, the solution was centrifuged at 1400 rpm for 5 minutes and the supernatant was filtered through a 0.45-micron filter and stored at 4 degrees Celsius.

Sample Preparation and T-Activation

The T-activated control cells were prepared from donated and deidentified samples including 30 EDTA whole blood samples and 30 packed RBC donor segments. Each sample was assigned an identifier for tracking, and the additive was recorded. The cells were forward typed using the traditional tube method and recorded. The cells were then washed three times to remove the anticoagulant/preservative and treated with neuraminidase enzyme filtrate in a 1:1 ratio of packed RBCs to enzyme filtrate. Samples were incubated at 37 degrees Celsius for 2 hours to allow for T-activation.

Testing and Storage

To test the procedure, two drops of blood were transferred into a new tube. The blood was then washed three times and prepared into a 3-5% cell suspension. In a second tube, two drops of lectin isolate were mixed with one drop of the washed T-activated RBC suspension and incubated at room temperature for 5 minutes. The process was repeated for each of the 60 samples. A negative control was prepared using non-activated RBCs in place of the sample. The samples were then centrifuged for 15 seconds and the agglutination was read against the negative control using the 0-4+ hemagglutination scale, and reactions were recorded. Following testing, all samples were washed three times to remove the enzyme filtrate and stored in a 1:1 ratio with Alsever's solution to preserve cellular integrity and stored at 4 degrees Celsius.

Monthly Testing

After the initial testing, each sample was tested after four, eight, and 12 weeks of storage to confirm the longevity of the cells and lectin. To test

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longevity, two drops of blood were transferred from the stored sample into a new tube and were tested as outlined above beginning with the wash steps. A negative control of non-activated RBCs was tested with the lectin at each four-week interval of testing.

RESULTS

To validate the LDT, a large RBC sample group needs to undergo successful T-activation and the lectin needs to produce strong agglutination. With the successful T-activation and strong 4+ agglutination of all 60 samples while using the lectin, we can validate the LDT (Table 1). Further, plasma from an adult AB Rh-negative sample containing the naturally occurring anti-T antibodies agglutinated the T-activated RBCs and did not react with the negative control of non-activated RBCs, which also confirms successful T-activation. To determine if other ABORh blood types can be T-activated, RBCs from each type need to be tested following the methods in the LDT. With the successful T-activation and strong 4+ agglutination of the seven ABORh blood types, we can confirm the suitability of these specific ABORh blood types for the creation of the positive control cells. To investigate if various additives inhibit the T-activation of the RBCs, RBCs need to be tested from different sources. With the successful T-activation of RBCs from the three different additives, this demonstrates three suitable options to source the RBCs from to create the positive control cells.

DISCUSSION

The purpose of this study was three-fold, including: the validation of the LDT created by researchers at Weber State University, investigation of the possibility to utilize other blood types for the creation of the positive control cells in the LDT, and determination of whether various anticoagulants or preservatives inhibit the T-activation.

Because all 60 samples produced strong agglutination, we can confirm the LDT is an easily reproducible and valid test that can be used in the clinical lab for the detection of T-activated PA.

The only variation in methods is the length of time needed for the control cells to incubate with the enzyme filtrate to T-activate. The LDT states a 24-hour incubation is required for T-activation. In our study, we tested different lengths of incubation and found the two-hour period to be the threshold at which the cells were sufficiently T-activated by the neuraminidase

filtrate. Any shorter time results in little to no T-activation activity; any longer incubation resulted in increasing hemolysis. This could be due to various concentrations of the neuraminidase enzyme in the enzyme filtrate, depending on how active the *S. pneumoniae* cultures are. Future studies could evaluate specific concentrations of enzyme and the length of time needed for T-activation at each concentration.

The blood type of the cells used to create the positive control for the LDT did not appear to have any impact on the T-activation ability. Of the seven out of eight ABORh blood types tested, all produced strong agglutination (Figure 2). This confirms that other blood types may be used to create the positive control cells in the LDT if the originally used O Rh-negative blood is not available. B Rh-negative RBCs were not available for our study. Further studies could evaluate if B Rh-negative RBCs are able to be successfully T-activated.

The additives the RBCs were collected and stored in did not inhibit the T-activation or strong agglutination (Figure 3). This confirms that RBCs from EDTA, AS-1, and AS-3 sources are viable options for creating the positive control cells in the LDT. Further studies could evaluate if other commonly used anticoagulants in blood collection and storage are suitable sources for the positive control cells. Further, we did not have any patient history for the samples to determine if the patients were currently taking any medications. This could be a point of additional research if any medications that patients are taking inhibit the T-activation.

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Table 1. Tested Samples of Various Blood Types

Sample Blood Type and Anticoagulant/Preservative Table				
ABORh Type	EDTA	AS-1	AS-3	Total
A+	10	11	-	21
A-	5	3	-	8
B+	1	2	-	3
B-	-	-	-	-
AB+	1	1	-	2
AB-	1	-	-	1
O+	9	6	1	16
O-	3	4	2	9
Total	30	27	3	60

Tested samples' characteristics including the various blood types, anticoagulant/preservatives. Abbreviations: EDTA, Ethylenediaminetetraacetic acid; AS-1, Adsol; AS-3, Nutricel.

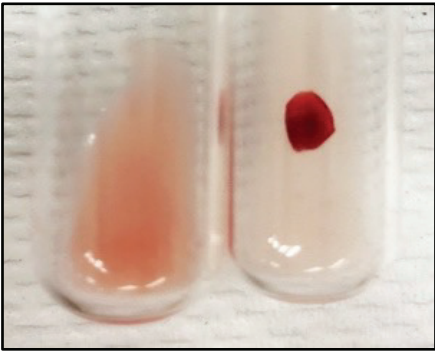


Figure 1. A negative control of free-floating cells next to a T-activated RBC sample with a 4+ hemagglutination reaction to the lectin.

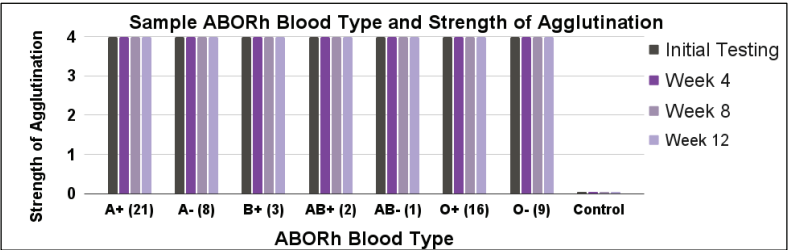


Figure 2. Hemagglutination results on a 0-4+ hemagglutination scale of the various T-activated RBCs of different ABORh blood types. All samples were successfully T-activated and produced a 4+ hemagglutination reaction. Quantity of samples for each blood type is denoted by (#) and are individually tested each month.

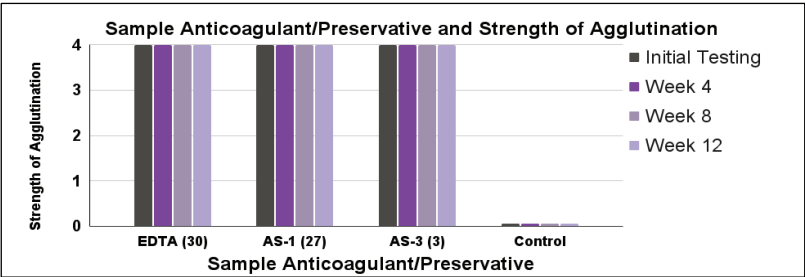


Figure 3. Hemagglutination results on a 0-4+ hemagglutination scale of the various T-activated RBCs exposed to the anticoagulant/preservatives. All samples were successfully T-activated and produced a 4+ hemagglutination reaction. Quantity of samples for each anticoagulant/preservative is denoted by (#) and are individually tested each month. Abbreviations: EDTA, Ethylenediaminetetraacetic acid; AS-1, Adsol; AS-3, Nutricel.

Effect of baiting on image capture rate and species richness documented using trail cameras at Weber State University

Jaicia Mills & Samuel Boyden

Mentor: Rebecka Brasso

Department: Zoology

INTRODUCTION

As human interest in monitoring wildlife populations grows, there is an increasing need for efficient and minimally invasive methods to effectively monitor these different populations of wildlife. Camera trapping has become a popular method for monitoring wildlife populations for many (Villette et al., 2016). Camera traps are devices that have a sensor trigger designed to take a photograph when an organism is present in the field of view and sets off the sensor. It has been used to answer a large variety of research questions in the field of ecology, behavioral studies, and conservation biology (Lamelas et al., 2020). These devices have opened several research opportunities for ecologists that were not possible with traditional trapping techniques.

With camera traps, scientists have been able to observe and estimate the distribution and population densities of elusive, nocturnal large mammal predators to inform conservation efforts (Preez et al., 2014; Trolliet et al., 2014). This can be seen in studies using camera trapping that have been able to estimate the population densities of tigers and other large cats for 20 years in India (Villette et al., 2016). In this study, camera traps were permanently left out in the trapping locations, allowing the animals to have familiarity with the traps, thus capturing more images of the individuals who the researchers were able to identify using unique markings, such as stripes or spot patterns (Villette et al., 2016).

Camera traps have proven to be a less invasive and disruptive way to study wildlife compared to traditional methods, such as mist netting and pitfall traps (Dundas et al., 2019). One study found that camera traps were much more effective in detecting wildlife when trying to study the effects of an environmental disturbance, such as human development of roads or housing as the researchers ended up disturbing the study site much less often

(Dundas et al., 2019). On the other hand, it was shown in the same study that pitfall traps were much more effective for capturing and identifying populations of lizards, insects, and other small animals that camera traps were less able to capture (Dundas et al., 2019).

As seen from these shared studies and many others, camera traps offer a reliable, minimally invasive, visual means of surveying wildlife that substantially reduces survey effort (Caravaggi et al., 2017). To help bring the animals to the camera traps, researchers are seeing that positive effect of using attractions, such as food nearby. Attractions, like food or scents, have been used to enhance both the probability of animals visiting the camera traps and species identification (Randler et al., 2020). Collected data has been effectively used to quantify species diversity, relative abundance, population parameters and describe species replacement processes, all from a single image captured (Caravaggi et al., 2017). While this method is an extremely useful tool in observing animals, there are of course small drawbacks and limitations. For example, they can capture a lot of irrelevant photos as any movement, weather or human activity around the camera can be recorded. These drawbacks can be easily mitigated through careful study design, but they should be addressed when using camera traps as a tool. Placement of the cameras and camera trigger times are some topics to be addressed when preparing to use this method as this can help in decreasing the chances of those drawbacks occurring.

To this end, our study aimed to determine the effects of using bait on image capture and species richness on the Weber State University campus. Specifically, we wanted to look at how bait affected the number of visits by mule deer (*Odocoileus hemionus*) in gamble oak (*Quercus gambelii*) communities, as well as the overall number of animal species observed (species richness). We hypothesized if there was bait put out near the traps, then the number of unique images of mule deer caught on the camera traps would increase from when there was no bait set out. We also hypothesized that if there was bait put out near the traps, then the total species richness would also increase.

METHODS AND MATERIALS

The experiment was conducted at the campus of Weber State University over a 22-day period from February 9, 2021 through March 2, 2021. A total of six HOMCOM trail cameras were used for this

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experiment. Three cameras were placed amongst gamble oak patches on the east side of campus, along Skyline Drive. Three cameras were placed to the west of Skyline Drive, just next to the W4 lot. Each trail camera used was set to take one 12M image (4000x3000 pixels) at an interval of two minutes between each image. This time interval was used to help reduce the likelihood of duplicate encounters being collected.

At the beginning of the experiment, empty bird feeders made of a set of four metal trays connected by nylon cords were hung from the branches of trees. The tray dimensions were 1.5 x 39 x 26 cm. The distance from the top tray to the second tray was 37 cm, the second tray to the third tray was 62 cm, and the third tray to fourth (bottom) tray was 23 cm. Distance from the bottom tray to the ground ranged around 12-40 cm. Each bird feeder was placed within view of each camera and remained empty for 11 days from February 9, 2021, through February 19, 2021. On February 20, 2021, we filled each tray of each feeder with black oil sunflower seeds (*Helianthus annuus*) as bait. The baited feeders and cameras were left up until March 2, 2021; feeders were refilled at least twice to make sure there was still adequate bait for the experiment. On March 2, 2021, the cameras and bird feeders were taken down.

Photos from each camera were uploaded and individually sorted; photos with animals were separated from those without. Only photos with animals were used for data analysis. Based on the recorded time stamps from the reviewed photos, images were divided into two groups: baited and unbaited. We first counted the number of unique visits by mule deer to each camera. Unique visits were defined as a visit (image) from any number of deer with at least ten minutes between captured encounters. This method reduced the likelihood of counting the same group of deer multiple times. To determine whether there was a significant difference in unique mule deer captures between baited and un-baited periods, we performed an unpaired t-test on the mean number of visits per day between the groups. We also analyzed the daily activity pattern, over a 24-hour time period, for the deer. Timestamps of unique visits were noted and the number of unique visits in each hour was counted to determine the daily activity pattern of mule deer. After processing the photos that included only deer, we then looked for photos of birds or mammals taken during the baited and un-baited periods to determine species richness and compare the species richness between the baited and unbaited time frames.

RESULTS

Over the course of the 22 days, a total of 5,703 images were captured. Of those 5,703 images, 1,130 captured images with animals. When placing bait out by the camera traps, the total number of unique visits by mule deer and the total species richness (Table 1) both increased. The total visits by mule deer on the un-baited days was 99, and the total visits on the baited days was 198. There was a significant difference in the mean visits per day (\pm SD) at the un-baited (5.4 ± 3.0) vs baited (18.0 ± 10.4) days ($t = 3.8608$, $df = 20$, $p = <0.001$; Fig 1). We also examined the daily activity pattern of the mule deer. Over the course of the 22 studied days, we detected a majority of mule deer visits between the hours of 16:00-06:00 during a 24-hour period (Fig 2).

DISCUSSION

We had hypothesized that there would be more visits from species with the baited traps compared to the un-baited traps and because of this, a greater species richness would be captured. Our results provided support for our hypothesis that when the sunflower seeds were placed out near the traps, the number of unique images of mule deer caught on the camera traps increased compared to when there was no bait present. The results also support that when there was bait put out near the trap, the total species richness increased as well.

There are other experiments that have had the same success as us with baiting camera traps. In a study done observing nocturnal mustelids, researchers found that baiting camera traps with both bait and glandular scents improved the detection and number of images taken. This study concluded that both bait methods were more successful than the control group that didn't have any sort of bait set out (Randler et al., 2020). Baited camera traps have also greatly increased Leopard (*Panthera pardus*) capture rates while trying to ascertain current population density in the Buby Valley Conservancy in Zimbabwe (Preez et al., 2014). Although both our study and others show that putting bait out does in fact help in increasing the number of visits and photos taken, this may not always be the case. In a study with carnivores, specifically the ocelot (*Leopardus pardalis*), and other species in the surrounding area, the scientists also set out bait for their camera traps. However, in this case, setting out the bait for the ocelots decreased the number of visits by common prey species. When the number

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of ocelots detected increased, the number of prey species detected started to decrease because they were no longer coming near the camera traps due to increased traffic of predators (Roch et al., 2016) This study shows that there may be factors, like the ocelots driving away other prey animals, impacting results when it comes to camera trapping with bait.

In general, the literature so far has shown that bait is an effective tool in surveying wildlife, and future research could focus on the effects of different types of bait. For example, would a different type of seed have been more effective at drawing in Mule Deer than the sunflower seeds used in the present study? Could bait like cat food help draw more animals in like the red fox (*Vulpes vulpes*) or the coyote (*Canis latrans*)? By analyzing and using the different bait types per species, it may allow us to get an even more accurate representation of the species richness around Weber State University.

ACKNOWLEDGMENTS

We would like to thank the Department of Zoology and Stewart Library for assistance with materials needed to complete this study. This was a class research project (ZOOL3450, Spring 2021) and we therefore thank all students who contributed to this research project during the semester.

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Table 1: Species that were detected in the baited and un-baited pictures (n=22 days)

Un-baited camera dates		Baited camera dates	
Common name	Scientific name	Common name	Scientific name
Red Fox	<i>Vulpes vulpes</i>	Finch	<i>Carpodacus spp</i>
Mule Deer	<i>Odocoileus hemionus</i>	Black-billed Magpie	<i>Pica hudsonia</i>
Striped Skunk	<i>Mephitis mephitis</i>	Mule Deer	<i>Odocoileus hemionus</i>
Black-billed Magpie	<i>Pica hudsonia</i>	Striped Skunk	<i>Mephitis mephitis</i>
		Raccoon	<i>Procyon lotor</i>
		Robin	<i>Turdus migratorius</i>
		Blackcap chickadee	<i>Poecile atricapillus</i>
		Spotted Towhee	<i>Pipilo maculatus</i>
		House Finch	<i>Carpodacus mexicanus</i>
		Dark Eyed Junco	<i>Junco hyemalis</i>

*

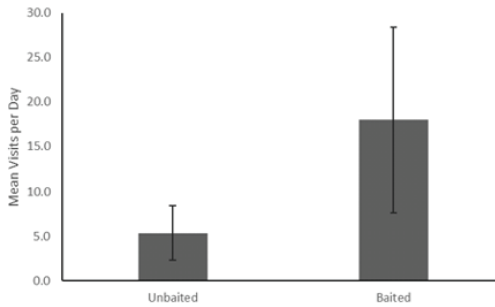


Figure 1: Mean visits to the camera traps per day (\pm SD) by mule deer (*Odocoileus hemionus*) on unbaited (n=11 days) versus baited (n=11 days). The mean number of visits per day was significantly higher during the baited period ($t=3.8608$, $df=20$, $p<0.001$).

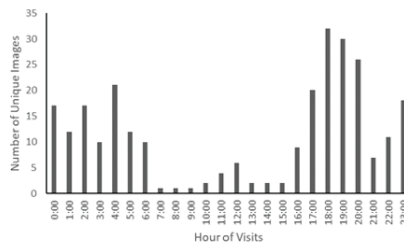


Figure 2: Histogram displaying the timestamps of image capture, or daily activity pattern, of mule deer (*Odocoileus hemionus*) over 24 hours (n=22 days).

CRISPR-Cas9 Mediated Elimination of Fermentative *S. cerevisiae*

Chandler Nicholas, Brian Rushforth, Cameron Shapiro & Kasey Doney

Mentor: Kendal Beazer

Department: Medical Laboratory Science

ABSTRACT

Auto-Brewery Syndrome (ABS) is a rare disorder in which yeast in the gut ferment ingested carbohydrates, leading to ethanol production. This research investigated the efficacy of CRISPR-Cas9 gene-editing as a treatment by designing an efficient guide RNA and Cas9 system to cleave vital genes of the ethanol-producing *Saccharomyces cerevisiae*. Plasmids targeting genes ADE2 and THG-1 were incorporated into *S. cerevisiae* cells using electroporation. Cells were then plated and colony forming units (CFUs) were counted for each condition. A significant reduction in CFUs was seen in plasmid-transformed cells when compared to controls (ADE2 B and THG-1 $t(2) = -6.623$, $p = 0.0220$ and ADE2 A $t(2) = -6.593$, $p = 0.0222$). This indicates that the CRISPR-Cas9 model resulted in fatal damage to *S. cerevisiae* cells, demonstrating the potential for CRISPR's use in treating ABS patients.

INTRODUCTION

Auto-Brewery Syndrome (ABS) is a disorder involving intoxication resulting from yeast-mediated fermentation of food in the gut (Painter et al., 2020). ABS is of particular interest because it can contribute to hepatic conditions such as non-alcoholic fatty liver disease (Campo, Eiseler, Apfel, & Pysopoulos, 2019). Current methods of treatment include carbohydrate-restricted diet, probiotics, and antifungals; however, these have failed to demonstrate universal success.

Modern studies into CRISPR genome editing offer a possible solution to ABS. The CRISPR-Cas9 method allows researchers to target specific sequences in an organism's DNA to make intricate edits, or in this case, cut essential genes and cause fatal cell damage (Gomaa et al., 2014). A CRISPR plasmid uses a complex of Cas9 protein and guide RNA (gRNA) to find and cleave a gene of interest, as denoted by a protospacer adjacent motif (PAM) sequence. Once cut, that portion of the genetic sequence is nonfunctional and can no longer contribute to cell functions. Depending on the gene that was destroyed, this could prove fatal to the cell.

This study used CRISPR plasmids to cleave important genes and fatally

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damage *S. cerevisiae* cells, the yeast most often implicated in ABS. Plasmids were designed to target and cut two genes in *S. cerevisiae*: ADE2 and THG-1. A control plasmid encoding for Leu2 and an empty, non-targeting Cas9 were also created. Each plasmid was incorporated into competent *S. cerevisiae* cells using electroporation, followed by growth on selective media, and analysis of the CRISPR model's killing efficiency.

METHODS

Plasmid Design

Four pML107 plasmids, specific to *S. cerevisiae*, were created by the University of Utah CORE lab (Fig. 1). To construct a plasmid, a genetic locus was selected to provide the highest on-target efficacy score. A protospacer adjacent motif (PAM) sequence in the DNA was used to locate the target sequence. The Cas9 protein and guide RNA (gRNA) were complexed to find and cleave the gene of interest. One component of the gRNA, the crRNA, is the nucleotide sequence complementary to the target DNA. For each plasmid, the crRNA is the sequence that was modified.

Two plasmids from different bacterial sources were designed to target the housekeeping gene Phosphoribosylaminoimidazole carboxylase (ADE2): ADE2 A and ADE2 B. The third plasmid targeted the essential tRNA guanylyltransferase (THG-1) gene. A fourth plasmid with the Cas9 protein but lacking the target crRNA acted as a positive control. Each of these plasmids encoded for the Leu2 gene (for the amino acid leucine). By including this gene, any successfully transformed yeast cells would be capable of growing on selective leucine-deficient drop-out (DO) media and would thus provide evidence that yeast cell transformation was effective. Meanwhile, growth on an accompanying yeast peptone dextrose (YPD) plate would prove the yeast cells survived the electroporation procedure, even if they were not successfully transformed.

Yeast Transformation

To achieve electrocompetency, *S. cerevisiae* cells (ATCC 200901) were grown in YPD broth until reaching an optical density (OD) of 0.5-1.2. Cells were centrifuged at 1100 g at 4°C for 5 minutes and decanted, followed by resuspension in ice-cold water and centrifugation. Cells were then treated with 20 mL of 0.1 M LiTE (16 mL 1 M sorbitol, 2 mL Tris-EDTA buffer, 2 mL 1 M lithium acetate) and incubated at 30°C for 30 minutes. Then,

0.2 ml of 1 M dithiothreitol was added and incubation resumed for an additional 15 minutes.

Cells were washed in sorbitol twice more, with a 5-minute centrifugation step between. Aliquots were then transferred to sterile microcentrifuge tubes and resuspended in sorbitol. 100 μ L of cells was aliquoted to 5 sterile tubes. In each tube, 5 μ L of plasmid was added (or sterile water for the negative control) and mixed with a pipette. Tubes were then incubated in the -20°C freezer for 15 minutes.

Immediately following this incubation, cells were prepared for electroporation. For each tube, the mixture was removed and pipetted into an ice-cold 0.1 cm sterile cuvette. The cuvette was placed in the shocking chamber and shocked using a Bio-Rad MicroPulser Electroporator (1.85 kV, 200 Ω , 25 μ Fd, time interval 2.8-3.4 ms). After electroporation, 1 mL cold sorbitol was added to the cuvette and mixed with cells, then the mixture was transferred to tubes of 5 mL YPD and 4 mL sorbitol for a resulting ratio of 1:1 YPD to sorbitol.

Growth inhibition

Cells were incubated at 30°C for 1 hour following electroporation. After incubation, they were immediately centrifuged for 1 minute then plated on YPD at a concentration of 10 μ L and DO media at concentrations of 1 μ L, 10 μ L, and concentrated (the remaining cells). For the ‘concentrated’ concentration, it was estimated there would be 100 μ L remaining following decantation. After plating the 1 μ L and 10 μ L concentrations, there would have been 89 μ L left, an estimate that was used for subsequent calculations. Plates were incubated at 30°C for 6 days and 16 hours then counted.

CFU (colony forming units) were counted for each of the DO plates. One successful run produced data for the following calculations. Transformation efficiencies were calculated by finding the average quotient of the colonies per microgram of positive plasmid divided by the plated concentrations. A single factor ANOVA was performed, followed by two-tailed two-sample t-tests to look for significant differences between the average CFU/mL found on the positive control vs. the other conditions.

Multiple runs were conducted that resulted in no growth on the DO positive control. Changes were made each run to improve chances of successful electroporation. Experimentation revealed that maintaining ice-cold cells

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and reagents was vital to successful transformation. It was also found that the electroporator settings (1.85 kV, 200 Ω , 25 μ Fd) were ideal for electroporating cells in 0.1 cm cuvettes.

RESULTS

To determine if the CRISPR-Cas9 targeting of the *S. cerevisiae* cells resulted in significant cell death, electroporated cells were plated on DO media in three different concentrations: 1 μ L, 10 μ L, and concentrated (89 μ L). To determine cell viability, they were also plated on nutrient rich YPD with a concentration of 10 μ L. Following incubation, CFU were counted.

For each condition, extensive growth on YPD media confirmed cell viability following electroporation. The positive control, which only contributed the necessary marker to grow without leucine, was plated to prove successful transformation. For this control on DO media, there was an average growth of 2.60×10^3 CFU/mL (Fig. 2). The transformation efficiency was calculated to be 34.8 CFU/ μ g. The negative control, as expected, exhibited 0 CFU/mL.

To determine if the plasmids caused significant cell reduction, growth for each condition was compared to the positive control. On DO media, ADE2 A had an average growth of 11 CFU/mL. In comparison to the positive control, ADE2 A showed a significant decrease in CFU ($t(2)=-6.593$, $p=0.0222$). ADE2 B and THG-1 plates each showed an average of 0 CFU/mL. Because they had the same average growth, when compared to the positive control, they each yielded the same significant decrease ($t(2)=-6.623$, $p=0.0220$).

This study showed growth on the positive control and no growth on the negative control, confirming successful controls. These results, alongside the significant difference in growth in the other conditions relative to the positive control, indicate that this experiment was successful in significantly reducing the number of *S. cerevisiae* cells using CRISPR-Cas9.

Despite these findings, the calculated transformation efficiency of 34.8 CFU/ μ g is low. Along with growth on the YPD, this suggests that the electrocompetency procedure was effective, but the electroporation step produced a low rate of successfully transformed cells. It is important to note that only a low volume of cells took up the plasmids, but those that did showed significant cell reduction.

DISCUSSION

This research sought to investigate whether CRISPR-Cas9 could effectively kill *Saccharomyces cerevisiae* cells, the main causative agent of Auto-Brewery Syndrome. To do this, four Leu2-containing plasmids were incorporated into yeast cells to allow growth on leucine-deficient media and thus prove successful electroporation. Three of these plasmids were also given gene targets to cut: ADE2 (incorporated into two plasmids, each with the same target, but different bacterial origins), and THG-1. Given the necessity of these two genes, successful targeting and cleaving would likely prove fatal to the cells.

Successful controls showed the Leu2 gene was successfully taken up and expressed. This indicates the other conditions did not grow because their respective plasmids were also successfully taken up and vital genes were cleaved by the CRISPR-Cas9 system. Electroporation with these plasmids was successful in reducing growth of *S. cerevisiae*, demonstrating the potential use of CRISPR-Cas9 as a treatment for ABS.

The major limitation in this study was a low volume of plasmid, limiting the attempts at successful electroporation. The only successful run had a low transformation efficiency, so future attempts would be needed to replicate these findings and increase efficiency. Potential methods to increase transformation efficiency include adjusting plasmid size, cuvette size, and incubation periods. Once efficiency is improved, the future of this research would be to find an appropriate vector for CRISPR-Cas9 to be tested *in vivo* in ABS patients. This method may one day be able to eliminate the effective cause of ABS in patients.

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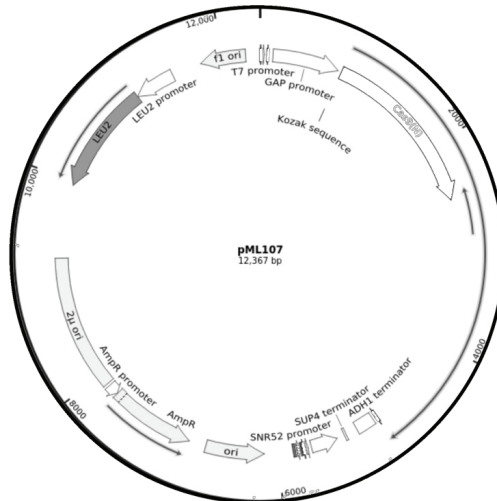


Figure 1. Diagram of positive control pML107 plasmid vector with Leu2 marker. This was the empty vector from which others were built. LEU2 arrow indicates Leu2 marker.

Ori: Bacteriophage origin of replication

AmpR: Ampicillin-resistant gene

SNR52: Small nuclear RNA gene

SUP4: *S. cerevisiae* tRNA gene

ADHI: Alcohol dehydrogenase 1

Cas9(N): N-terminus of *S. pyogenes* Cas9

GAP: Glyceraldehyde-3-phosphate dehydrogenase

Kozak sequence: Sequence for strong initiation of translation

T7: Bacteriophage T7 RNA polymerase

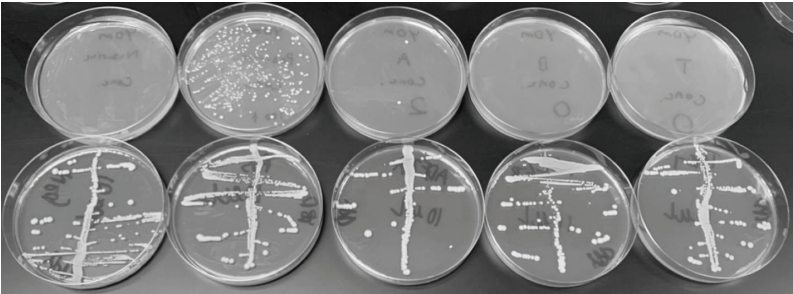


Figure 2. Comparison of growth of concentrated cells (89 µL) on leucine-deficient drop-out (DO) media (top) vs. 10 µL of cells on yeast peptone dextrose (YPD) agar (bottom). From left to right: negative control, positive control, ADE2 A, ADE2 B, THG-1. DO media was used to determine transformation of cells, with extensive growth on positive control indicating successful transformation. YPD was used to confirm cell viability following electroporation. Negative control was sterile water; positive control was an empty vector containing the Leu2 marker.

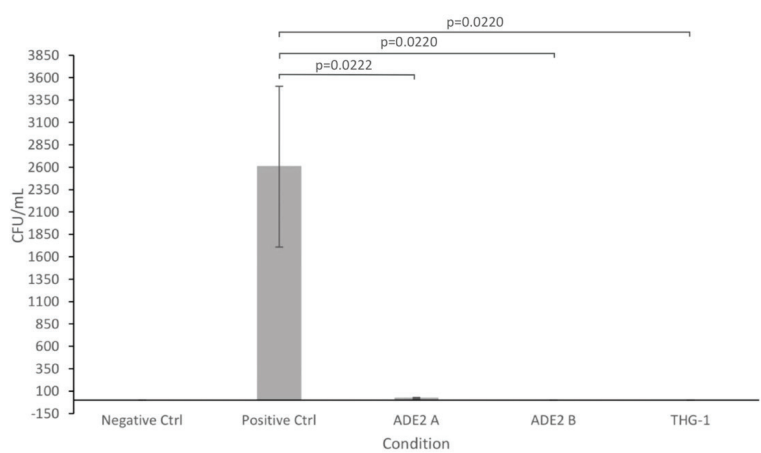


Figure 3. Mean CFU (colony forming units) per milliliter of *Saccharomyces cerevisiae* ATCC 200901 following electroporation. Cells were plated on leucine-deficient drop-out media. Mean CFU/mL is shown for each condition. Prior to t-tests, a single factor ANOVA was performed that showed a significant difference between groups ($p=0.041378$). Error bars indicate standard error. Significance bars indicate significance for each comparison ($p<0.05$).

Investigating the cytotoxicity of *Centella asiatica* methanolic leaf extracts on MDA-MB-231 human breast cancer cells

Mercedes Randhahn

Mentor: Barbara Trask

Department: Zoology

ABSTRACT

This study evaluated the effectiveness of two *Centella asiatica* (CA) methanolic leaf extracts on the triple-negative breast cancer cell line MDA-MB-231. The purified extract (PE) was created using precise lab equipment and was intended to possess a greater concentration of triterpene glycosides, particularly asiaticoside (Helan et. al, 2011). The crude extract (CE) was created using a similar procedure, however instead of precise lab equipment it used materials accessible to someone living in impoverished regions. Each extract was tested at dilutions of 10%, 1%, 0.1%, 0.01%, and 0.001% at 60 and 96 hours. After evaluation, it was determined that CE induced the greatest amount of cytotoxicity in comparison to PE. Furthermore, CE possessed statistical significance in a concentration dependent manner at time points of 60 hours and 96 hours. Therefore, CE may be a justifiable antineoplastic agent for those diagnosed with triple-negative breast cancer living in developing regions.

INTRODUCTION

CA is a native Indian plant that has been used in herbal medicine for centuries due to its anti-inflammatory, antioxidant, anxiolytic, and anti-tumoral properties (Gohil et al., 2010). The leaves contain five triterpenes, the most abundant of which is asiaticoside, a glycoside (Helan et al., 2011). The interaction of triterpene glycosides with sterols causes disturbance of selective permeability in plasma membranes. By weakening the permeability of cancer cells, CA can initiate cytotoxicity to cells (Anisimov, n.d). Based on this, several recent studies have emerged to investigate the potential of CA as a chemopreventive agent.

The majority of studies conducted on the antineoplastic properties of CA have been examined on colon cancer, lung cancer, leukemia, and cell line MCF-7 (Babykutty et al., 2008 ; Babu et al., 2000 ; Prakash et al., 2017). MCF-7 is a highly invasive hormone dependent breast cancer, whereas MDA-MB-231, another form of metastatic breast cancer, isn't (European Collection of Authenticated Cell Cultures, n.d).

This study investigates the effects of CA methanolic leaf extracts upon the

cell line MDA-MB-231. Methanolic leaf extracts have been observed to have higher solvent recovery rates, and produce greater yields of triterpene glycosides (Jiang et al., 2008).

It was predicted that PE would present a statistically significant measure of cytotoxicity to MDA-MB-231 cells after 96 hours due to the precision of equipment used. Based on this, the PE is expected to have a greater yield of asiaticoside. (Anisimov, n.d)

METHODS

Plant Identification:

The CA plant was purchased from a Northern California retailer on Etsy, and the identity was confirmed using a plant identification index.

Purified Extract Preparation:

The CA leaves were first removed from the plants and then thoroughly cleaned and frozen overnight. The leaves were then dried in a drying oven for forty minutes. Afterward, the plant leaves were ground into a fine powder using a mortar and pestle. 1.4g of the powder was placed in 50mL of 100% methanol and stirred overnight. The solution was then centrifuged and filtered before evaporating the methanol using a rotary evaporator. The remaining extract was dissolved using dimethyl sulfoxide (DMSO). DMSO was added in increments of 150µL to create a fully saturated solution with a concentration of 4.1 mg/mL.

Crude Extract Preparation:

The CE preparation procedure mimicked that of the PE, yet used less refined equipment. Instead of a centrifuge, two tubes of equal volume of extract were placed on opposite sides of a salad spinner and spun at the highest speed for 30 minutes. After filtering the solution, it was evaporated from a large beaker set in a fume hood with a handheld fan placed directly overhead. The solution evaporated within two hours after it was set on a 45°C hot plate. The remnants were dissolved using DMSO in increments of 150µL to produce a fully saturated solution of 57.9 mg/mL.

Serial Dilutions:

To ensure sterility, each of the treatments were filtered separately with a

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0.2µm antibacterial and antiviral syringe-top filter using a 10mL syringe in a BSL II laminar flow biosafety cabinet. 10mL 1:10 dilutions of each stock solution were performed to produce dilutions from 10% to 0.001% using DMEM+10% FBS as a diluent.

Cell Preparation:

MDA-MB-231 cells were procured from the Zoology Department at Weber State University. The cell line originates from the ATCC database and represents triple-negative, metastatic breast cancer. This cell line was selected because previous studies investigating CA on MDA-MB-231 cells produced inconclusive results. MDA-MB-231 cells were plated in the wells by first aspirating the spent medium from each flask. 1mL of Trypsin was added to each flask and tilted to cover the entirety of the cells. This amount was aspirated and repeated. The flasks were then placed in an incubator for 5 minutes. Afterward, 7mL of DMEM+10% FBS were added to the first flask. The contents were mixed and transported into the second flask where the process was repeated. The final solution in the third flask was added to a sterile conical tube and counted using a 1:1 ratio of 50µL of Trypan Blue on a Countess chamber slide. Based on the viable cells value, 5×10^4 cells were added to each well for six well plates. All plates were returned to the 5% CO₂ incubator. 24 hours later, each well's media was aspirated and replaced with 800µL of the corresponding treatment.

Cell Counting:

At each of the two time points, the cells were counted in triplicate. At 60 hours Plates 1-3 were counted and at 96 hours Plates 4-6 were counted. When counting each plate, the cells' form first had to be examined. The cells in suspension were transferred to separate sterile conical tubes. The now empty wells were treated with 200µL of Trypsin, aspirated, and replaced with 150µL of Trypsin. In the wells with adherent cells, the treatments could be aspirated, and restored with 200µL of Trypsin. After aspirating those wells, 150µL of Trypsin were added. The plate would then be placed in the incubator for five minutes. Afterward, the cells that were originally in suspension would be treated first. 200µL of DMEM+10% FBS were added to each well using sterile micropipette tips, and then fully mixed into the corresponding conical tubes with the other cells in suspension. Then 20µL of each respective tube would be added to 20µL of Trypan Blue for counting. After mixing, a Countess chamber slide was loaded with the

solution and the amount of viable and deceased cells were recorded via a Countess automated cell counter (ThermoFisher). For the remaining wells that hadn't been treated, 200µL of DMEM+10% FBS were added to each well and thoroughly mixed. Each solution was added in a 1:1 ratio with Trypan Blue and counted. This process was repeated for the remaining two plates at each time point.

Microscopy:

Micrographs were taken using an Evos inverted light microscope 48 hours after treatment.

Statistics:

Significance was determined by comparing the average ($n=3$) number of viable cells with each treatment at both time points relative to DMSO (vehicle). These tests utilized a left-tail, one sample t-test via the website "Statistics Kingdom".

RESULTS AND DISCUSSION

The data at both time points conclusively show that PE had no significant effect on cell death at the concentrations studied. In fact, the figures partially depict a growth promoting effect at the lower concentrations, although statistical analysis didn't reveal a consistent relationship. However, at 60 and 96 hours, CE possessed far greater cytotoxic effects compared to the corresponding concentrations of DMSO.

At 60 hours, both the 5.79 mg/mL and 0.579 mg/mL CE significantly reduced cell proliferation relative to the corresponding concentrations of DMSO alone ($p<0.05$). At 96 hours, only the 0.579 mg/mL CE was significant, which may be attributed to the presence of filamentous debris in the wells of the 5.79 mg/mL CE. This debris likely impacted the accuracy of the cell counting machine by conveying that there were some viable cells, which when compared to the calculated total number of cells, was entirely insignificant. Yet this could not be accurately accounted for in statistical analysis.

Although the author cannot currently confirm the molecular explanation for the CE results, previous studies suggest that asiaticoside present in the plant's leaf region disrupts cell proliferation by inhibiting signal pathways (Zhou et al., 2020; Bruce, n.d.). Furthermore, asiaticoside is known to

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behave like a detergent molecule. When encountering a cell membrane, the hydrophobic tail inserts itself into the lipid bilayer and inhibits protein-protein interactions, thereby enhancing membrane permeability and inducing demise (Anisimov, n.d).

Overall, CA CE significantly reduced cell proliferation of MDA-MB-231 cells and may be considered a potential antineoplastic agent.

FUTURE RESEARCH

Reverse phase HPLC testing should be employed to isolate the active component in each extract and verify the potential identity as asiaticoside. Additionally, testing on benign and malignant primary cell cultures should be completed to confirm the extract's specificity toward cancerous cells. The entire experiment should also be repeated to authenticate results prior to isolating the signal pathways being inhibited by the effective extracts. Previous studies suggest that inhibition of the NF- κ B pathway indicates the presence of a potential anticancer agent (Zhou et al., 2020; Bruce, n.d.). However, it's necessary to confirm these results in relation to these particular CA extracts.

ACKNOWLEDGEMENTS

The author is appreciative of the expertise of Dr. Walker, who assisted with the extract production.

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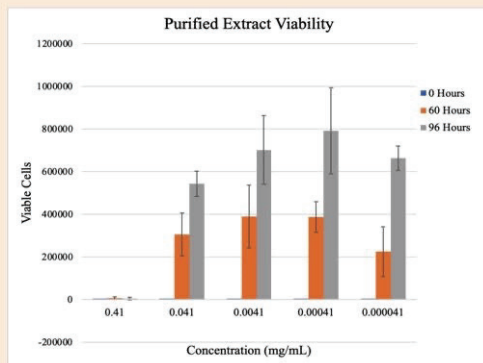


Figure 1 represents average cell viability for each dilution of the 4.1 mg/mL PE at 60 and 96 hours. At 0 hours, each well contained 5×10^4 cells. The error bars represent the standard deviation for three replicate wells. Cell viability was determined via Trypan Blue exclusion.

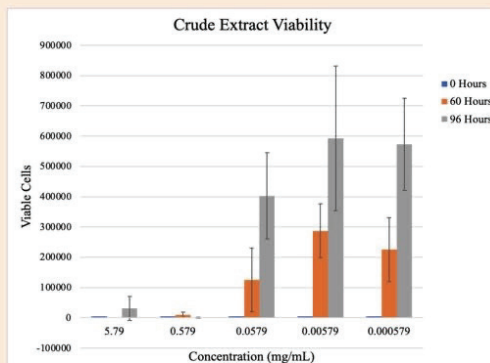


Figure 2 represents average cell viability for each dilution of the 57.9 mg/mL CE at 60 and 96 hours. At 0 hours, each well contained 5×10^4 cells. The error bars represent the standard deviation for three replicate wells. Cell viability was determined via Trypan Blue exclusion.

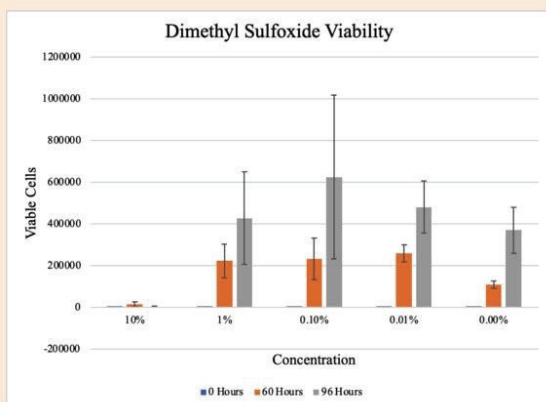


Figure 3 represents average cell viability for each dilution of Dimethyl Sulfoxide (DMSO) control at 60 and 96 hours. At 0 hours, each well contained 5×10^4 cells. The error bars represent the standard deviation for three replicate wells. Cell viability was determined via Trypan Blue exclusion.

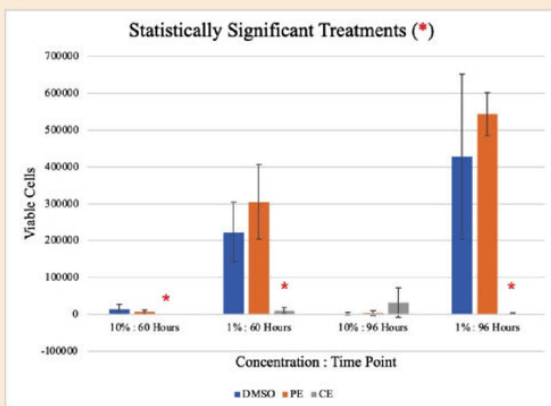


Figure 4 depicts a comparison of average cell viability for the two highest concentrations of DMSO, PE, and CE. At 60 and 96 hours, the 10% and 1% CA CE were statistically significant ($p < 0.05$). Statistical analysis was conducted on cell viability results determined via Trypan Blue exclusion.

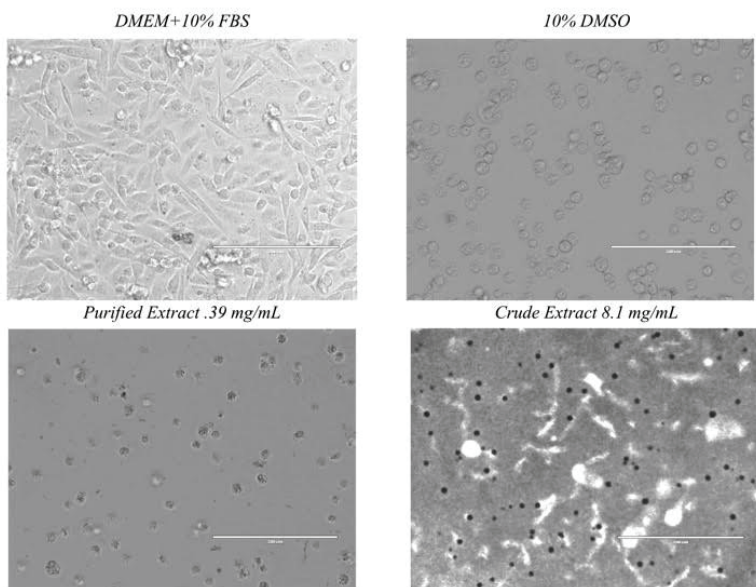


Figure 5 represents microscopic images of MDA-MB-231 cells taken after 48 hours with various treatments. Images are scaled to 200µm. PE and CE concentration discrepancies are due to the added use of a sonicator when preparing the secondary batch of extracts.

An Application of an SIR Epidemic Model in Predicting the Impacts of Variable Vaccination and Booster Rates on the Propagation of COVID-19 in Utah

Joseph Richey, Nicole Gwilliam, Adam Roberts & Harrison Ure

Mentor: Afshin Ghoreishi
Department: Mathematics

ABSTRACT

As of December 11, 2020, the FDA announced their decision to allow individuals 16 years and older to be able to receive the Pfizer-BioNTech COVID-19 vaccine. The U.S. began vaccinating willing individuals soon after. The effectiveness of the vaccine (and others formed thereafter) has been scrutinized, and many individuals still have questions as to its effectiveness. This paper presents a series of models that discuss vaccination efficacy. We claim that vaccinating individuals will help to stop the spread of the virus.

In this paper we track Utah's infection rates using a SIR model, accounting for vaccination rates and booster shots and their effectiveness in slowing down the spread COVID19. Using data we collected from the NY Times and Bloomberg, we created a model which closely approximates the infection rates in Utah from August 22 to November 22, 2021. We determine how various vaccination rates and booster rates correlate with infection rates of individuals in the state of Utah.

We conclude that the most effective way to decrease daily infections of COVID-19 is to increase initial vaccination rates and booster doses.

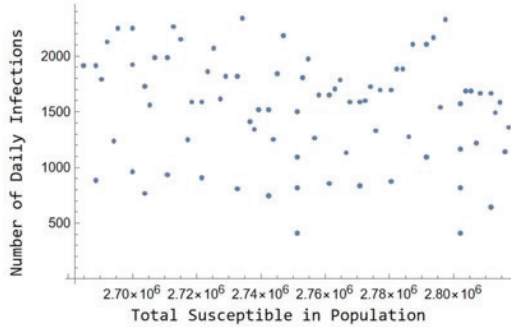
INTRODUCTION

On August 23, 2021, the U.S. Food and Drug Administration approved the first COVID19 vaccine, to be distributed to those 16 years and older for the prevention of disease caused by the novel coronavirus (FDA, (n.d.)). Emergency vaccinations were granted as early as December 22, 2020. This was a major milestone in battling the pandemic, but it was met with hesitation of many Americans due to a myriad of concerns about the vaccine (Dance, 2021, pg.1).

We offer various insights into the trends that accompany the percentage of people in Utah being vaccinated and receiving booster shots and their effect in slowing the spread of COVID19. Our model provides key insights into how an increase in these rates can ensure our communities return to a "business as usual" way of life.

INITIAL DATA ANALYSIS AND CONSTANT ESTIMATION

Initially, we devised a series of models to help us understand the spread of COVID-19. In the graph below, we see a stable and random distribution of cases of COVID-19. We investigate the 3-month interval from August 22 to November 22, 2021, corresponding to this data (shown at below).



Using this 3-month period, we applied an SIR Model and found a best-fit line with a coefficient to match the data. On the x-axis, we show the $S(n)$ data, representing our susceptible population. Our y-axis corresponds to the equation:

$$\frac{I(n+1)-I(n)}{I(n)}$$

where $I(n)$ represents the daily infected cases. The best-fit line we were able to find from this was $y = 1.02402 \times 10^{-9}x$. We scale the slope by 2.25 to achieve a best fit for the data. The resulting line was $y = 2.25 \times 1.02402 \times 10^{-9}x$. We will define $X = 2.30405 \times 10^{-9}$ for the remainder of this paper.

We estimate the constant of vaccination to be 2,245. Using data from Bloomberg (Bloomberg Covid-19 Vaccine Tracker Open Data, (n.d.)), we made several simplifying assumptions to model vaccination of the general population. Our first assumption is that most people get a two-dose vaccine. We also discount the wait time between doses and the two-week post vaccination period to develop antibodies. During our three-month focus, on average, there were 4490 doses administered in a day. As such, we remove 2,245 people per day.

We also estimate the rate at which people are added back into our susceptible population after they have been vaccinated. There is no data on how long vaccinations remain effective. For this model, we will make a conservative guess that vaccinations last for 8 months, a 33% increase from the CDC's booster recommendation (COVID-19 Vaccine Booster shots.

(n.d.)). 8 months after an individual is vaccinated, they are taken from the removed population and included in the susceptible population. Currently, only about 22.2% of fully vaccinated individuals are getting a booster shot (COVID-19 Vaccine Booster shots. (n.d.)). Therefore, in our model, we will reintroduce vaccinated people into the susceptible population at a rate of 0.78.

OUR MODEL

We use three recursive equations within our SIR model to predict our total susceptible population, $modSus(n)$, total infected population, $modI(n)$, and total removed population, $modR(n)$. We use the constants explained above (X , 2245, and 0.78) to accurately predict spread.

The model is as follows:

Our model begins August 22, 2021, with $n = 0$.

Utah's population is 3,271,616 (U.S. Census Bureau quickfacts: Utah. (n.d.)).

$$modSus[0] = 1,233,139$$

$$modI[0] = 453,118$$

$$modR[0] = 1,585,359$$

$$modSus[n] = modSus[n - 1] - X \times modSus[n - 1] \times modI[n - 1] - 2245 + 0.78 \times vac[[n + 1]]^*$$

$$modI[n] = modI[n - 1] + X \times modSus[n - 1] \times modI[n - 1] \quad modR[n] = 3,271,616 - modSus[n - 1] + modI[n - 1] - 0.78 \times vac[[n + 1]]^*$$

* $vac[[n]]$ is a set of data of daily vaccinations from Bloomberg from December 22, 2020, to November 22, 2020.

We extend the model out 8 months to predict the spread of COVID-19 and analyze what will happen from implementing four different scenarios.

Table 1: Defined Scenarios

Scenario 1: No Change	In this scenario, the rate of vaccination remains constant, removing 2,245 people a day, and the rate that people receive booster doses remains the same.
Scenario 2: Increase Vaccination Rate by 50%	In this scenario, we increase the rate of vaccination by 50%. This simulates an increase in daily vaccination from August 22, 2021, to July 22, 2022. We changed our vaccination constant from 2,245 to 3,367.
Scenario 3: Increase in Booster Rate to 75%	In this scenario, we increase the rate at which people receive booster shots from 22% to 75%. Our vaccination rate remains unchanged.
Scenario 4: Increase in Booster Rate to 75% and Vaccination Rate by 50%	Our final scenario combines scenario 2 and 3 for a large overall increase in both initial vaccination and booster vaccination.

ASSUMPTIONS AND THEIR JUSTIFICATIONS

In extending our model out 8 months, we make several simplifying assumptions. First, we assume that the infection rate will remain the same. This is not likely to be the case, however, due to changes in social distancing restrictions, seasonal changes, and behavioral changes. The infection rate will also likely change as new variants of the virus emerge and begin to infect the population.

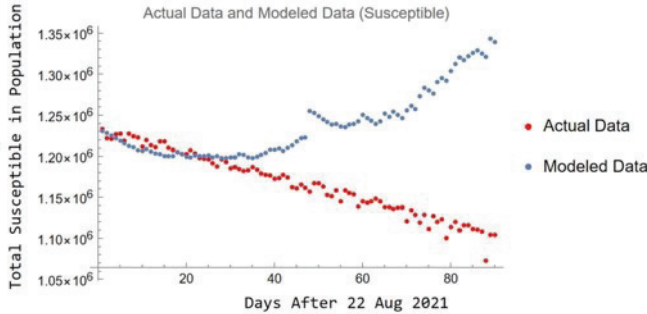
We also assume that immunity from vaccination only lasts approximately 8 months. At this point, there is no data on how long immunity lasts. This is one of the weak points of this model but can be adapted as new data as the CDC and other organizations study immunity from vaccination.

We justify these assumptions by understanding our goal: to find what is most effective in minimizing the spread of COVID-19. This model will likely not accurately predict the exact number of COVID-19 cases over the period of November 23, 2021, to July 22, 2022. However, it will predict the outcome of different vaccination efforts, holding all other variables constant.

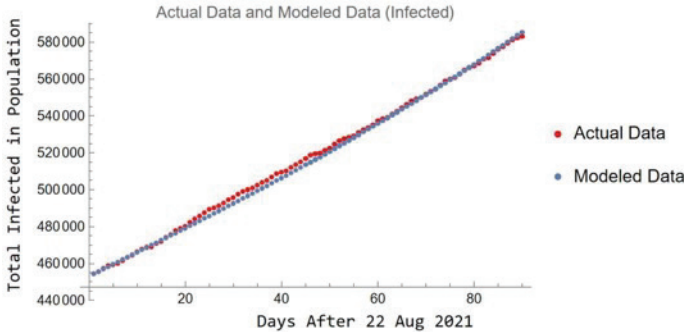
VERIFICATION OF THE MODEL

To verify our data, we compared the real-world data against our models, using Wolfram Mathematica. For our first model, we see that the real-world’s susceptible data matches our model well during the first month, but

then diverges from that course. The “actual” data (or the real-world data) doesn’t reintroduce vaccinated people, which accounts for the deviation.



The next model, “Actual Data and Modeled Data (Infected),” represents our infection data during August 22nd, to November 22nd, 2021. Notice the actual data matches our model nearly completely, supporting our model’s validity. We then use this first three-month model as the first segment of the next three models that predict a year out from August 22nd, 2021.



STRENGTHS AND WEAKNESSES

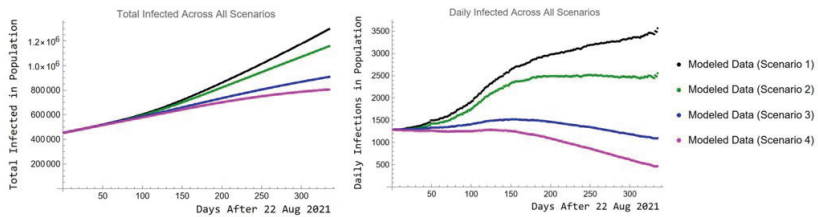
There are several benefits to our model. Chiefly, our model closely agrees with real world data over a period of several months. In addition, our model is easily reusable, and thus broadly applicable to yearly COVID-19 outbreaks in Utah. The methods used can be repeated for similar effect to make predictions about infections in the future using different periods of data.

The weakest parts of our model were the assumptions we made about how long immunity from vaccination lasted, as well as the decision to implement a constant infection rate. As information becomes available about the longevity of vaccine immunity, our model can be redefined to accurately

predict the long-term behavior of COVID-19 spread.

CONCLUSIONS

With our established model, we can test what happens as we vary both vaccination and booster shot rates. We conclude that the most effective actions to reduce infections of COVID-19 are a joint increase in vaccination rates and individuals receiving booster shots. Assuming immunity doesn't last, we find that focusing on booster administration is more effective than increasing initial vaccination rates.



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Using Computer Aided Drug Design to Improve Semaglutide Receptor Binding

Gwenyth Skriner

Mentor: Tracy Covey

Department: Chemistry

ABSTRACT

Insulin resistance is the most common risk associated with type 2 diabetes (T2D), so it is vital to develop treatments that overcome this disrupted biological mechanism. GLP-1R agonists significantly increase insulin production and lead to weight loss in patients affected with T2D independent of insulin. Semaglutide, the favored GLP-1R agonist, has unwanted gastrointestinal side effects despite its treatment efficacy. We hypothesized that increasing semaglutide binding to the target could extend the half-life, thereby lowering the amount needed and off-target effects in the gut. To test if semaglutide modifications with increased binding affinity could be created, the primary drug-target interactions were investigated. Key amino acids within semaglutide's polypeptide chain were virtually substituted to create a new drug molecule with higher binding affinity for GLP-1R. The results of our study indicate that semaglutide with a Val33Ile mutant had a more favorable free energy of binding with target GLP-1R.

INTRODUCTION

Glucagon-like peptide-1 (GLP-1) is a hormone produced to lower blood glucose levels via insulin secretion (Drucker, 2002) when glucose, fatty acids, and dietary fibers are ingested (MacDonald et al., 2002). The glucagon-like peptide-1 receptors (GLP-1R) are present in three main tissues in the body: the gastrointestinal (GI) tract, the hypothalamus in the brain, and the pancreas. GLP-1 binding to receptors in the GI tract and CNS result in weight loss (Christou et al., 2019); however, binding in the pancreas significantly increases the rate of insulin production (MacDonald et al., 2002). GLP-1 is responsible for 70% of total insulin production within the human body (Knudsen & Lau, 2019) and is a self-regulating process (Manandhar & Ahn, 2014), meaning this hormone and its receptor play a critical role in the development of treatments for type 2 diabetes (T2D) (Choi & Kim, 2010).

GLP-1 itself cannot be used as a drug because it's metabolized too quickly in the bloodstream (Hall & et al., 2018); instead, GLP-1R agonists with increased stability are used (Hall & et al., 2018). Semaglutide, the most favorable GLP-1R agonist, is prescribed secondarily as a subcutaneous

injection, alongside metformin, to induce insulin production and weight loss with a low risk of hypoglycemia (Hall & et al., 2018). Semaglutide increases the maximum insulin secretion capacity in the bloodstream to comparable levels in participants without T2D after 12 weeks (Kapitza et al., 2017). However, it has unwanted side effects within the GI tract: nausea, vomiting, diarrhea, abdominal pain, constipation, and heartburn (American, 2021).

The goal of this study was to adjust the structure of semaglutide to have tighter binding to the receptor. The hypothesis is that a tighter interaction with the target may minimize the negative GI tract side effects by creating a longer-lasting GLP-1R agonist. Key amino acid residues within semaglutide were selected and virtually substituted to create six new alpha-helix molecules, which were then analyzed for their docking compatibility. An optimal linker and fatty acid chain were added to the best candidate to create the completed, alternative GLP-1R agonist.

PROCEDURES

First, a literature search was done to better understand the important chemical features of semaglutide. Semaglutide is an analog to GLP-1 with three key modifications that extend its half-life to 7 days (Hall & et al., 2018): substituting Ala8 with Aib, adding a side chain to Lys26, and substituting Lys34 with Arg (Lau et al., 2015) (Fig. 1). The optimal side chain combination is a γ Glu-2xOEG linker with an 18 carbon diacid fatty chain (Lau et al., 2015). This optimizes human serum albumin (HSA) binding and GLP-1R potency (Knudsen & Lau, 2019; Lau et al., 2015). HSA facilitates the solubility and transportation of insoluble substrates; ideal for the distribution of GLP-1R agonists (Knudsen & Lau, 2019).

Generally, short-acting GLP-1R agonists tend to have more weight loss efficacy, while long-acting GLP-1R agonists tend to have more insulin efficacy (Lau et al., 2015). Therefore, it's presumed that increasing the binding affinity of semaglutide could minimize the negative side effects. The key interactions between the receptor, GLP-1R, and semaglutide are investigated using Maestro molecular modeling software (Fig 2). The most important amino acids on the receptor binding site are Glu68 and Arg 43, which 'hug' the alpha-helical semaglutide molecule (Fig 2a). For semaglutide, the C-terminal amino acids Gly37, Arg36, Gly35, Val33, Trp31, and Phe28 play vital roles maintaining shape and binding to the receptor (Fig. 2b).

Each key amino acid on semaglutide was substituted with a similar amino acid to create six new alpha-helix molecules called S1 – S6 (Table 1, Fig. 3). To analyze the impact of each amino acid substitution, each semaglutide mutant was virtually docked to the binding site in the extracellular N-terminal domain of GLP-1R to determine a docking score using the web browser FlexPepDock Server, specialized for peptide-protein docking (Zhang et al., 2021) (Table 1). The binding scores were then analyzed for increased binding to target, assessed by a lower free energy of binding score.

The docking scores represent a predicted sum of all the free energy terms – including Van Der Waals interactions, hydrogen bonds, salt bridges, solvation effects, and structural penalties – between the drug and target. The more negative the number, the better the predicted interactions in kJ/mol. The docking free energy of binding of Semaglutide was -234.138 kJ/mol. S4 – used as a control for docking – had a docking score of -174.110 kJ/mol and the worst predicted binding affinity for GLP-1R (Table 1). This was expected because S4 has a Glycine to Proline substitution, and prolines are structurally unfavored in alpha helical structures. S1, S2, S5, and S6 had very similar docking scores to semaglutide, indicating that the selected amino acid mutation has little effect on drug-target binding. However, S3 had a better docking score by -2 kJ/mol, meaning it had the best binding affinity out of the seven molecules (Table 1). Although the free energy change from -234 kJ/mol (semaglutide) to -236 kJ/mol (S3, a V33I mutant) may not appear very significant, it is much larger than the expected change based on mass alone. Semaglutide is a 31 amino acid peptide with a mass of 4114 g/mol. The S3 mutant is a 31 amino acid peptide with a V33I mutant and has a mass of 4127 g/mol. The mass change between the semaglutide and S3 mutant is 0.3%. The expected free energy change based on mass alone would be 0.3%, however we see a 0.9% free energy change with the mutant. Mass alone cannot explain the free energy difference between the S3 mutant and the receptor, and it is more likely explained with new intermolecular forces between S3 and the receptor.

Since S3 mutant binds to the receptor with the best predicted free energy, we next wanted to explore how these structural changes might affect absorption, distribution, metabolism, excretion, and toxicity (ADMET) properties of the S3 mutant. The optimal side chain was added to the Lys26 of S3 since it is necessary for absorption and distribution; the new

molecule is called S3a (Fig. 4).

An *in silico* ADMET analysis of the polypeptide was completed to understand its drug-like properties compared to semaglutide (Table 2). S3a appears to have similar predicted ADMET properties in the human body as semaglutide (S). S3a's predicted plasma protein binding percentage is higher. Since binding to HSA facilitates the transportation and distribution of GLP-1R agonists (Knudsen & Lau, 2019), a higher protein plasma binding suggests better transport of S3a mutant. However, the similar prediction for intestinal absorption suggests that GI tract side effects may remain.

CONCLUSION

In this work, *in silico* mutations of semaglutide were designed to increase binding to receptor GLP-1R. S3a semaglutide mutant with a Valine 33 to Isoleucine substitution was found to have a lower predicted free energy of binding to the receptor than semaglutide and has better predicted plasma protein binding. These two characteristics may mean the S3a mutant would be transported more efficiently and spend more time with the drug target. The hypothesis is that these two characteristics of S3a would mean that less drug is needed therapeutically, thereby reducing off-target effects such as problems in the gut. The largest limitation of this study was our inability to perform bioassays or *in vivo* experiments. Future directions will test the combination of the Ile33 substitution with additional amino acid substitutions to further optimize the free energy of binding.

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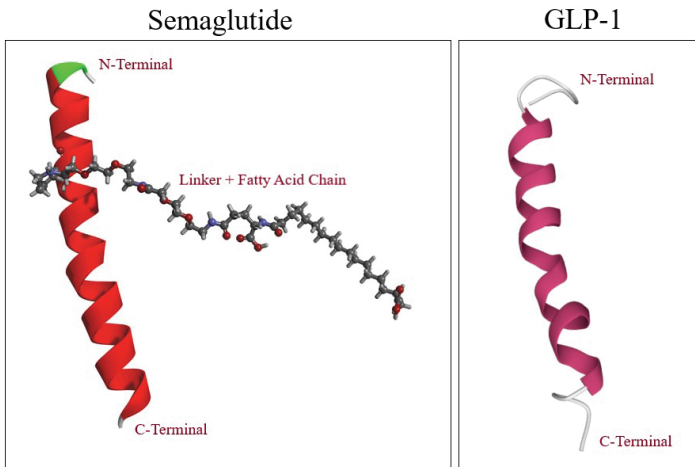


Figure 1. The 3D structure of semaglutide compared to the 3D structure of native GLP-1, highlighting addition of the side chain. Alpha helices are red/pink, variable tertiary structures are white, and the N-terminal is green on semaglutide. Semaglutide image was taken from 3DChem.com; GLP-1 image was taken from PDB; both images were labeled using Paint 3D.

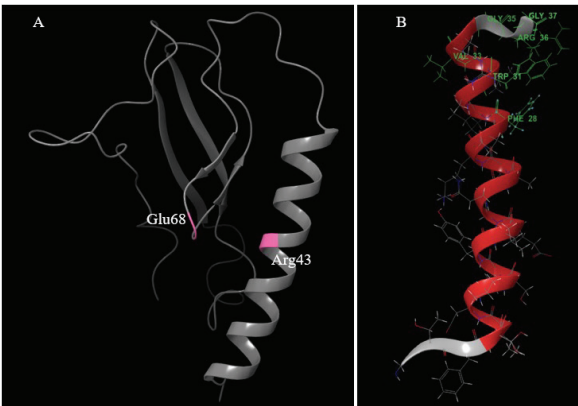


Figure 2. (a) Important amino acids within the GLP-1R binding site (pink). (b) Important amino acids on semaglutide (green). Both images generated using Maestro 12.9.

Table 1. Summary of the amino acid substitutions

Semaglutide (S) Structural Changes		
HU*EGTFTSDVSSYLEGQAAKEFI A WLVRGRG		
Docking Score: -234.138		
S1: Phe28 with Leu	S2: Trp31 with Met	S3: Val33 with Ile
HUEGTF T SDVSSYLEGQA AKEFI A WLVRGRG	HUEGTF T SDVSSYLEGQA AKEFI A MLVRGRG	HUEGTF T SDVSSYLEGQA AKEFI A WLVRGRG
Docking Score: -233.008	Docking Score: -232.697	Docking Score: -236.039
S4: Gly35 with Pro	S5: Arg36 with Lys	S6: Gly37 with Pro
HUEGTF T SDVSSYLEGQA AKEFI A WLVR G PRG	HUEGTF T SDVSSYLEGQA AKEFI A WLVRGKG	HUEGTF T SDVSSYLEGQA AKEFI A WLVRGR P
Docking Score: -174.110	Docking Score: -234.376	Docking Score: -233.469

Summary of the amino acid substitutions (gray) made to semaglutide with the corresponding docking scores (kJ/mol). Docking scores generated in FlexPepDock Server. *U = Aib = 2-aminoisobutyric acid, a non-proteinogenic amino acid.

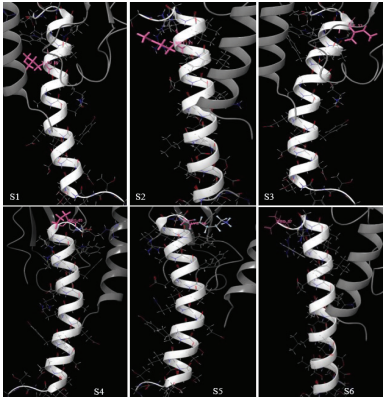


Figure 3. 3D structures of S1- S6 (white) bound to GLP-1R (gray) with substituted amino acids (pink); created using Maestro 12.9.

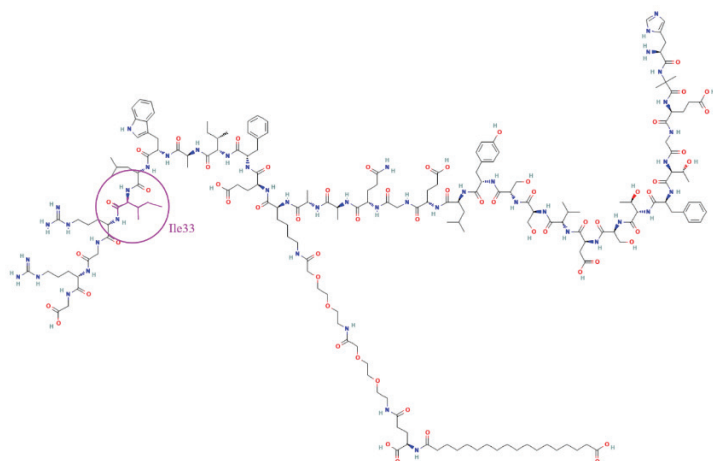


Figure 4. The 2D structure of S3a with the mutation drawn in purple. Image taken from PubChem and labeled using Paint 3D.

Table 2. ADMET analysis of semaglutide (S) and S3a

Molecule	Absorption		Distribution (logS)	Metabolism (Enzyme)	Excretion (Organ System)	Toxicity (Acute Oral Toxicity)
	Human Intestinal Absorption	Plasma Protein Binding				
S	73.36%	79.8%	-3.472	DP-IV	Kidneys	3.628 kg/mol
S3a	73.36%	85.8%	-3.472	DP-IV	Kidneys	3.416 kg/mol

ADMET analysis of semaglutide (S) and S3a. Both sets of data generated using admetSAR, except for excretion (DrugBank Online) and metabolism data (Hall & et al., 2018).

Analysis of beneficial microbial flor and their effects on bacterial species associated with MDD

Zachary Tangaro, Hunter Bird, Jose G Mendoza-Escareno, and Heather Morgan

Mentor: Kendal Beazer & Daniel Clark

Department: Medical Laboratory Science & Microbiology

ABSTRACT

Gut microbiomes vary among populations, but especially in patients diagnosed with Major Depressive Disorder (MDD). Research by Zheng et al. 2016 has shown that after fecal samples from patients with MDD were transplanted into mice, the mice later developed symptoms of MDD. MDD symptoms could later be eradicated if the Microbiome was then normalized. The phylum of Actinobacteria is significantly higher and the phylum Bacteroidetes is significantly lower in patients with MDD and the scope of this research posits if beneficial enteric flora, *Bifidobacterium bifidum* and *Lactobacillus acidophilus*, can “normalize” the concentrations of the two phyla. *Collinsella aerofaciens* and *Actinomyces israelii* represent the Actinobacteria phylum, while *Allistipes shahii* and *Bacteroides fragilis* represent the Bacteroidetes phylum. Experimentation using an artificial gut and inhibitory experiments using BHI agars were used to assess the effect the beneficial enteric flora has on the MDD associated species. *A. israelii* showed the most significant inhibition in both experiments, experiencing a near 4-fold decrease when grown with *B. bifidum* ($p=0.011$) and a near 1.5-fold decrease when grown with *L. acidophilus* ($p=0.08$). The members of the Bacteroidetes phylum experienced mixed results, as did *C. aerofaciens*.

INTRODUCTION

The human microbiome has a major impact on a person’s wellbeing, physically and mentally. Research has shown the gut microbiome is especially influential and changes to it affect receptors in the brain (Lach et al. 2018) and has been shown to have links to depression (Sharon et al. 2016).

The effects the host gut microbiome has on MDD is explained best by analyses of microbiomes of human subjects with MDD, which found significantly higher Actinobacteria and lower Bacteroidetes phyla species present in these patients (Zheng et al. 2016). Fecal transplants from these

patients were then performed on mice. There was increased activity in hypothalamic- pituitary-adrenal axis (HPA) stress response and anxiety and depression symptoms in those with an altered microbiome. After transplant, the mice began to show symptoms of MDD. Normalizing the microbiome eradicated these symptoms, especially if done at an early age (Tetel et al. 2018). This suggests there is a connection between these species of bacteria and symptoms of MDD.

This study will assess how beneficial enteric flora, *Bifidobacterium bifidum* and *Lactobacillus acidophilus*, affect the populations of bacteria associated with MDD. The hypothesis tested if the addition of beneficial enteric flora would show a decrease of Actinobacteria phylum, represented by *Collinsella aerofaciens* and *Actinomyces israelii*, and an increase of Bacteroidetes phylum, represented by *Alistipes shahii* and *Bacteroides fragilis*.

METHODS AND MATERIALS

Inhibition Experiments

This procedure was adapted from Moran et al. 2016. First, all components of plastic 30 mL perfume bottles were soaked in surface disinfectant overnight, then filled with 70% ethanol and stored in a biosafety hood until use. In the first round of experimenting, dilutions of each species were done using a turbidimeter and each species (probiotic and MDD associated bacteria) were diluted in BHI broth to a reading of OD₆₀₀ 0.3+/-0.05. 25 uL of probiotic species were pipetted onto the center of plates and then incubated anaerobically overnight. 24 BHI agar plates were inoculated, in which 12 contained *L. acidophilus* in the center, and 12 contained *B. bifidum*. These plates were then sprayed with approximately 250 microliters (3 sprays) from sterilized perfume bottles containing MDD associated bacteria in BHI broth. Each MDD assoc. species were sprayed onto 6 plates, 3 per probiotic plate. The plates were incubated overnight, anaerobically. Lastly, plates were assessed for inhibition quantitatively and qualitatively, using a ruler and measuring to the nearest .1 mm, then assessed for haziness of the inhibition.

The second round of experiments were done identical to the first round, except MDD associated bacteria were diluted to a concentration of OD₆₀₀ 0.06 +/- .02, and number of sprays onto each plate were reduced to 2 sprays, which is approximately 167 uL.

Gut Simulation Experiment

This procedure was adapted from Mokszycki et al. 2018. Two master mixes were made for the simulated gut model. A Day 0 mix was made so each tube would contain 1 mL of HEPES-Hanks buffer, porcine gastric mucin (500 ug/mL), porcine cecal mucous (0.1 mL), Cleland's reagent (3 mM), and 0.3% agarose (by weight). Porcine cecal mucous was created by ordering porcine cecum and letting it sit in sterile saline overnight, then the inside of the cecum was scraped with a sterile scalpel to get any excess mucous. The saline mucus mixture was then centrifuged down at 2500 rpm for 10 minutes, the sediment used.

The days 1-3 mix was made so each tube would contain 900 uL of HEPES-Hanks buffer, porcine gastric mucin (500 ug/mL), porcine cecal mucous (7.4 uL), Cleland's reagent (3mM), and 0.3% agarose (by weight).

First, day 0 master mix was pipetted into 31 sterilized 1.5 mL microcentrifuge tubes, 600 uL per tube. Then concentrations of each bacteria were made to be an OD₆₀₀ 0.06 +/- .02, using day 0 mix as a blank for the instrument and to make concentrations of bacteria. There were primarily 4 sets of tubes made: 6 tubes contained *B. fragilis*, 3 of which also contained *L. acidophilus* and another 3 contained *B. bifidum*. This set was repeated for each MDD associated bacteria. To each designated tube, 200 uL of each bacterium was added, to make a total volume of 1 mL. Additionally, there were 6 positive control tubes, one for each bacteria species, and 1 negative control tube only containing day 0 master mix.

After being incubated anaerobically overnight, 100 ul of each tube was added to a fresh tube of 900 uL of day 1-3 master mix. After incubating anaerobically overnight again, 100 uL of the tubes were again added to a fresh 900 uL of day 1-3 master mix. Day 1 tubes were then plated onto SBA plates using a .001 mL loop to tentatively measure colony counts. Day 2 tubes were then incubated anaerobically overnight. Then only 10 uL of the day 2 tubes were transferred to tubes containing 990 uL of fresh day 1-3 mix. These tubes were incubated anaerobically overnight then frozen the following day to preserve colonies over the weekend to have their DNA extracted.

DNA Extraction and qPCR

The procedure to extract DNA from the gut simulation tubes was found in “QIamp DNA Mini and Blood Mini Handbook” by *Qiagen*, and the procedure used was “Isolation of genomicDNA from bacterial suspension cultures” followed by “Protocol: DNA Purification from Tissues”.

qPCR was then performed using “2x qPCR Master Mix (Low ROX)” containing a Hot Start Taq DNA Polymerase by Bioland Scientific LLC on a 96 well-plate and using a *QuantStudio 3*. PCR conditions followed specifications of the master mix, which started with denaturation at 95 C for 10 minutes, followed by 40 cycles of 95 C for 15 seconds then 60 C for 60 seconds. The fluorescent dye used was SYBR green, and primers were created using *GenBank* and performing a blast sequence program for each species’ 16s rDNA. The primers were picked to have a low G:C content, as well as making sure product lengths were between 80- 200 BP. To see specific primers, look to addendum.

Calculations and Statistical Comparisons

A delta Cycle Threshold (CT) value was taken for each bacteria combination compared to the positive control CT values. A Fold change (FC) value was then calculated by the formula $FC=2^{-(\Delta CT)}$, then an average FC value was calculated for each combination done in triplicate. To create sensical graphs, a $1/FC$ was calculated for all FCs < 1. All data was analyzed with Microsoft Excel.

RESULTS

The first set the Inhibition experiments using BHI agars did not yield any useful data, due to excessively high concentrations of MDD associated bacteria sprayed onto the plates. The second set of experiments did show *B. bifidum* was able to inhibit both *C. aerofaciens* and *A. israelii*, both of which belong to the phylum of Actinobacteria. *B. bifidum* inhibited *C. aerofaciens* by an average radius of 7.5 mm, and inhibited *A. israelii* by an average of 4.1 mm, totaling for an average of 5.8 mm overall. *B. bifidum* did not show any inhibition toward the other two species of bacteria. *L. acidophilus* did not show any inhibitory patterns.

Assessment of bacteria concentrations using qPCR revealed similar results for *A. israelii*, as *B. bifidum* was able to inhibit its growth ($p=0.011$). All MDD assoc. bacteria showed a relatively insignificant decrease fold change when grown with probiotics, exceptions to this were when *B. fragilis* was

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grown with *L. acidophilus* and when *C. aerofaciens* was grown with *B. bifidum*. In these exceptions, they experienced a 1.08- and 2.89-fold increase, respectively, but the p-values do not suggest they were significant.

DISCUSSION

The gut microbiome of an individual has potential to influence every system in the body. After a disruption of the gut microbiome, deleterious effects can become apparent, and these effects can influence symptoms of mental health disorders, such as MDD. Overall results of decreased FCs for the MDD species may be due to space and resource limits of the bacteria grown together. *A. israelii* and *A. shahii* showed the most significant decreasing FCs, revealing that when grown with probiotics it will effectively inhibit them, giving mixed results since it decreased both phyla instead of just the Actinobacteria phylum. Additionally, *C. aerofaciens* showed a significant increase when grown with *B. bifidum*. Results from experimentation conducted in this study have shown beneficial microbial flora have potential to influence microbial species related to the gut microbiome of a person with MDD.

While more studies need to be done to expand the understanding of interactions between these bacteria, the results of this study are both encouraging and cautionary. Significant inhibition was seen, but not as initially intended. Probiotics could be a new supplemental treatment of MDD with less side effects than current treatments, however more research needs to be done to confirm their effectiveness.

This experiment could be improved upon using an additional freeze-thaw step during DNA extraction to improve accuracy. Removal of normal flora from the gut simulation master mixes would also provide a clearer picture of the effect of each probiotic.

Data accrued throughout this study cannot be used to confirm or deny the hypothesis to which this study set out to test. Anecdotal data obtained does suggest probiotics could have an influence on the bacterial species associated with MDD. This can further suggest probiotics could be used as a form of supplemental treatment to help manage symptoms of MDD. Further research should be conducted with human subjects testing effects of probiotics on gut microbiome populations and should observe the effects treatment has on their symptoms.

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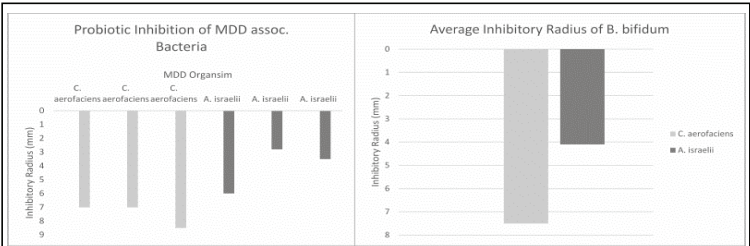


Figure 1.
Inhibitory effects of *B. bifidum* against *C. aerofaciens* and *A. israelii* measured by the radius of inhibition to the nearest 0.5 mm.

Figure 2.
Average Inhibitory effects of *B. bifidum* against *C. aerofaciens* and *A. israelii* measured by the radius of inhibition to the nearest 0.5 mm.

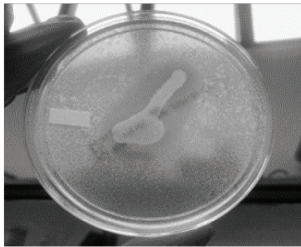


Figure 3.
B. bifidum inhibiting *C. aerofaciens*

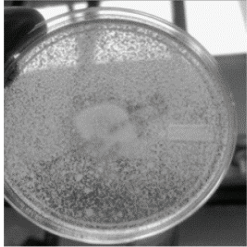


Figure 4.
B. bifidum inhibiting *A. israelii*

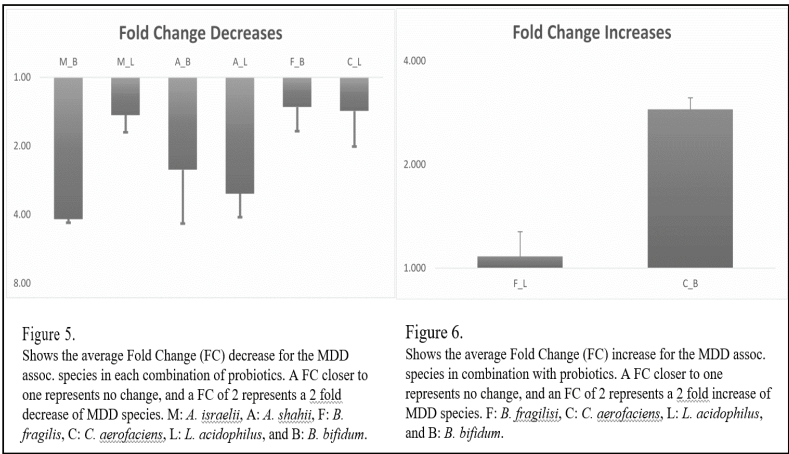


Figure 5.
Shows the average Fold Change (FC) decrease for the MDD assoc. species in each combination of probiotics. A FC closer to one represents no change, and a FC of 2 represents a 2 fold decrease of MDD species. M: *A. israelii*, A: *A. shahii*, F: *B. fragilis*, C: *C. aerofaciens*, L: *L. acidophilus*, and B: *B. bifidum*.

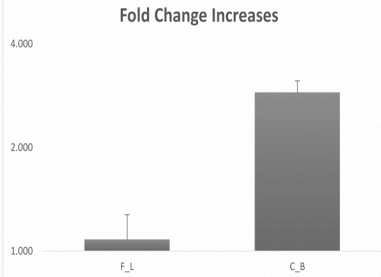


Figure 6.
Shows the average Fold Change (FC) increase for the MDD assoc. species in combination with probiotics. A FC closer to one represents no change, and an FC of 2 represents a 2 fold increase of MDD species. F: *B. fragilis*, C: *C. aerofaciens*, L: *L. acidophilus*, and B: *B. bifidum*.

<u>Two-Tail P-values</u>		
A. israelii		
	L. acidophilus	0.080377621
	B. bifidum	0.011272499
C. aerofaciens		
	L. acidophilus	0.641993634
	B. bifidum	0.11507474
A. shahii		
	L. acidophilus	0.113990046
	B. bifidum	0.184267209
B. fragilis		
	L. acidophilus	0.627852531
	B. bifidum	0.212936994

Figure 7.
Table displaying the p-values for each set of growth conditions by MDD bacteria species.
Significance of each result is determined by the p-values calculated, which shows that the
only truly significant result is that with a p-value less than or equal to 0.05.

ADDENDUM

Primers used for each species are as followed:

Alistipes shahii (ATCC BAA-1179)

Forward primer: GTAGTTGCGGTAGGCGGAAT

Reverse primer: GTAAGCTGCCTTCGCAATCG

Collinsella aerofaciens (ATCC 25986)

5'-3' fwd: CGAGCAGGCGACCTTATACC

5'-3' rev: GGGGCCCAAGATCTCGAATG

Actinomyces israelii (ATCC 10048)

Forward primer: AGCTTGTTGGTGGGGTAGTG

Reverse primer: AGTCTGGGCCGTATCTCAGT

Bacteroides fragilis (ATCC 23745)

Forward primer: TGGGAGGTATGGAGCGAGAA

Reverse primer: CCTCTATATGTTGCCGCCGT

B. bifidum (ATCC 11863)

Forward primer: TCCCCATGTGCGACTGGA

Reverse primer: TAGGCGGCGTTCTTGACTT

L. acidophilus (ATCC 314)

Forward primer: TGGTATCCCGGGTGAAAAGC

Reverse primer: ACTGAACCGCCCAATCAT

Travel Abstracts



Volume 16

Characterization of metformin's repression of chemokine production by cancer cells

Benjamin Alton

Mentor: Barb Trask | Department: Zoology & Microbiology
4th International Conference on Cytokines in Cancer 2022 | Chania, Crete, Greece

ABSTRACT

Numerous studies have demonstrated that the anti-hyperglycemia drug, metformin, exhibits both antiproliferative and anti-metastatic effects on cancer cells. For patients diagnosed with triple-negative breast cancer, these in vitro effects are associated with life-prolonging outcomes in vivo. Although the anti-metastatic potential of metformin is striking, the mechanism by which the drug exerts this effect is unclear. Generally, the number of tumor-associated macrophages (TAMs) found in solid tumors portends poorer prognoses. TAMs are recruited to solid tumors not only by tumor-infiltrating stromal and inflammatory cells but also by tumor cells themselves. Tumor cell production of monocyte-recruiting chemokines has been well-documented for a number of cancer types, including triple-negative breast cancers. We hypothesized that metformin exerts its anti-metastatic effects, at least in part, by inhibiting tumor cell chemokine production. To test this hypothesis, two triple-negative breast cancer cell lines were treated with varying concentrations of metformin and at varying timepoints. Metformin treatment diminished the production of several key CC chemokines as measured via real-time PCR.

Urine Splatter Characteristics

Ethan Barlow

Mentor: Randy Hurd | Department: Mechanical Engineering
ASME Fluids Engineering Division Meeting 2022 | Toronto, Canada

ABSTRACT

In spite of current understanding of fluid behavior, common urinals do little to prevent urine splash back. This poster presents data from lab-simulated urinal usage and splatter visualization. A realistic prototype of a male urethra (nozzle) was created on a 3D printer and connected to a reservoir of dyed water that generated stream volumetric flow rate in-line with average values for healthy males (21 mL/s). This flow system was allowed to flow for 20 seconds at a time onto a geometrically simplified urinal (sheet of vertical glass). Large sheets of white paper were placed on the ground below the urinal for each iteration to visualize the resulting splatter. Streams and stream impact characteristics were filmed with high-speed cameras (images from these videos are presented on the left side of the poster). The horizontal distance from the nozzle to the vertical sheet of glass was varied with each experiment. The resulting data show that, for this particular stream diameter and flow rate, the liquid stream breaks into droplets between 18 and 23 cm after exit (see colored streams). The nature of the water impacting the glass plays a critical role in the formation of droplets. When a steady stream of water is flowing onto a flat surface, no small satellite droplets are ejected from the impact site. If the stream has broken into droplets, each droplet creates a splashing event as it impacts the wetted surface. These splashing events are capable of propelling satellite droplets to surprising distances, sometimes exceeding 1 m from the impact location as can be seen from collage of multiple splatter patterns (right side of poster). These results suggest that standing closer to the urinal is a non-intuitive solution to this problem.

Lovecraft's Bible

Toban Barnes

Mentor: David Hartwig | Department: English Language & Literature
Rocky Mountain Language Association 2022 | Albuquerque, New Mexico

ABSTRACT

Corrupted Christian themes are apparent in many of H.P. Lovecraft's stories: "The Horror at Red Hook" tells of ancient rites practiced in a Catholic Church; "The Dunwich Horror" includes an evil Christ character in the half-god half-man, Wilbur Whateley; Lovecraft's character, Cthulhu, is a retelling of the second coming of Christ; and Lovecraft's fictional book, the Necronomicon, is referenced as scripture in occult religious organizations. Lovecraft was not religious, but his use of religious themes transformed his fiction oeuvre into a religious text that has influenced cult organizations, including the Church of Satan and the Esoteric Order of Dagon. American historians and critics often overlook H.P. Lovecraft. However, he was one of the most influential writers during the Progressive Era in America, and his work continues to influence the contemporary horror genre. This paper argues that Lovecraft's fiction has inadvertently become its own Bible that tells the history of ancient beings with no love for humankind. Furthermore, I demonstrate that just like the Christian Bible, Lovecraft's work has become a mythos for those who follow its scriptural message.

Amino Acid Decarboxylation, a Source of CO₂ Formation in Cheese

George Barrera

Mentor: Matthew Domek | Department: Microbiology
American Society of Microbiology, Microbe 2022 | Washington D.C.

ABSTRACT

Amino acid decarboxylation is a potential source of CO₂ production in cheese by *Paucilactibacillus wasatchensis* WDC04. Kate Sorensen, George Barrera, Michele Culumber, Matthew Domek, Craig Oberg, Taylor Oberg, and Donald McMahon *Paucilactobacillus wasatchensis* (WDC04) is a non-starter lactic acid bacteria that is linked to unwanted late gas production in Cheddar cheese. Recent research has shown that this organism has the capability of utilizing the Pentose Phosphate Pathway, following the removal of CO₂ from a 6-carbon sugar, such as galactose. However, WDC04 has still been known to produce splits and cracks in Cheddar cheese in the absence of these sugars. In cheese production trials, more CO₂ is released than can be accounted for by added carbon substrates. One possible source of gas production could be the decarboxylation of free amino acids with the formation of biogenic amines. The ability of lactic acid bacteria to decarboxylate amino acids varies greatly but can be used to generate proton motive force. Putrescine and cadaverine, the decarboxylation products of ornithine and lysine respectively, have been detected in cheese inoculated with WDC04. The purpose of this study was to determine if lysine and ornithine could be utilized for growth by cWDC04 and if decarboxylation would lead to gas production. The incomplete *P. wasatchensis* WDC04 genome (GCF_000876205.1) was analyzed for decarboxylation enzymes. In this research, an ornithine decarboxylase was found, but a lysine decarboxylase was not. Carbohydrate restricted MRS (CR-MRS) with 100-700 mM of lysine or ornithine was inoculated with *P. wasatchensis* WDC04 in 24-well plates and incubated at 30°C. Oxyrase (2%) was added to create anaerobic conditions. Growth curves were monitored by measuring turbidity over 72 h on a Tecan Infinite M200 plate reader. Without the addition of ribose (1%), neither amino acid supported growth above the media alone. However, amino acid decarboxylation may still be the source of excess CO₂ production without the amino acids being used as a growth substrate. Further culture-based analysis will determine if the amino acids contribute to gas release by *P. wasatchensis* WDC04.

Role of MMP2 in Retinal Regeneration in Zebrafish

Landry Batis

Mentor: Elizabeth Sandquist | Department: Zoology
Society for Neuroscience Meeting 2022 | Chicago, Illinois,

ABSTRACT

Cell transplantation therapy has the potential to remedy presently incurable neurodegenerative diseases and injuries of the retina. However, low cell survival and retention is observed following transplantation to the retina. Disrupted environmental architecture and the presence of growth inhibitory molecules can reduce the efficiency of transplanted cells. Replicating regenerative stem cell niches such as those observed in zebrafish may improve cell survival and retention following transplant. Further, the use of developing zebrafish allows for live visualization of cell migration, an important step for stem cell integration following transplant. Matrix metalloproteinase-2 (MMP2) promotes cell migration during development, with some evidence of involvement in regeneration. The objective of this study was to confirm whether MMP2 plays a role in retinal repair. Following photolesion to the zebrafish retina at three days post fertilization, the expression of MMP2 was measured at 1, 2, 3, 5, and 7 days postlesion. Results demonstrated that the gene was upregulated in the eye compared to controls. Significant changes in MMP2 expression indicates that further investigation of MMP2 in retinal regeneration is warranted. A second goal was to explore the validity of larval, rather than adult, zebrafish as a model for retinal regeneration. Immunohistochemistry to detect proliferating cell nuclear antigen (PCNA) was used to measure cell proliferation in the retina following injury. To identify proliferative Müller glial cells, Tg(alpha-1 tubulin: EGFP)zebrafish were used. This can determine whether Müller glia are the source of new cells, as is seen in adults, or if the cells originate in the ciliary marginal zone, which is responsible for normal retinal development. Future experiments will use live imaging to characterize the migration patterns of retinal stem cells during regeneration, as well as the effects of loss of MMP2 on this process. The ability to live image retinal stem cell migration in vivo will be an additional tool available to scientists as they investigate the mechanisms of regeneration. A better understanding of the manner in which stem cells migrate within their environment during repair, such as with matrix metalloproteinases, will lead to optimized cell delivery methods and improved prognosis for patients with retinal disease.

Dancing Through the Stillness

Ashley Beckwith

Mentor: Amanda Sowerby | Department: Performing Arts, Theatre
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

How does collaborating and gathering with other universities in this country help us to learn and expand our skills, and therefore grow as a loving person of the community? Being a part of Tara Lemon's dance project has brought me endless joy and opportunities to find research within dance. I have not only discovered things about myself through dancing in Tara's company, but I have become filled with gratitude as we have a chance to perform for other university students at the American College Dance Association at the University of Oregon. Not only do I get the chance to perform, but I get to observe other university dancers from all over the country. I get to learn from professional choreographers and teachers that can hugely benefit me in my education and continuous dance research on embodiment, vulnerability through movement, and connection between all communities.

The Impact of Head Position on Muscle Activation During the Back Squat

Marissa Brunner

Mentor: Alysia Cohen | Department: Athletic Training
National Strength and Conditioning Association 2022 Conference | New Orleans, Louisiana

ABSTRACT

The back squat is an integral strength training exercise. Squat technique influences muscle activation, performance outcomes, and risk of injury. Guidelines for foot placement, knee alignment, and torso are well supported by previous studies; however, head position lacks sufficient scientific support. **PURPOSE:** The purpose of this study was to investigate the influence of head position on abdominal (external and internal obliques, rectus abdominis) and gluteus maximus muscle activation during the combined eccentric and concentric phases of a weighted back squat. The hypothesis was an upward head position would increase abdominal and gluteal muscle activation. **METHODS:** A randomized counterbalanced study of 19 participants (9 female, 10 male, aged 23.37 ± 2.29 yrs, height 174.18 ± 9.27 cm, weight 79.74 ± 14.03 kg) with back squat experience included an initial 3RM back squat followed by a 72-hour rest period. Participants returned and performed MVIC tests for each individual muscle; then 2 sets of 3 reps of the back squat at 75% of their estimated 1RM at neutral (0 degrees), extended (20 degrees), and flexed (20 degrees) neck position. Neck position was maintained via a constructed harness with a laser headlamp to stabilize the participant's gaze aligned with the head position. Delsys Trigno Wireless EMG System with Avanti sensors were positioned over each muscle. Individual MVICs were referenced to normalize the rate of muscle activation (% mean, % peak) throughout the back squat motion. One-way RM-ANOVA were performed to assess differences in muscle activation for each muscle per head position. Statistical significance was set at $P < 0.05$. **RESULTS:** No statistically significant main effects were observed between head position and MVIC (%) for the four muscles (Table 1). **CONCLUSIONS:** When performing the back squat, the abdominal and gluteus maximus muscles appear to activate similarly regardless of head position. No single head position was shown to be superior to another that would support a case for enhanced performance-related outcomes or reduced risk of injury. During the back squat, head position guidelines may be more flexible than other joints, suggesting a possible cushion zone that could facilitate sufficient muscle activation to produce strength gains and avoid injury. Emphasis on trunk flexion (loading forces) rather than head position alone, should be further examined to support the results of this study. **PRACTICAL APPLICATIONS:** In practice, given the lack of support for a single head position during the back squat, strength and conditioning specialists may allow athletes/clients to position the head and

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adjust their gaze as it works best for the individual, including fluctuations through the full movement. It remains important for the community to recognize increases in overall trunk flexion during the back squat greatly increases the risk for vertebral injury, which may or may not be impacted by head position. References 1. Donnelly, D., W.P. Berg, and D. Fiske. The effect of the direction of gaze on the kinematics of the squat exercise. *J. Strength Cond. Res.* 2006; 20 (1):145–150. 2. Beaudette SM, Briar KJ, Mavor MP, Graham RB. The effect of head and gaze orientation on spine kinematics during forward flexion. *Hum Mov Sci.* 2020; 70:102-590. 3. Hlavenka TM, Christner VFK, Gregory DE. Neck posture during lifting and its effect on trunk muscle activation and lumbar spine posture. *Appl Ergon.* 2017; 62:28-33.

The Refugees NYC Theatre Research Trip

Caleb Campbell

Mentor: Jennifer Kokai | Department: Performing Arts, Theatre
Theatre New York Trip 2022 | New York, New York

ABSTRACT

This research project is based on the studying of the professional theatre environment in New York City. A group of Weber State theatre students along with some mentors will be traveling to New York to work with the Adjusted Realists Theatre Company on a production of *The Refugees*. As part of this grant application, \$1,000 is requested from the Office of Undergraduate Research to assist in covering the housing costs. The students will take on a variety of roles during the process of the production, including assistant designers, assistant stage managers, and even actors. The value of this project is learning how the creation of theatre varies based on location and level of professionalism. At present, the majority of the students have not worked in theatre outside of the educational context, nor have they worked outside of the state. This project would allow them to do both, by working both in a professional context, and in a drastically different environment. Overall this project would allow for more well rounded and experienced artists.

Survey of Strain Specific Phage From the Great Salt Lake

Preston Capener

Mentor: Matthew Domek | Department: Microbiology
American Society for Microbiology National Conference 2022 |
Washington D.C.

ABSTRACT

Bacteria growing in the Great Salt Lake (GSL) are halophilic in nature due to the high salt concentration and are represented by a large number of diverse species. Previous studies from this laboratory have led to the isolation of various phages that infect GSL halophiles, including *Halomonas*, *Idiomarina*, *Salinivibrio*, and *Marinobacter*. In this study, we collected a single sample from Bridger Bay in the GSL and plated it on three different halophilic media formulations: HB agar, CB agar, and TH agar. A unique bacterial isolate was saved from each media formulation, which were named HB3, CB6, and TH4. Sequencing of the 16S rRNA gene of the three isolates revealed that they are all unique strains of the same species: *Salinivibrio costicola*. Concurrently, a portion of the water sample was centrifuged and filtered through a 0.2-micron filter. We challenged each bacterial isolate with the filtered water sample and measured growth on a plate reader at 25 °C for 30 hours. An increase of absorbance, followed by a rapid decrease was taken as evidence of the presence of a lytic phage. Three samples showed evidence of phage infection—one for each host. We recovered phage lysates for each of these three samples and confirmed that they were lytic against the original host by performing spot tests. Remarkably, there was no cross-reactivity of phage infections between the three samples. We also tested the three bacterial hosts against an expanded panel of bacteriophages in our collection.

Using Research to Improve Water Sustainability at Weber State

Breanna Child

Mentor: Carla Trentelman | Department: Sociology and Anthropology

Global Conference on Sustainability in Higher Education 2020 | Virtual Conference

ABSTRACT

Our student session will focus on undergraduate research done in Ogden, Utah at Weber State University. This research investigates attitudes, beliefs and perceptions towards water and water use held by various stakeholders at Weber State. This is a replication of research that was done six years ago which provided valuable insights that improved campus water sustainability practices. By replicating this study, we hope to gain further suggestions towards future water sustainability management practices on campus. Additionally, this presentation will address Weber State University's water sustainability efforts in an attempt to provide tips and insights that others can implement at their own institutions. Originality: This particular research study is unique from others in that it is undergraduate student community-based research where our community partners are Weber State University Campus Operations. Audience Empowerment: This Student Session will include information on how water sustainability efforts at Weber State University were pushed forward thanks to insights and findings from previous student community-based research. Our goal with sharing the replicated research is to empower students and inform sustainability staff on how they can address the barriers and solutions towards water sustainability. This can be done by partnering together and communicating with the right stakeholders on campus. Through this presentation, we hope to encourage others to mobilize for a just transition by remembering to bring in the often neglected topic of water sustainability. By doing this, we can truly move towards a more holistic, sustainable future.

Rhetorically Reflective FYC: A Student-centered, WAC-aligned Foundation for Transfer

Elissa Cruz

Mentor: Jason Barrett-Fox | Department: English
TYCA-West Conference 2022 | Mesa, Arizona

ABSTRACT

For more than a century, scholars have argued the merits of teaching writing skills in First Year Composition (FYC) courses that must then somehow transfer to the more specialized writing necessary in the disciplines students choose to study. This becomes increasingly difficult as more students from diverse backgrounds and varying levels of preparedness and knowledge enter college. Therefore, what FYC instructors need is a more robust FYC course that places students at the center of the coursework. This presentation discusses the intersection of Writing Across the Curriculum (WAC), transfer theory, and student-centered pedagogies to create a rhetorically reflective FYC course that will help the students gain the personalized education they need to be successful once they leave the FYC classroom.

“Dancing Through the Stillness”

Alexa Cunningham

Mentor: Joseph Blake | Department: Performing Arts, Dance
American College Dance Association Northwest Conference 2022 | New
York, New York

ABSTRACT

While being a part of Tara Lemons “Dancing Through the Stillness,” I have taken close focus on my relationships with others and how they react to me with intention through focus and movement. Tara has provided a foundational understanding of the movement, but I strongly feel she has given us all the opportunity to find moments in her piece to connect nonverbally, gracefully, and distinctively. We are working as a group to create a show that highlights comfortability as well as vulnerability. Overall, dancing provides a showcase to audience members how the body can move naturally vs unnaturally. How beautiful it is to see how the body works as a whole creating shapes as well as how it relates to others in the space!

Demenstruators, Menstrual Products, and Métis: An Embodied Rhetoric of Wearable Technologies

Mashaela Farris

Mentor: Jason Barrett-Fox | Department: English

Conference on College Composition and Communication | Chicago, Illinois

ABSTRACT

Building off Jay Dolmage's work on embodied rhetoric and demonstrative rhetoric, this piece incorporates an analysis of wearable technology and knowledge produced from the body. By implementing Jordyn Jack's feminist framework of the breast pump to menstrual products, I narrow my focus on how menstruators generate knowledge from their menstrual products and menstruating bodies. This piece provides a rhetorical analysis on various menstrual products cultivated from my designed surveys and interviews with menstruators. In this sense, I concentrate primarily on how menstruators'—or demenstruators'—experiences with wearable technologies act as a form of knowledge production. I maintain that by advocating for bodies who have been marked as Other to explore their bodies or bodily cycles, to speak up about their menstruation, and by simply menstruating and using menstrual products in a public place, we not only provide marginalized voices a kairotic moment of empowerment, but we also champion a different kind of rhetoric—a rhetoric of the body.

Dancing Through the Stillness

Robert Favela

Mentor: Amanda Sowerby | Department: Performing Arts, Dance
American College Dance Association Northwest Conference 2022 | New
York, New York

ABSTRACT

Tara Lemons is the first person at Weber State University to be awarded the “Lindquist Student Fellowship Award”. After receiving this award, Tara has created the dance project “Dancing Through the Stillness”. Tara hired eight dancers and created eight different pieces with all different concepts. For me, “Dancing Through the Stillness” is about connection, and how the connection is present or absent through our lives. Connection to ourselves, connection to the space around us, connection to humanity, and connection to spirituality. Being a part of the project “Dancing Through the Stillness” has informed me kinesthetically, intellectually, and internally. Being a part of this process, I’ve learned so much about myself. It was important for me to gain more experience working with a choreographer that pushes their dancers physically and intellectually. In the Spring of 2022, the Weber State dance area wants to represent Weber State at the “American College Dance Association” conference. Having the opportunity to attend the “American College Dance Association” would enhance my research process and benefit my future goals as a professional dancer. My goals include networking, performing in front of larger audiences, challenging myself by trying different dance styles, and growing as a dancer from receiving constructive criticism at adjudication from ACDA. I would be honored to represent Weber State while working hard towards my goal of becoming a professional dancer.

Dancing Through the Stillness

Gina Fuller

Mentor: Joseph Blake | Department: Performing Arts, Dance
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

Participating in “Dancing Through the Stillness” has been such an amazing experience. Through the beautiful choreography, the long rehearsals, and dedication to the art of dance, I believe each dancer has come to learn much more about our choreographer, each other, and ourselves. This project has really highlighted for me how stunning movement can be, and how words aren’t always needed to portray emotion or a purpose. Every single dancer has brought something different and wonderful to the table by their own style and interpretation, and it truly wouldn’t be the same project without anyone. Overall, Dancing Through the Stillness has brought to me a new way of expression, a fresh perspective on emotions and community, and a sense of family within dance.

Hand Dryers Serve as a Reservoir for Antibiotic Resistant Bacteria

Ashlynd Greenwood

Mentor: Michele Culumber | Department: Microbiology
American Society for Microbiology | Washington D.C.

ABSTRACT

Automatic hand dryers on the Weber State University campus have been installed in most restrooms to improve convenience and decrease paper waste. In addition, hand dryer manufacturers claim they provide a more hygienic method of hand drying. However, previous research has shown that these hand dryers may act as a reservoir for pathogenic bacteria and viruses. The purpose of this experiment was to isolate bacteria from hand dryers, characterize their antibiotic resistance profiles, and then identify these bacteria. Hand dryers from 32 high-traffic restrooms (16 men's and 16 women's), from four buildings, were sampled. A 10 cm² area at the bottom of the drying chamber inside of the hand dryer was sampled using 3M Quickswabs. Swabs were used to inoculate MSA, TSA, EMB, and SBA plates, which were incubated at 37° for 24-48 hours. A total of 73 isolates, primarily from the MSA, EMB, and SBA plates were selected for further characterization. Individual isolates were transferred to TSB broth and grown at 37° for 24 hours and were used to screen the isolates for resistance to five antibiotics; ampicillin, vancomycin, tetracycline, penicillin, and chloramphenicol utilizing the Kirby-Bauer method. Isolates that showed antibiotic resistance were identified using 16S rRNA gene sequence analysis. Forty-four isolates showed resistance to one or more antibiotics and 42 were resistant to at least two of the five antibiotics. The majority of the isolates were resistant to penicillin, but a few were also resistant to vancomycin. The most common isolates among the penicillin-resistant organisms were common human commensal *Staphylococcus* sp. including, *S. warneri*, *S. intermedius*, *S. saprophyticus*, and *S. aureus*. We also found representatives of environmental bacteria, *Bacillus pumilus* and *B. velezensis* and *B. subtilis*. Less common were Gram-negative bacteria including *Enterobacter hormaechei* and *Mixta calida*. All of the species identified have the potential for opportunistic infections. We have shown that antibiotic resistant bacteria are present in electric hand dryers and may represent a significant source of community-acquired antibiotic resistant infections. To prevent bacterial contamination and the spread of antibiotic resistance during hand drying, the hand dryer's inner chamber should be thoroughly cleaned with a disinfectant on a daily basis.

TRAVEL ABSTRACTS

Stage Manager on New York Theatre Production The Refugees

Adam Hellewell

Mentor: Cully Long | Department: Performing Arts, Theatre
The Refugees, a Weber State University ad Adjusted Realists co-
production in New York City | New York, New York

ABSTRACT

Theatre can lend itself to be a diverse interconnected cultural exploration of the human experience. New York City hubs a massive diversity of ethnicity, culture, and experience. Meshing these two worlds together in an off-Broadway production that explores this concept can lend itself to an exploration of intersectionality. How do stage managers manage this diverse population in a respectful and culturally sensitive manner? How do professionals work together, especially in a diverse sense?

NYC Refugees Project

Lily Hilden

Mentor: Jennifer Kokai | Department: Performing Arts
The Refugees, a Weber State University ad Adjusted Realists co-production in New York City | New York, New York

ABSTRACT

Many important skills are cultivated while working hands-on in a professional field. A group of students from Weber State University was offered to work in New York on a production of The Refugees alongside The Adjusted Realist Theatre Company in a professionalizing educational opportunity this May through June. I will be a performer in the cast, alongside professional actors and directors. Evidence suggests that this type of experience makes entering the professional world easier after graduation, and helps form habits and skills that can be used while still completing their degree. Some of the skills include time management, professionalism, and interpersonal skills such as communication and collaboration. Since theatre is a collaborative effort, this chance to collaborate with individuals who have more experience should challenge these students to put forth their best work, providing them a platform in which to build off of for future work within the theatre world. Engaging with the New York theatre community as undergraduates is an experiment in creating art with professionals in a different environment than a college setting can provide, and is an excellent way to start a career in theatre. Funding requested will go toward housing while I am on this project.

Investigating the Effects of Media Engagement on Confidence with the Police

Rhiannon Hopes

Mentor: Dennis Lee | Department: Criminal Justice
American Society of Criminology 2021 | Chicago, Illinois

ABSTRACT

Media coverage of the crime fighter image of police may negatively affect citizens' attitudes toward the police. Previous studies have found a significant relationship with the consumption of media and its impact on citizens' attitudes toward the police. Yet, there has been minimal research on whether how individual's engagement of police-related news on the internet and social media has an impact on their perception of the police. Using a sample of college students from multiple universities, the current study contributes to the literature by examining the relationship between engagement in police-related news and attitudes toward police. Results indicate that news engagement on the internet and social media is a significant factor on attitudes toward the police. Limitations and future studies are discussed.

Growing Up -- Sigma Tau Delta International Conference

Kassandra Hurtado

Mentor: Laura Stott | Department: English

Sigma Tau Delta International Convention 2022 | Atlanta, Georgia

ABSTRACT

The poem, “Growing Up” is based on real-life actions that have been experienced by myself firsthand. I want my poem to show others (especially those who may not have experienced any form of discrimination) that as a child being told the color of skin only limits jobs, education, and status has made a stereotype that many find hard to grow out of. Being told this at an early age can make children grow up self-conscious, but when children of color are told repeatedly that their color is something that should be celebrated, they finally start to see it themselves. This poem fits the theme of Sigma Tau’s Conference in Atlanta, GA.

Analysis of the Cathodoluminescence of Zircon Crystals Using Python

Chloe Jones

Mentor: Kristin Rabosky | Department: Physics

Conference for Undergraduate Women in Physics 2022 | Tucson, Arizona

ABSTRACT

Spectroscopy, the study of the wavelength dependence of light and its interactions with matter, can unlock many mysteries about the composition and history of a substance. A specific branch of spectroscopy, cathodoluminescence (CL), which correlates specific wavelengths to specific components, is a valuable tool to geoscientists and physicists alike. It is a useful process in both the microscopic and macroscopic world, from zirconium crystal grains the size of a few micrometers to planetary nebulae stretching trillions of kilometers across. Python is an excellent tool for creating a consistent method of analysis. In this project, we identified the characteristics that make spectroscopy applicable across fields, described the coding process for analyzing data, and applied the idea of elemental “fingerprints” to gather information regarding sample composition.

The Syrian War and the Worldwide Refugee Crisis

Konstantinos Kambouris

Mentor: Janicke Stramer-Smith | Department: Political Science and Philosophy

International Studies Association West Pasadena Conference 2022 |
Pasadena, California

ABSTRACT

In 2011 the Arab world changed. Citizens from over 15 nations took to the streets with a goal to gain more political influence, civil rights, and civil liberties. In response, governments and leaders across the region responded in various ways. Some were toppled, like Egypt and Tunisia. Others immediately shut down the opposition forces, like Jordan and Saudi Arabia. One however, had such a violent shut down of protesters, it started an ongoing civil war, like Syria. The Syrian Civil War, that started as an offshoot of Arab Spring protests, has turned into an international proxy war with many fronts and players involved. In this analysis, I will state how the Syrian Civil War became a war of international interest with support, conflict, and opposition from many world powers towards many different states and nonstate groups within the geography of Syria. This analysis of the war was understood by studying the qualitative data gathered from media articles at the time of the war, briefings and interviews that highlight the United States foreign policy towards Syria, and academic writings that highlight the political dynamics of all the players involved. I will then go on to argue that this multi-dimensional war has created an international humanitarian conflict that consists of millions of ordinary Syrian people displaced. The bulk of analyzing the humanitarian conflict comes from reports released from the United Nations Higher Council on Refugees and Pew Research, along with various articles that highlight the political, social, and economic impact bringing in refugees has had on neighboring states. With this being an international proxy war, the United States and the international community has had a lot of involvement so far. In reflection of this international proxy war and humanitarian crisis, it will also take a lot of courage and bravery from the United States and the international community to house and aid the struggling refugees, restore regional alliances, and rebuild a war-torn land for a healthy Syrian diaspora to return to.

Identification of Antimicrobial Fermentation Products by *Latilactobacillus curvatus* Using GC-MS

Dallin Leatham

Mentor: Craig Oberg | Department: Microbiology
American Society for Microbiology 2022 | Washington D.C.

ABSTRACT

Dairy food preservation has evolved over time through the use of lactic acid bacteria (LAB) cultures to ferment lactose into lactate. Recently, LAB cultures have been identified which produce antimicrobial compounds that inhibit the growth of spoilage and pathogenic organisms. *Latilactobacillus curvatus* has been identified as a major organism in aged Cheddar cheese, and the potential to make antimicrobial products have been identified through whole genome sequencing. These products include propionate, 3-hydroxypropionate, and the intermediate 3-hydroxypropionaldehyde, which constitutes part of the antimicrobial reuterin. Reuterin has been well studied for its antimicrobial properties. This potential ability in *Lat. curvatus* to produce reuterin is unique. The purpose of this study was to determine the metabolic capabilities of *Lat. curvatus* to synthesize these compounds when grown on different substrates. *Latilactobacillus curvatus* strains were incubated anaerobically using different carbon sources with and without vitamin B-12 for 7 days. Samples were taken on day 0, 1 and 7. Substrates included 1,2-propanediol, lactate, and glycerol. GC-MS was used to identify metabolomic compounds. Samples were derivatized with methoxamine hydrochloride in pyridine followed with N-Methyl-N-trimethylsilyl)trifluoroacetamide (MSTFA). Fatty acid methyl esters were also added as an internal standard and the samples were then analyzed on the GC-MS. Analytes were identified by comparing reference indices and mass spectral data to AMDIS and Shimadzu GC-MS libraries. Results showed that *Lat. curvatus* can produce propionate from 1,2-propanediol, but not from lactate. This indicates that the organism is missing the ability to convert lactate to 1,2 propanediol. Results also showed that *Lat. curvatus* can produce 3-hydroxypropionate from glycerol, and that the amount dramatically increases when B-12 is added to the media. These results illustrate the potential use of *Lat. curvatus* as a protective adjunct culture to decrease spoilage and potentially inhibit pathogenic organisms from growing in fermented dairy products.

Lemontree Dance Project

Tara Lemons

Mentor: Amanda Sowerby | Department: Performing Arts, Dance
American College Dance Association Northwest Conference 2022 | New
York, New York

ABSTRACT

My movement exploration and research for Dancing Through the Stillness revolve around finding expressions that resonate with audiences as reason for human existence, providing possibilities for the struggle that all humanity endures. Science finds that art capable of touching the human soul answers a neurological need to connect with a higher power. My work aims to unify neurotheology with audience receptivity to explore a performative embodiment of the human condition. I believe there is beauty in the struggle to triumph over pain, because in it, we find relinquishment of ego and the will to reach beyond toward a bigger reality. My work hopes to reflect an abiding faith in humanity that extends dance as an expression of life, moving in patterns and rhythms that unite and uplift. Throughout this process, I have worked closely with my dancers to find elements of movement that bring dance to the forefront of our consciousness. For example, anyone with an intuitive connection to the environment we move through, in essence, dances through life. Dance, as I perceive it, is using movement of any kind to intuit the world and our understanding of it. We, as a company, allow our practice sessions to grow an aesthetic that might exhibit a dancer's individual honesty and vulnerability. It is the purest of moments that Dancing Through the Stillness looks at within a dedicated search for accessible and relatable movement.

Dancing Through the Stillness

Brittany Lundmark

Mentor: Amanda Sowerby | Department: Performing Arts
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

The project that I have been working on has been in collaboration with a student dance choreographer and the research that I have conducted has been on the performance side of dancing. This includes bringing the choreographer's vision for the dance to life and sharing the story with the audience. My experiences and research in this project have provided me with many valuable skills that will benefit me in the future when I become a choreographer or dance teacher. I learned how to better communicate with other people working on the same project and how to implement many different elements of dance seamlessly into the same piece of choreography. It was an honor to witness a choreographer work through her choreographic process, see the process of creating a show from beginning to end, and watch her entire process evolve into a great product; a live performance. The American College Dance Association (ACDA) conference allows for students to continue their research in the field of dance on a regional and sometimes national level. The main focus of the conference is to promote and support the talent and creativity of college and university dance students. During ACDA, college students are given the opportunity to take classes from instructors in the northwest region and across the nation. This is a great opportunity for students to continue their research of dance because each teacher and choreographer has something different to offer. This provides students with the opportunity to research while outside of their university's academic setting and be exposed to how diverse the dance in college is. Presenting the finished dance piece and research at ACDA is the end goal of this project.

Forget-Me-Not

Sean Maloy

Mentor: Laura Stott | Department: English

Sigma Tau Delta International Convention 2022 | Atlanta, Georgia

ABSTRACT

The story I will be presenting is titled “Forget-Me-Not” and is authored by me, Sean Maloy. It follows an aging man named John as he explores the place of his childhood and relives the memories of his lost love. The story deals with themes of memory and death, and the unending passage of time, nature of change. It is narrated by death, and death is the point of view character.

The Effect of the Game Ready vs Frozen Elastic Bandage on Skin and Intramuscular Temperature

Logan Matthews

Mentor: Valerie Herzog | Department: Athletic Training
National Athletic Trainers' Association 2022 Convention | Philadelphia, Pennsylvania

ABSTRACT

The Effects of the Game Ready® vs. a Frozen Elastic Bandage on Intramuscular Temperature Herzog VW, Matthews L, Castiana M. Weber State University, Ogden, Utah Context: Previous research has shown the effectiveness of various devices in cooling intramuscular tissue. Because of the low cost, a frozen elastic bandage may be a more practical clinical technique than commercially available cold compression units. The objective was to compare the intramuscular temperature changes in the gastrocnemius using a Game Ready® 2.0 (~\$2,500) or a frozen elastic bandage (~\$10) in healthy, recreationally-active individuals. Our hypothesis was that the frozen elastic bandage would reduce intramuscular temperature more than the Game Ready® Methods: This was a randomized controlled crossover study in a controlled research laboratory. Twenty-four individuals (12 males, 12 females, age=24.5±2.6years, wt=76.0±14.7kg, ht=173.3±8.5cm) volunteered to participate. Each received both treatments, with at least 7 days between bouts. Participants were randomly assigned to the treatment order, counterbalanced by treatment and sex. The total treatment time was 30 min., followed by 25min. rewarming. 30.5cm of the low leg was cooled and compressed (45-55mmHg – measured with a PicoPress®) with a 9.1m x 10.1cm frozen elastic bandage or the Game Ready® on the high pressure setting (cycled 5-70 mmHg). Data were collected using an Isothermix™ thermocouple to record intramuscular temperature every 30-sec for 60-min. The dependent variable was intramuscular temperature at 1cm (+subcutaneous fat). Data were analyzed using a two-way repeated measures ANOVA, 0.05 alpha level. Results: There was no statistical difference in baseline intramuscular temperature ($P=.908$) between the frozen elastic bandage ($35.24\pm.90^{\circ}\text{C}$) and the Game Ready® ($35.22\pm.78^{\circ}\text{C}$). A significant time x treatment interaction ($F(11,253)=11.38, P<.001, n_2=.331, \text{observed power}=.998$) indicated a difference over time between the two treatments (Figure 1). Post-hoc testing showed lower intramuscular temperature with the frozen elastic vs. the Game Ready® at several timepoints during the treatment, with greatest difference at 15min ($P=.002$), respectively ($28.81\pm2.79^{\circ}\text{C}$ vs. $30.82\pm2.45^{\circ}\text{C}$). There was no difference in intramuscular temperature between the two treatments at the end of the 30min treatment ($P=.533$) or during rewarming at 10min ($P=.638$) or 25min ($P=.484$). The coldest intramuscular temperature for the frozen elastic bandage was achieved 10 minutes into rewarming ($26.11\pm2.44^{\circ}\text{C}$) and for the Game Ready®

at five minutes into rewarming ($26.04 \pm 2.51^{\circ}\text{C}$). Conclusions: The frozen elastic bandage reduced intramuscular temperature more quickly than the Game Ready®, but resulted in the same overall cooling by the end of the 30-minute treatment and throughout the 25 minutes of rewarming. Both treatments were effective at decreasing intramuscular temperature, however, the frozen elastic bandage is significantly more affordable. Future research is needed to determine tissue temperature thresholds at a variety of depths and within joint spaces for specific therapeutic effects including preventing edema, reducing pain, and reducing secondary injury.

TRAVEL ABSTRACTS

“Dancing Through the Stillness”

Cydnee Medina

Mentor: Amanda Sowerby | Department: Performing Arts, Dance
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

Being able to showcase one of Tara Lemon’s Dancing Through the Stillness works at the American College Dance Association Conference would be a once in a lifetime opportunity. As an educator and artist, I will be exposed to several new networking opportunities, knowledgeable individuals within the dance industry, and a diverse professional environment. Attending ACDA will open my eyes to new creative ideas as an artist, as well as allow me to expand my technique and experience. Outside of the different genres we practice currently in the Weber State Dance Area, I will be able to explore new artistic ideas, styles, and genres of dance. Exposing myself to these new ideas and artists will challenge me as an individual and dancer, requiring me to step outside of my comfort zone and push my limits. Overall, if given such an opportunity to attend the American College Dance Association Conference will only benefit myself as an individual, artist, performer, and educator. I would be greatly honored and appreciative to represent the university and the Weber State Dance Area.

The Importance of Oral Cancer Screening in Dental Hygiene

Hawaii Misleng Jones

Mentor: Kim Caldwell | Department: Dental Hygiene
American Dental Hygienist's Association Annual 2022 | Louisville,
Kentucky

ABSTRACT

Background and Problem Statement: This project is written to explore the current measures taken to perform oral screenings in hopes to find a solution to the neglect of oral cancer screening done by dental hygienists. There have been, and may be many more cases of oral diagnoses and lesions that have gone undiagnosed and/or taken longer to be diagnosed when there is clear evidence of it present. Early detection of oral cancer is vital to its outcome, and the neglect of oral cancer screenings by dental hygienists can be detrimental to patient health. Therefore, this research will explore the knowledge of the dental hygienist on oral cancer screening, the importance of oral cancer screening, and barriers that prevent dental hygienists from performing oral cancer screenings on a regular, efficient basis. It will also expand on the importance for more extensive education and continuing education to ensure dental hygienists are equipped to perform more intensive oral examinations. **Methodology:** In order to collect our resources, students utilized Weber State Universities Stuart Library OneSearch search engine as well as google scholar. To find relevant articles, terms such as 'oral cancer screenings done by dental hygienists' and 'frequency of oral cancer screenings in dental settings'. **Conclusion:** Oral cancers are not being screened by dental hygienists for a multitude of reasons. Among those reasons are dental hygienists having a lack of time in their appointments, not having the proper understanding of oral cancer risk factors, or the dentist is the one to perform the exam. Some barriers were presented in the articles reviewed, but even after a group attended a continuing education there was only a minimal improvement of exams being accomplished. There is still work and research to be done regarding the lack of oral cancer screenings being accomplished. With advancement in frequency and completeness of oral cancer screenings patients will benefit from full comprehensive care.

Lichens of Antelope Island: Cambrian and Proterozoic Era Formations

Gabrielle Nielson

Mentor: Carie Frantz | Department: Microbiology
Botany 2022 Plants at the Extreme! 2022 | Anchorage, Alaska

ABSTRACT

Lichens are cryptic symbioses with fascinatingly complex living strategies. Most lichen genera evolved before continental drift began breaking up Pangaea (100-200 mya); their distribution is tied to Earth's history (Brodo et al., 2001). Antelope Island has a geologic history spanning 2.8 Ga (Willis et al., 2000). The extreme conditions of the Great Salt Lake (GSL) gives lichens a competitive edge. Previously, one species (*Psora tuckermanii*) was identified from Antelope Island by Sereno Watson in 1867. It would remain the only identified species for 154 years, until I began collection in fall 2021. Lichens were identified using the key in Lichens of North America (LoNA, Brodo, 2001), the LoNA expanded key, the Consortium of North American Lichen Herbaria (CNALH) database, chemical spot tests, and microscopy. Specimens are being cataloged into the Mary Carver Hall Herbarium at Weber State University and the CNALH database for public access. To date, 10 species have been identified on Cambrian and Proterozoic Era formations on the north side of Buffalo Point: *Amundsenia approximata*, *Xanthomendoza trachyphylla*, *Candelariella terrigena*, *Cladonia chlorophaea*, *Protoparmeliopsis bipruinosa*, *Lecanora muralis*, *Lobothallia alphoplaca*, *Polysporina simplex*, *Rhizoplaca peltata*, and *Rhizoplaca melanophthalma*. Four rare species might only appear together on Antelope Island, the second record of *A. approximata* and the first occurrence of *P. bipruinosa* in Utah, and two species might indicate a disjunct from an arctic population.

The Effect of PNF and Dynamic Stretching on ROM, Jump Performance, and Dynamic Balance

Yuta Ozawa

Mentor: Valerie Herzog | Department: Athletic Training
National Athletic Trainers' Association 2022 Convention | Philadelphia, Pennsylvania

ABSTRACT

Context: Dynamic stretching and Proprioceptive Neuromuscular Facilitation (PNF) stretching are often used by athletic trainers to increase flexibility, joint range of motion (ROM), muscle temperature, and prevent injury as part of a warm-up. The purpose of this study was to investigate the effect of PNF stretching and dynamic stretching on ROM, vertical jump performance, and dynamic balance. Methods: This study was a randomized 3-group pretest-posttest. Thirty active, healthy subjects (14 male and 16 female, age= 23.50 ± 2.46 years old, mass= 79.65 ± 19.78 kg, height= 169.83 ± 8.96 cm, and leg length= 88.13 ± 5.64 cm) were randomly assigned to the PNF stretching group (5 male, 6 female), the dynamic stretching group (5 male, 5 female), or the control group (4 male, 5 female). Our independent variables were the type of stretching protocol (PNF stretching, dynamic stretching, and control) and time (pre, post). The dependent variables were active knee extension range of motion (AROM), passive hip flexion range of motion (PROM), vertical jump height, ground reaction force during the vertical jump take-off, and dynamic balance using the Star Excursion Balance Test (SEBT) in lateral, anterior, and posterior directions. We measured all dependent variables on the first day of visit (Day1) and 12 days after (Day12). We stretched participants in the stretching groups on the first day after the baseline measurements (Day1), Day2-5, Day8-11, and the last day before the final measurements (Day12). Data were analyzed using a One-Way ANOVA ($\alpha=.05$). Results: There was a statistically significant difference between groups in the degrees of PROM changed, $F(2,27)=5.00$, $p<.05$, partial $\eta^2=.27$. PNF stretching group increased PROM (10.1 degrees) more than control group. ($p=.011$) There were no statistically significant differences between the groups over time for AROM ($P=.59$), vertical jump height ($P=.08$), ground reaction force ($P=.16$), SEBT Lateral ($P=.70$), SEBT Anterior ($P=.08$), or SEBT Posterior ($P=.13$). Conclusions: Ten stretching sessions over two weeks of PNF increased PROM, but there was no difference in dynamic stretching group. Neither protocol affected AROM, vertical jump height, ground reaction force, or dynamic balance. PNF can be used to increase PROM without negative effects on vertical jump height, ground reaction force, or dynamic balance. Future research should measure the effect of various stretching protocols for longer durations on muscle activation, strength, and performance.

Cognitive Dissonance and User Engagement with Belief-Challenging Online Content

McKenna Pace

Mentor: Aaron Atkins | Department: Communication
Association for Education in Journalism and Mass Communication
Midwinter 2022 Conference | Norman, Oklahoma

ABSTRACT

Misinformation regarding controversial scientific phenomena has flourished in recent years due, in part, to the prevalence of social networking sites. The proliferation and subsequent belief in misinformation can polarize the public, which in the case of the COVID-19 pandemic, can have dire consequences including the endangerment of human lives. Because the nature of social media allows users to engage in selective exposure to information that only conforms to prior beliefs, this study examined engagement with online misinformation regarding the COVID-19 vaccine through the lens of cognitive dissonance theory. A quantitative survey was deployed via convenience snowball sampling. Results indicate individuals do not engage with belief-challenging online content any more or less than general content except when accounting for belief in vaccine misinformation. Specifically, individuals who believe misinformation regarding the vaccine are less likely to engage with belief-challenging content than those who believe in the efficacy of the vaccine. Additionally, evidence suggests users are likely to block, mute, or unfollow other users who post belief-challenging information, suggesting selective exposure may help explain the perpetuation of misinformation.

Age and Evolution of the Farmington Canyon Complex, Northern Utah: Insights from U-Pb Geochronology

Kristi Rasmussen

Mentor: Elizabeth Balbord | Department: Earth and Environmental Sciences

Geological Society of America 2022 | Las Vegas, Nevada

ABSTRACT

Basement rocks of the Farmington Canyon Complex (FCC) exposed in northern Utah provide a window into the crustal evolution between the Archean Wyoming Province and Grouse Creek block. The FCC is comprised of granitic orthogneisses, a range of paragneisses containing metaquartzite and sillimanite-bearing schist, and amphibolite that underwent polyphase deformation and high-grade metamorphism, along with late-stage leucogranites and pegmatites. Previous studies have identified inheritance of Archean components and late Paleoproterozoic metamorphism in sampled lithologies. Provenance and depositional ages of paragneiss protoliths, and geochemical signatures and ages of some igneous units, however, remain poorly constrained, partly due to a complex history. For this study, systematic sampling of multiple lithologies (paragneiss, metaquartzite, orthogneiss, and late leucogranite) spanning northern, southern, and western exposures of the FCC in the Ogden, Bountiful Peak, and Antelope Island areas was completed. Zircon grains were separated using standard techniques, imaged using cathode luminescence to identify cores and growth zones, and analyzed by LA-ICPMS using a small spot size (20 μm). This approach was designed to constrain the provenance and ages of paragneiss protoliths, ages of igneous and xenocrystic zircon in orthogneiss units, metamorphic ages of zircon rims, and ages of leucogranites that bracket end of major deformation. Preliminary data show that different paragneiss samples have varying proportions of (i) 2.7-2.6 Ga plus some older cores likely sourced in part from the Wyoming Province; (ii) 2.6-2.5 Ga cores possibly sourced from the Grouse Creek block; (iii) a mode of 2.45 Ga cores likely sourced from local granitic intrusions; and (iv) ~2.3-2.0 Ga cores, similar to ages of strata along the southern rifted margin of the Wyoming Province. Zircon rims have low Th/U and dates of 1.7-1.6 Ga across the FCC that record regional peak metamorphism. Some orthogneiss samples contain a mode of 2.45 Ga grains related to early intrusions. Additional orthogneiss and leucogranite samples have been collected and will be run for U-Pb and Hf to evaluate the potential for multiple igneous intrusions, crustal recycling, and relationships to paragneiss units.

Percolation Threshold of Sputtered Thin Films

Jordyn Redmond

Mentor: Kristin Rabosky | Department: Physics

Conference for Undergraduate Women in Physics 2022 | Tucson Arizona

ABSTRACT

Percolation threshold for a material is the point at which an insulating material transitions to a conductive material, usually within several to tens of nanometers. Results from this research could be helpful in optimizing electronic devices, as this threshold marks the physical limitation for how thin electronic components made from these materials can be while still being conductive. After depositing various thin films of both aluminum and molybdenum via the Weber State University sputtering system, we measured the materials' resistance to determine the threshold thickness. We determined the percolation threshold for aluminum lies in the range between 5 and 7.5 nanometers, while molybdenum's percolation threshold lies in the range between 7.5 and 10 nanometers. During testing we also determined that exposure to ambient air significantly skews the results due to native oxide growth on the films, so problem solving methods are discussed.

Channeling the Huxleys: Will Michale Pollan be Changing Our Minds?

Jackson Reed

Mentor: David Hartwig | Department: English

Seventh International Aldous Huxley Symposium 2021 | Toulon, France

ABSTRACT

Aldous Huxley's 1958 *Brave New World Revisited* voiced the concern that his dismal predictions of 1932 were materializing more rapidly than he had expected they would. But there was also cautious optimism in his text. The tools used to control the *Brave New World* populace (technology, hypnopedia, and drugs) can, Huxley said, be used either "well or badly"; particularly, chemical compounds can "both enslave and make free." Might we, he asked, find ways to have them serve rather than control us? Huxley wrote this on the eve of an emerging drug culture gone wrong, one that shut down clinical research of the kind he advocated. After over a half century of repression, Michael Pollan, along with others, has raised this banner again. Like Huxley, he is a well-respected global humanist with a rare combination of intelligence, common sense, empathy, and daring. Unlike Huxley, he is less bound by the repressive zeitgeist due in no small part to Timothy Leary's public "drop-out" campaign. The elements fundamental to Huxley's groundwork are traceable in much of Pollan's work, but became the driving force in his recent book, *How to Change Your Mind*. Since its publication in 2018, the medical community has, increasingly, endorsed the value of administering controlled chemical substances like psilocybin to heal mental and physical illness, manage addiction, ease trauma on occasions of death and dying, and to cultivate mind expansion. The benefits for mental and physical illnesses are now beyond question. But other questions remain. Among the most important of them is how deliberately we should broaden the use of these substances for the purpose of advancing the race to what Julian Huxley labeled its "transhuman" state of existence.

Gas production by *P. wasatchensis* WDC04 is increased in Cheddar cheese containing sodium gluconate.

Kate Sorensen

Mentor: Michele Culumber | Department: Microbiology
American Society for Microbiology 2022 | Washington D.C.

ABSTRACT

Paucilactobacillus wasatchensis can use gluconate (GLCN) as well as galactose as an energy source. Since sodium GLCN can be added during salting of Cheddar cheese to reduce calcium lactate crystal formation, our objectives were to determine if the presence of GLCN in cheese is a risk factor for unwanted gas production leading to slits in cheese and calculate the amount of CO₂ produced during storage and to relate this to the amount of gas-forming substrate utilized. Ribose was added to promote growth of *P. wasatchensis* WDC04 to high numbers during storage. Cheddar cheese was made with lactococcal starter culture with addition of WDC04 in 3 trials. After milling, curd was divided into 6 12-kg portions. To the curd was added (A) salt, or salt plus (B) 0.5% galactose + 0.5% ribose, (C) 1% Na GLCN, (D) 1% Na GLCN + 0.5% ribose, (E) 2% Na GLCN, (F) 2% Na GLCN + 0.5% ribose. A vat of cheese without added WDC04 was used as an additional control. Cheeses were cut into 900-g pieces, vacuum packaged and stored at 12°C for 16 wk. Each month bags were examined for gas production and cheese sampled and tested for lactose, galactose and GLCN content, and microbial numbers. In the control cheese, WDC04 remained undetected (i.e., <104 cfu/g), while in cheeses A, C and E it increased to 107 cfu/g, and when ribose was included (cheeses B, D and F) increased to 108 cfu/g. The amount of gas (measured as headspace height or calculated as mmoles of CO₂) during 16 wk storage was increased by adding WDC04 and by adding galactose or GLCN to the curd. Galactose levels in cheese B were depleted by 12 wk while no other cheeses had residual galactose. Except for cheese D, the other cheeses with GLCN added (C, E and F) showed little decline in GLCN levels until wk 12, even though gas was being produced starting at wk 4. Based on calculations of CO₂ in headspace plus CO₂ dissolved in cheese, galactose and GLCN added to cheese curd only accounted for half of total gas production. It is proposed that CO₂ was also produced by decarboxylation of amino acids. Although WDC04 does not have all the genes for complete conversion and decarboxylation of the amino acids in cheese, this can be achieved in conjunction with lactococcal starter culture. Adding GLCN to curd can now be considered another confirmed risk factor for unwanted gas production during storage of Cheddar cheese. Putative risk factors now include having a community of bacteria in cheese leading to decarboxylation of amino acids and release of CO₂ as well autolysis of the starter culture that would provide a supply of ribose that can promote growth of *P. wasatchensis*.

Nature is a Haunted Smart Home: Blending Ecogothic and Technology in Ruth Ware's *The Turn of the Key*

Amanda Stevens

Mentor: Julia Panko | Department: Master of Arts in English
SIGDOC 2022 | Boston, Massachussettes

ABSTRACT

In 1876, Emily Dickinson described the mysteries of nature: “Nature is a Haunted House — but Art — a House that tries to be haunted.” Dickinson is expressing that art imitates nature. While art is still imitating nature one hundred and forty-five years later, our society has now applied this adage to technology—technology imitates nature. We see this today with technological terms such as “the cloud” and “data stream.” In our digital age, we can update Dickinson’s prose to read — but Technology — a House that tries to be haunted. Ruth Ware understands the idea of technology imitating nature and displays it in her 2019 novel, *The Turn of the Key*. While one key theme of the novel explores how the Gothic modality lends itself to our inclusion of technology in our lives, I argue that Ware’s most Gothic setting in this story is an overgrown poison garden rather than the state-of-the-art smart home of Heatherbrae House. To discover why Ware showcases an ecogothic setting in such a prominent way, I consider the poison garden’s purpose. I posit that the purpose of the poison garden is, first, paying homage to the Medieval Gothic practice of medicinal/poisonous gardening, and second, providing nomenclature roots of technological processes. While Ware does not mention these processes by name, the concepts are represented in characters’ interactions with the smart home system. I use the example of a technological walled garden and compare it to the poison garden. I argue that Ware’s use of both technology and the natural are representing the ecogothic trope of entrapment. Ware creates a story where two seemingly opposite subject matters, nature and technology, blend to give the novel a Gothic tone. When we include ecogothic into this thinking, we can see that nature is a haunted smart house.

Risk Factors Associated with Increased Fibrosis and Steatosis in Non-Alcoholic Fatty Liver Disease Utilizing Transient Elastography (FIBROSCAN) in a Community Multispecialty Practice

Bridger Stratford

Mentor: James Moore | Department: Zoology

Western Medical Research Conference 2022 | Carmel, California

ABSTRACT

Non-alcoholic fatty liver disease (NAFLD) is associated with increased risk of fibrosis in patients with obesity, diabetes and metabolic syndrome. Noninvasive liver assessment using Fibroscan is increasingly an integral part of the evaluation of these patients. The aim of this study is to assess the efficacy of the FibroScan in helping to identify patients who are at risk of developing or are currently diagnosed with NAFLD in order to improve patient outcomes. Over a 16 month period (3/2020 to 6/2021), 331 patients with suspected NAFLD were referred for Fibroscan assessment. A retrospective chart review was conducted for risk factors of metabolic syndrome (obesity, HTN, diabetes, sleep apnea, hyperlipidemia), measurements of liver stiffness (MLS)/steatosis, and liver biopsy outcomes. A total of 331 patients were reviewed with a mean age of 49 years and mean BMI of 35 (range 18-58). Fifty-three percent of patient were obese (BMI > 30) and 20% were morbidly obese (BMI > 40). Metabolic risk factors were common, HTN (45%), hyperlipidemia (37%), sleep apnea (31%) and diabetes (23%). Greater fibrosis risk was seen with increased BMI (normal vs. morbidly obese BMI, mean MLS 5.5 kPa vs. 9.9 kPa, $p < 0.001$), metabolic risk factors (0 vs 5 risk factors, mean MLS 5.7 kPa vs. 13.5 kPa, $p < 0.0003$) and presence of diabetes (no diabetes vs. diabetes, mean MLS 7.3 kPa vs. 10.3 kPa, $p < 0.003$). Increased steatosis scores were seen in increased BMI (normal vs. morbidly obese BMI, mean CAP 236 dB/m vs. 334 dB/m, $P < 0.0001$), metabolic risk factors (0 vs. 5 risk factors, mean CAP 265 dB/m vs. 340 dB/m, $p < 0.0001$) and presence of diabetes (no diabetes vs. diabetes, mean CAP 307 dB/m vs. 333 dB/m, $p < 0.0005$). Twenty-five patients underwent liver biopsy evaluation and all patients were diagnosed with non-alcoholic steatohepatitis (NASH). Stage II-III fibrosis was diagnosed in 12 patients (48%) and stage 4 bridging fibrosis/cirrhosis in 3 patients (12%). This cohort of patients undergoing Fibroscan testing in a community practice were mostly obese and had >1 metabolic syndrome risk factors. Elevated liver stiffness and steatosis were significantly correlated with increasing BMI, presence of diabetes and increasing risk factors for metabolic syndrome. These results will help guide clinician utilization of Fibroscan testing in routine practice.

WSU Theatre NYC Project: The Refugees

Christian Sykes

Mentor: Jessica Greenberg | Department: Performing Arts
The Refugees, a Weber State University and Adjusted Realists co-
production in New York City | New York, New York

ABSTRACT

Have you ever considered that academic specialization isn't the only answer? What if the artistic and analytical can be joined? To investigate, Chris Sykes will be working in New York City under the combined guidance of Weber State professors and Professional artists during this production of "The Refugees," on-site in New York City. Though his primary duties will be the care and coordination of the costumes of the production, he was the only applicant to receive interviews for backstage and acting. To him, acting is a joy that can always be honed -- now he aims his aspirations higher than the stage. However, a student from Utah cannot hope to succeed in entertainment without knowing the industry. By living in New York City under the circumstances of the entertainment industry, Chris has the opportunity to expand not only his artistic skill and education, but also a freedom to create contacts and have a "dry run" of the New York Life. Weber State has given Chris the knowledge and skills to understand theatre. Now it is his time to temper his education in the fires of experience, and truly understand how the world works.

Elli Thornley

Mentor: Joseph Blake | Department: Performing Arts
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

Through the process of creating this piece I have developed many intellectual ideas that I would like to continue researching. Specifically the idea that dance helps you overcome trauma. The American College Dance Association will allow me to continue the development of the work by connecting with other artists from around the United States, and learning how dance affects different people. This will also allow me to create connections that will help further me in my career of dance education. The American College Dance Association will provide endless opportunities not only for me but for Weber State Universities performing arts department!

Kennadie Thredgold

Mentor: Joseph Blake | Department: Performing Arts
 American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

This semester I had the opportunity to choreograph in Weber State's Orchestis fall concert called "Where Dance Breathes." After going through the classes, such as improvisation, choreography 1, and choreography 2, I felt very prepared going into this semester of creating a work of my own. At auditions, after thinking about it over the summer, I knew that I wanted to do a piece about human connection, and I knew I wanted to do a duet. I wanted to do something different than the other choreographers. The dancers I chose were Adilyn Thredgold, my sister, and Elli Thornley, my lifelong friend. My dancers were very open to my ideas and were eager to advance their knowledge as college performers. As the rehearsal process went on, the story of the piece advanced to be about one person needing someone in their life to help them through a dark time and all the emotions that come with that from both sides. In some rehearsals, we had to sit down and talk about what we thought each part of the movement meant in the storyline. This helped me and my dancers connect to the story of the piece more and then once it was time to perform, they could share that story with the audience. I ended up giving the piece the title "2". Going to ACDA will allow me to advance my piece by getting feedback from the amazing adjudicators. It will be seen by many students, professors, dancers, and professionals from around the country. It would allow for my name to be put out into the dance world and share the story of my piece with a bigger and different audience. I will use the feedback I receive and apply it to my dance to make it stronger emotionally, artistically, and technically. I will also be able to take classes from amazing professionals from around the United States. I will meet many dancers and create a network for myself for the future. I, as a choreographer and dancer, will expand my dance education, choreography skills, and technique by attending this festival.

Adilyn Thredgold

Mentor: Joseph Blake | Department: Performing Arts
American College Dance Association Northwest Conference 2022 | New York, New York

ABSTRACT

I was in Kennadie Thredgold's piece for our dance concert, "Orchesis." We created this amazing, emotional piece that everyone could relate to. Being able to create this different movement showed us what we were capable of. This process helped us realize what we can do and showed us we want to explore this research further than the surface level. Going to the American College Dance Association could help us represent Weber State University in a new way.

Research presentation on cross-generational miscommunication through texting

Melina Tonks

Mentor: Hailey Gillen-Hoke | Department: Communication
National Communication Association 107th Annual Convention 2021 |
Seattle, Washington

ABSTRACT

As text messaging becomes more common between family, friends, business associates and clients, the risk of misunderstanding increases further without face-to-face, nonverbal cues and traditional full-dialogue exchange. Miscommunication is “the failure of conversational partners to establish shared interactional meaning” (Kelly & Miller-Ott, 2018, p. 267). Sherblom (2010) describes effective communicators as those who listen attentively, show emotion, elicit positive body language, and are expressive. In computer mediated communication (CMC), where traditional nonverbal communication is absent, partners must substitute these tactics with other methods, such as emojis, descriptions, or other non-visual means (Venter, 2017). Without face-to-face cues, CMC often leads to misunderstandings, negatively influencing the communicators, and altering the intended meaning of their messages (Sherblom, 2010). As a marketing director at a mid-sized university, and the parent of a Gen Z child, the researcher also encountered many personal instances where “unwritten rules” or generational expectations in punctuation, spelling, capitalization and emoji use in texting created a misunderstanding.

Selective Media for the Isolation of *Paucilactobacillus wasatchensis*

Robert Wahlstrom

Mentor: Michele Culumber | Department: Microbiology
American Society for Microbiology 2022 | Washington D.C.

ABSTRACT

Selective Media for the Isolation of *Paucilactobacillus wasatchensis* Chase Wahlstrom, Matthew Domek, Michele Culumber and Craig Oberg
Paucilactobacillus wasatchensis causes late gas defect in aging cheese. The ability to quickly and accurately isolate *Plb. wasatchensis*, especially when present at low concentrations compared to other bacteria in cheese, would benefit the dairy industry since the current protocol is time intensive and lacks sensitivity. The goal of this study was to develop a plating media to detect *P. wasatchensis* within 72 h when as few as 103 CFUs per gram are present while inhibiting competing starter lactic acid bacteria (SLAB) and nonstarter lactic acid bacteria (NSLAB). Carbohydrate restricted MRS (CR-MRS) media with varying concentrations of vancomycin and 2-deoxyglucose, a glucose analog that inhibits glycolysis was developed. Initial testing was conducted in triplicate using 24 well plates in a Tecan Infinite 2000 plate reader utilizing 5 SLAB and NSLAB strains along with the *P. wasatchensis* WDC04 for each variable. CR-MRS broth containing 1% ribose, 2% Oxyrase and either .01% 2-deoxyglucose or various vancomycin concentrations was screened. Application testing was then conducted using CR-MRS agar plates containing 1% ribose, 5 ?g/mL vancomycin, and various concentrations of 2-deoxyglucose (0.01-0.1%) incubated anaerobically for 72 h. WDC04 was not inhibited by 2-deoxyglucose or vancomycin in broth culture, but the SLAB and other NSLAB cultures showed inhibition by either 2-deoxyglucose and/or vancomycin. *Lactococcus lactis* and *Lactococcus paracasei*, two common NSLAB, showed the greatest level of inhibition between the control MRS broth (OD600 1.28 at 28 h) and CR-MRS+2-deoxyglucose broth (OD600 0.60 and 0.54, respectively) after 28 h. The SLAB *Lactococcus lactis* showed nearly complete inhibition with 5?g/mL vancomycin. Agar plate results showed WDC04 growth was not inhibited by the experimental medium, while *L. casei* and *L. paracasei* showed limited inhibition and *L. lactis* was inhibited. However, the media can be used to differentiate *L. casei* and *L. paracasei* from WDC04 since they appear as pinpoint colonies. Incorporation of 0.01% 2-deoxyglucose and 5 ?g/mL vancomycin into CR-MRS+1% ribose agar is a selective plating media for *P. wasatchensis* based on its selective and differential properties. This media could be used to determine the presence of *P. wasatchensis* in cheese when it is found in low concentrations (103 CFU per gram) versus the high concentration of SLAB (108 CFU per gram) that obscures its detection with current isolation techniques.

NYC Refugees Project

Jacob Watts

Mentor: Jess Greenberg | Department: Performing Arts
The Refugees, a Weber State University and Adjusted Realists co-
production in New York City | New York, New York

ABSTRACT

As a theatrical student the one thing that our department preaches and advocates for the most is to work in the theater. While our professors are excellent at creating exciting lesson plans and the classrooms at Weber State are a terrific place to explore ideas and concepts about the theater, the greatest place to actually learn is working IN the theater. This summer we plan on doing just that by working with the Adjusted Realists Theatre Company in NYC on their production of *The Refugees*. I will be working as a Deck Manager/Run Crew member on the show that involves a lot of different responsibilities such as managing actors, creating rehearsal documentation, etc. The funding that we request will go toward our housing for staying in NY. True experience in the theater is the best teacher and what our department values most is taking as much experience as you can from Weber State and putting it forward when starting your career after you graduate. This is a professionalizing educational experience that will improve our understanding of our career as theatrical artists/technicians/etc. This is shown through the way that experience and diverse thinking positively affect our confidence surrounding theatrical productions and boost our ability to collaborate with the professionals that may hire us in the future.

TRAVEL ABSTRACTS

The Refugees NYC Theatre Research Project

Grace Zito

Mentor: Kenneth Plain | Department: Performing Arts, Theatre
The Refugees, a Weber State University ad Adjusted Realists co-
production in New York City | New York, New York

ABSTRACT

Performing in New York is a goal many Theater Arts students have not only here at Weber State, but all around the USA. Weber State's Theater Program is trying to fund a New York Project where students can establish what the difference of the stage here in Utah is as opposed to one in New York. We will be traveling to New York in the month of May until the end of June, students will be found with all hands on deck putting on the show *The Refugees* written by Stephen Kaliski, alongside the Adjusted Realists Theatre Company in New York. The funding provided by you would go towards our housing in New York. While there, I will be pursuing the role of one of the Actors performing. This job includes spending time memorizing, attending and working hard at rehearsals, working with other actors and stage hands, taking notes and applying them, achieving personal and group goals, and then when the time comes, performing on the stage and showing the end product.. Being in New York will be an amazing set up to success by showing students the benefits of having a professionalizing experience like work experience and gaining more of a network. Having a glimpse into what goes into the preparation of a professional show as well as how an individual can maintain a performance every night, is another great benefit The New York Project has to offer. This project will not only open so many doors in the theater for so many students, but also will provide the chance for them to live the life they want in the future now.

