

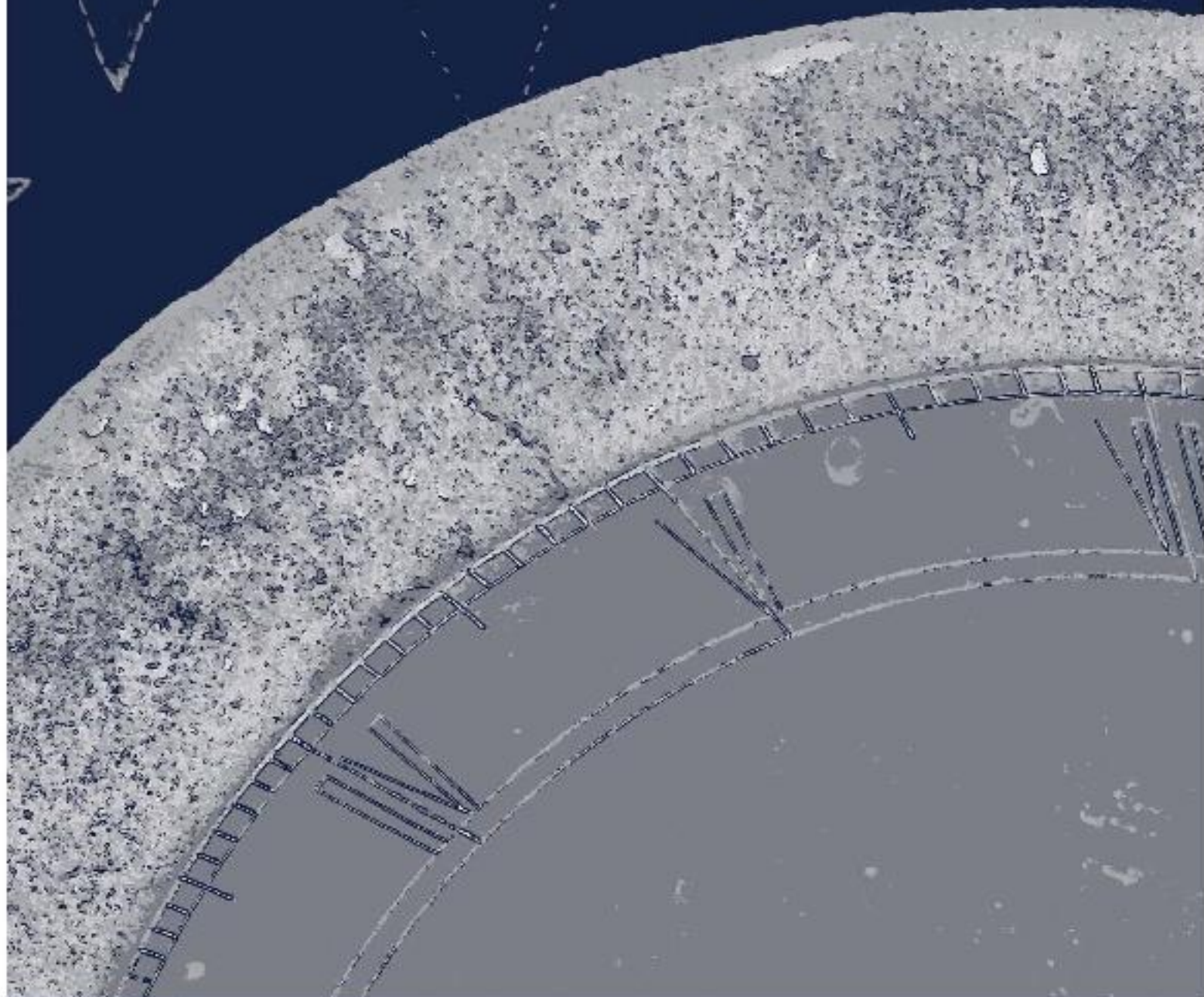
Spring 2023

Special Edition Issue

Volume 5 Issue 1

THE ARSENAL

Augusta University's Undergraduate Research Journal



23rd Annual Undergraduate Student Research and Fine Arts Conference

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About *The Arsenal*

The Arsenal: The Undergraduate Research Journal of Augusta University (ISSN 2380-5064) is a peer-reviewed, open access, interdisciplinary journal for undergraduate research conducted at Augusta University. This journal is managed in collaboration by the Center for Undergraduate Research and Scholarship (CURS), University Libraries, and the student organization On the Shoulder of Giants.

The Arsenal was initiated by On the Shoulder of Giants in Fall 2016. The journal represents and highlights undergraduate research of academic and scholarly value from various disciplines at Augusta University. Each article undergoes a peer-review process facilitated by the journal's Editorial Review Board and must be approved by an appointed faculty reviewer in the article's respective discipline.

Editorial Board

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University Libraries

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Center for Undergraduate Research and Scholarship

Preface



AUGUSTA UNIVERSITY

Center for Undergraduate Research and Scholarship

The Center for Undergraduate Research and Scholarship (CURS) proudly presents the proceedings for the 23rd annual Undergraduate Research and Fine Arts (URFA) Conference on March 29, 2023. This annual conference is supported by the CURS, the AU Chapter of Phi Kappa Phi, and the Office of Interdisciplinary Research. The proceedings consist of the program for the 23rd annual conference, along with abstracts of the undergraduate's original work across multiple disciplines.

Over 60 undergraduate students majoring in Animation, Anthropology, Art, Biology, Cell and Molecular Biology, Chemistry, Computer Science, Ecology, English Literature, Health Services, Kinesiology, Physics, Nursing, and Psychology, and 50 faculty from the departments of Art and Design, Biochemistry and Molecular Biology, Biological Sciences, Chemistry and Physics, English and World Languages, History, Anthropology and Philosophy, Honors, Georgia Cancer Center, Internal Medicine, Kinesiology, Neuroscience and Regenerative Medicine, Nursing, Ophthalmology, Oral Biology and Diagnostic Sciences, Pharmacology and Toxicology, Physics, Physiology, Psychiatry and Health Behavior, Teaching and Learning, and Vascular Biology are represented in the conference.

We are grateful for our keynote speaker, Dr. Warren "Bill" Karp, who shares his love for the sciences and the arts.

We would like to express our gratitude to all the speakers, presenters, participants, and volunteers for their contributions. In particular, we would like to thank our generous sponsors for their financial support to the 23rd URFA Conference. We hope that the proceedings and conference grant the most beneficial and fruitful experience to all those involved.

Dr. Quentin Davis, Co-Chair URFA Conference

Dr. Alex St. Louis, Co-Chair URFA Conference

President's Welcome



It is with great pleasure that I welcome you to Augusta University's 23rd annual Undergraduate Research and Fine Arts Conference; a showcase of discovery, ingenuity, and scholarship. The URFA conference is hosted by the Center for Undergraduate Research and Scholarship with support from the AU Chapter of Phi Kappa Phi and the Office of Interdisciplinary Research.

CURS, established in 2008, has a mission of supporting undergraduates in the pursuit of discovering new information, investigating factors of influence, and innovating original work under the collaborative guidance of a faculty mentor. Since 1897, Phi Kappa Phi – the nation's oldest, largest, and most selective all-discipline honor society—has displayed a perfect blend of academic and personal excellence. As the original host of this event, PKP continues to offer students the opportunity to showcase their scholarly and artistic endeavors. The Interdisciplinary Research Office also reaches across all colleges and campuses to connect collaborative research groups assist researchers in pursuing internal and external support.

Our focus at Augusta University is to be like no other through a commitment to effective teaching and engaged learning. Academic research is both a teaching tool and a pathway to discovery. Scholarly engagement brings education to life, impacts students long-term, and develops competencies and networks that prepare them to become life-long learners and contributors to an ethical and innovative society. I encourage you to immerse yourself in the comprehensive and stimulating presentations highlighting the research and creative concepts developed by our students.

I appreciate the volunteers and faculty whose hard work made this conference possible. Enjoy today's experience and congratulations to all of our student presenters and performers.

Go Jags!

Dr. Brooks Keel, President of Augusta University

Summary Schedule of Events

Opening Ceremony	12:00 pm -12:50 pm
<i>Welcome</i>	Dr. Zach Kelehear, Vice Provost for Instruction
<i>Opening remarks</i>	Dr. Kevin Frazier, Vice Dean, Dental College of Georgia, Chapter President, Phi Kappa Phi
<i>Musical Performance</i>	Arendil Plummer and Rhett Lever, accompanied by Dr. Martin Jones, Professor of Music
<i>Keynote Address</i>	Dr. Warren “Bill” Karp, Professor Emeritus
<i>Navigating the Conference</i>	Dr. Alex St. Louis, Coordinator, Center for Undergraduate Research and Scholarship
Oral & Poster Sessions	1:00 pm – 4:45 pm
Awards Ceremony & Reception	5:00 pm – 6:00 pm
<i>Conference Awards</i>	Dr. Elizabeth Culatta, Assistant Professor, Department of Social Sciences
<i>Distinctions in Research</i>	Dr. Alex St. Louis, Coordinator, Center for Undergraduate Research and Scholarship
<i>Closing Remarks</i>	Dr. Neil MacKinnon, Executive Vice President and Provost
<i>Acknowledgments</i>	Dr. Quentin Davis, Director, Center for Undergraduate Research and Scholarship

Schedule of Events

Opening Ceremony

12:00 – 1:00

Poster Session

1:00 – 2:30

Art & Design Oral Sessions

Session A 1:00 – 2:30 Session B 2:45 – 3:45

Interdisciplinary Sciences Oral Sessions

Session A 1:00 – 2:30 Session B 2:45 – 3:45

Social Sciences Oral Session

Session 2:45 – 3:45

4x4 Showdown Oral Competition

Session 4:00 – 4:45

Awards Ceremony & Reception

light refreshments served

5:00 – 6:00

Student Presenters: Please feel free to relax and have refreshments in the Hospitality Room (Hardy, JSAC 232) between sessions.

Navigation

TIME	Butler Rm 227	Coffeehouse Rm 235	Ballroom Rm 155	Hardy Rm 232	Markert Rm 142
11:00- 12:00				Hospitality Room (Refreshments for presenters)	Conference Headquarters (All Check in Here)
12:00 - 12:50			Opening Ceremony		
1:00 - 2:30	Art & Design A	Interdisciplinary Sciences A	Poster Session		
2:30 - 2:45	break	break	break		
2:45 - 3:45	Art & Design B	Interdisciplinary Sciences B	Social Sciences		
4:00 - 4:45			4x4 SHOWDOWN		
4:45 - 5:00			Transition		
5:00 - 5:30			Awards Ceremony & Reception		
5:30 - 6:00					

Keynote Speaker

Warren "Bill" Karp, MD and Professor Emeritus

THE KEY IS ASKING THE RIGHT QUESTION



Dr. Karp is celebrating his 52nd year on the faculty of The Medical College of Georgia. He is a Professor Emeritus of Biochemistry and Molecular Biology, Pediatrics, Oral Biology and Oral Diagnosis at Augusta University. He has a Ph.D. in biochemistry from The Ohio State University and a D.M.D. from Augusta University. He is an elected member of The American Society of Clinical Nutrition and is past president of the Georgia Nutrition Council.

Dr. Karp has served on the Governor's Obesity Taskforce and as Vice Chair of the Columbia County Board of Health. He is married to a physical therapist, Dr. Nancy Karp, and they have two (grown) children. He is also a jazz musician.

Performers



Arendil Plummer is a Junior undergraduate at Augusta University studying Piano Performance. Having started piano at age five and violin at age nine, he has had a lifelong affinity for music. He attended Davidson Fine Arts Magnet School in Augusta, GA and served as concertmaster for its Chamber Orchestra and pianist for the Jazz Band. At Augusta University, he has won the Georgia Federation of Music Clubs Floride Dean Scholarship Competition, honorable mention for the Georgia Music Teachers Association (GMTA) College/Adult Piano Competition, and winner of the Georgia Music Educators Association (GMEA) Composition Competition. He was the 2022 winner of the Augusta University Concerto Competition and performed a Mozart Piano Concerto with the College Orchestra. Arendil studies with Dr. Martin David Jones and previously studied with Gigi Davis.



Rhett Lever (them/them/him) is a pianist and singer from Waynesboro, Georgia. They are 22 years old. They currently reside in North Augusta, South Carolina. They are studying vocal performance with a secondary in collaborative piano at Augusta University, and they graduate with their degree in the spring of 2023. Rhett studies voice with Dr. Christi Amonson and piano with Dr. Rosalyn Floyd. After graduating, they plan to take a gap year, move up North to teach and gain some more experience in the field, and then return to higher education. They have various awards in music, including Governor's Honors Finalist 2018, National Honor Choir (NAfME) 2018, State Literary Boy's Voice Champion 2019, Southeastern Regional Classical NATS Runner-up 2020, Southeastern Regional Musical Theatre NATS 3rd Place 2020, Georgia NATS Musical Theatre 1st Place 2020, and Collaborative Pianist for Lily Brannigan (Winner for National NATS 2022). In their free time, Rhett enjoys traveling, writing, spending time with their partner and friends, and learning different languages.

1:00-2:30

Ballroom, Room 155

Poster Session

- 1. Abby Bryant, Cell and Molecular Biology**
MODELING EMERGENT PATTERNS OF SYNTHETIC NOTCH SIGNAL
TRANSDUCTION IN VIVO
Mentor: Dr. Paul Langridge
- 2. Anabelle O'Keefe, Health Services**
COVID-19 IN NURSING HOMES: A COMPREHENSIVE SURVEY OF HEALTHCARE
MANAGEMENT PRACTICES
Mentor: Dr. Barbara Manley-Smith
- 3. Anita Singh, Psychology, and Ashland Amerson, Psychology**
MINDFULNESS SERVING AS MEDIATION FACTOR FOR DEPRESSION AND
SUICIDE SKILLS
Mentor: Dr. Lara Stepleman
- 4. Christine Williams, Chemistry**
EXAMINING THE FUNCTION OF ELAVL GENES DURING NEURONAL
REPROGRAMMING
Mentor: Dr. Hedong Li
- 5. Daniela Velez, Cell and Molecular Biology**
REVERSING ALZHEIMER'S DISEASE PATHOLOGY IN ZEBRAFISH BY APPLYING
PHOTOBIO-MODULATION TREATMENT
Mentor: Dr. Ali Eroglu
- 6. Elana Koehler, English Literature**
MONARCHS – THEY'RE JUST LIKE US: PEOPLE MAGAZINE ARTHUR
Mentor: Dr. Blaire Zeiders
- 7. Ford Berger, Biology**
EFFECTS OF POLYPROPYLENE MICROPARTICLES ON INFLAMMATORY
CYTOKINES IN A549 CELLS
Mentor: Dr. Jennifer Cannon
- 8. Gabsu Smallwood, Biology**
TERRACOTTA POTS AND MANURE COMPOST ENHANCE GROWTH AND
SURVIVABILITY OF A RARE PLANT SPECIES, PEDIOMELUM PIEDMONTANUM
(FABACEAE)
Mentor: Dr. Stacy Bennetts

9. Garrett Hachem, Kinesiology

DIETARY AND CAFFEINE INTAKES OF FIREFIGHTERS LOCATED IN THE
SOUTHEAST

Mentor: Dr. Angelia Winkler

10. Heer Patel, Kinesiology

ROLE OF CA-19-9 AND HBA1C IN MICE WITH INDUCED PDAC

Mentor: Dr. Maria Sabbatini

11. Jade Moore, Chemistry

DESIGN AND SYNTHESIS OF POTENTIAL ANTIVIRAL DRUG CANDIDATE

Mentor: Dr. Siva Panda

12. Jazmine Neal, Physics

ARDUINO-BASED TURBIDIMETER

Mentor: Dr. Joseph Hauger

13. Jordan Moratin, Cell and Molecular Biology

BMAL2 IN ENDOTHELIAL CIRCADIAN RHYTHM AND REMODELING

Mentor: Dr. Dan Rudic

14. Shelton Swint, Biology

ANALYSIS OF SEASONAL DIVERSITY OF CILIATE SPECIES FROM LOCAL
WATERWAYS

Mentor: Dr. Jessica Reichmuth

15. Katie Ko, Cell and Molecular Biology

THE THERAPEUTIC POTENTIAL OF CANNABIDIOL IN THE TREATMENT OF
HEAD AND NECK CANCER

Mentor: Dr. Babak Baban

16. Lyndsay Martin, Cell and Molecular Biology

NADPH OXIDASE 1 INCREASES REACTIVE OXYGEN SPECIES IN PANCREATIC
ADENOCARCINOMA

Mentor: Dr. Maria Sabbatini

17. Makenzie Jane, Cell and Molecular Biology

SOCIODEMOGRAPHIC INFLUENCES ON OPINIONS ABOUT PHYSICIAN
ASSISTED SUICIDE

Mentor: Dr. Angela Bratton

18. Mark Shearer, Cell and Molecular Biology

CRYOPRESERVATION OF ZEBRAFISH GERM CELLS BY VITRIFYING GONADS

Mentor: Dr. Ali Eroglu

19. Mindy Ho, Cell and Molecular Biology

BILE ACID-BASED THERAPIES TO TREAT RETINOPATHY OF PREMATURITY

Mentor: Dr. Menaka Thounaojam

20. Priya Giddens, Kinesiology

INTRA-RENAL PRESSURES DURING WARM ARTERIAL AND VENOUS ISCHEMIA-
REPERFUSION IN RATS

Mentor: Dr. Paul O'Connor

21. Trevor Jordan, Ecology

ADAM PROTEASE KUZBANIAN CLEAVES MULTIPLE UNRELATED PROTEIN
DOMAINS

Mentor: Dr. Paul Langridge

22. Truc-Mi Hoang, Nursing

THE EFFECT OF LAVENDER ESSENTIAL OIL ON PRIMARY DYSMENORRHEA

Mentor: Dr. Dawn Langley-Brady

1:00 – 2:30

Butler Room 227

Art & Design A

Moderator: Prof. MB Khan

Hailey Dowdy, Animation

PAINTING A 3D MODEL IN SUBSTANCE PAINTER DEMO

Mentor: Prof A.B. Osborne

Tripp Gustin, Art

TRUENIVERSE COMICS: AN EXPLORATION OF HYPERMEDIA IN SEQUENTIAL ARTS

Mentor: Prof A.B. Osborne

Patricia Marcano, Animation

BEYOND GAME ENGINES

Mentor: Prof A.B. Osborne

Jordan Womack, Animation

3D ANIMATION

Mentor: Prof A.B. Osborne

1:00 – 2:30

Coffeehouse Room 235

Interdisciplinary Sciences A

Moderator: Dr. Ellen LeMosy

Vaani Balyan, Keshu Bhat, Aidan Van Derhei, Raymond Chen, Logan Ouellete, Taitum Gossman, Sai Nasanally, and Karen Aikhionbare, Cell and Molecular Biology

GENERATION OF HOMOZYGOUS TRANSPARENT TRANSGENIC ZEBRAFISH STRAIN TO STUDY CARDIOMYOCYTE ACTIVITY

Mentor: Dr. Surendra Rajpurohit

Khaylie Boothe, Anthropology Major

INFLAMMATORY RESPONSES TO CHORDA TYMPANI NERVE SECTIONING IN TNFR1 KNOCKOUT MICE AND THEIR ROLE IN TASTE BUD DEGENERATION

Mentor: Dr. Lynette McCluskey

Raymond Chen, Logan Ouellette, Cell and Molecular Biology

THE ZEBRAFISH ENVIRONMENTAL CHALLENGES AND OPTIMIZATION

Mentor: Dr. Surendra Rajpurohit

Chloe Johnson, Cell and Molecular Biology

FILTRATION IS ABSENT IN THE RAT KIDNEY EARLY IN REPERFUSION

Mentor: Dr. Paul O'Connor

Tom Rusch, Computer Science

SIMULATING WOUND HEALING WITH VARIABLE INTERCELLULAR CONTACT ADHESION

Mentors: Dr. Abdul Malmi-Kakkada, Dr. Johnathan Dawson

2:45-3:45

Ballroom, Room 155

Social Sciences

Moderator: Dr. Bill Karp

Ashland Amerson, Psychology, and Anita Singh, Psychology

INTERSECTIONALITY BETWEEN MALE GAZE AND INTERNALIZED VIEWS OF
TRANSFEMININE PERSONS

Mentor: Dr. Lara Stepleman

Lia Carter, Kinesiology

THE EFFECTS OF SOCIETAL PRESSURE UPON ADOPTING DIETING BEHAVIOR

Mentor: Dr. Tim Sadenwasser

Kaamya Mehra, Cell and Molecular Biology

GOOGLE TREND ASSOCIATION FOR DSM-V PREVALENT DISORDERS AND SUICIDE
FREQUENCY

Mentor: Dr. Vanessa Spearman-McCarthy

Tumi Adaramola, Kinesiology

THE ETHICS OF EMBRYO MODIFICATION

Mentor: Dr. Lee Maynard

2:45-3:45

Butler Room 227

Art & Design B

Moderator: Dr. Hasibur Rehman

Max Leverett, Animation

SELF DISCOVERY THROUGH CHARACTER CREATION Mentor: Prof. A.B. Osborne

Aislin Sparrow, Art

ARTIST TALK - PRISMATIC WIDOW Mentor: Prof. A.B. Osborne

Andrew Vincent III, Art

TRANSCENDENTAL RELATIONSHIPS: ART, SCIENCE, AND RELIGION
Mentor: Prof. Jennifer Onofrio

2:45-3:45

Coffeehouse Room 235

Interdisciplinary Sciences B

Moderator: Dr. Ruchi Patel

Kaylin Browning, Biology

DEVELOPMENT OF AN INTESTINAL BARRIER SYSTEM FOR THE STUDY OF DRUG PERMEABILITY

Mentor: Dr. Darren Browning

Colin Miller Jr., Chemistry

SYNTHESIS OF SLIDENAFIL ANALOGS FOR THE PREVENTION OF COLON CANCER

Mentor: Dr. Shaobin Miao

Samuel Sherman, Physics

THERMAL EXPANSION COEFFICIENT OF BK7 OPTICAL GLASS

Mentor: Dr. Tom Colbert

Bianca Tubalinal, Biology

A SEX-DIVERGENT RESPONSE TO ALDOSTERONE ANTAGONISM IN THE KIDNEY OF SPONTANEOUSLY HYPERTENSIVE RAT

Mentor: Dr. Mykola Mamenko

Cheyenne Voorhies, Ecology, and Cheyenne Kent, Ecology

WATER LEVEL EFFECTS ON WETLAND BIODIVERSITY – NORTH AMERICAN RIVER OTTER

Mentor: Dr. Brandon Cromer

4:00 – 5:00

Ballroom Room 155

4x4 Showdown

Moderator: Dr. Josefa Guerrero-Millan

Melvin Hilson, Psychology and Jerin Jamil, Health, Society and Policy

MENTOR SCIENCE IDENTITIES AND THEIR INFLUENCE ON STUDENT RELATIONSHIPS WITH SCIENCE

Mentor: Dr. Alex St. Louis

Kaamyra Mehra, Cell and Molecular Biology

ARE ANNUAL OVERDOSE DEATHS FOR HIGH-RISK DRUGS IMPACTING GOOGLE SEARCH FREQUENCIES?

Mentor: Dr. Vanessa Spearman-McCarthy

Saniya Momin, Cell and Molecular Biology

THE ROLE OF KCTD17 IN STRIATAL G-PROTEIN COUPLED RECEPTOR SIGNALING

Mentor: Dr. Brain Muntean

Hailey Ramos, Chemistry

DEVELOPMENT OF NON-SYSTEMIC PHOSPHODIESTERASE INHIBITORS FOR THE TREATMENT OF GASTROINTESTINAL DISEASES

Mentor: Dr. Darren Browning

Issac Williams, Biology

EFFECTS OF CLIMATE CHANGE ON FIDDLER CRAB LIMB REGENERATION RATES

Mentor: Dr. Jessica Reichmuth



Special Thanks



Conference Committee and Planning Team

Dr. Elizabeth Culatta, *Department of Social Sciences*
Ms. Jennifer Davis, *Library Services and Arsenal Editor*
Dr. Quentin Davis, *Center for Undergraduate Research and Scholarship*
Ms. Janice DeLoach, *IT Customer Experience*
Dr. Josefa Guerrero-Millan, *Department of Chemistry and Physics*
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Ms. April Masterson, *Classroom and Event Scheduling*
Mr. A.B. Osborne, *Department of Art & Design*
Dr. Alex St. Louis, *Center for Undergraduate Research and Scholarship*

Recognition of Financial Contributions and Support

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Dr. Zach Kelehear, *Vice Provost for Instruction*
Coca-Cola Co.

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Peter Browning, *Vice President*
Jordan Moratin, *Historian Secretary*
Haley Gilbert, *Undergraduate Conference Committee Chair*
Katelinn Jones, *Undergraduate Conference Committee*
Tanish Kumar Arsenal *Undergraduate Journal Committee Chair*
Skyler Owens Arsenal *Undergraduate Journal Committee*
Tom Rusch, *Arsenal Undergraduate Journal Committee*

Special Thanks



Oral Session Moderators

Dr. Bill Karp, Biochemistry
Dr. Ellen LeMosy, Cellular Biology and Anatomy
Dr. Ruchi Patel, Physiology
Prof. MB Khan, Neurology
Dr. Hasibur Rehman, Neurology
Dr. Josefa Guerrero-Millan, Chemistry and Physics

Oral Session Judges

Dr. Pankaj Ahluwalia, Pathology
Ms. Samantha Atkinson, Science & Math
Ms. Emily Burns, Physiology
Dr. Xuanyu Chen, Neuroscience & Regen. Med.
Ms. Ashley Christman, Dental Hygiene
Ms. Katie Ann Fopiano, Physiology
Dr. Lynn Glenn, Nursing Science
Ms. Angelica Hill, 1st & 2nd Year Experiences
Dr. Bangxing Hong, Pathology
Dr. Ravirajsinh Jadeja, Biochem & Mol. Bio.
Ms. Melissa Johnson, University Libraries
Dr. Michelle Johnson, Faculty Affairs
Dr. Thomas Joshua, Nursing Science
Dr. Seungwoo Kang, Pharm & Toxicology
Dr. Bill Karp, Biochemistry
Dr. Ashok Kumar Kanugula, Medicine
Dr. Trent Kays, English & World Languages
Prof. MB Khan, Neurology
Dr. Ravi Komaravolu, Immunology
Dr. Dawn Langley-Brady, Nursing Science
Dr. Paul Langridge, Biological Sciences
Dr. Ellen LeMosy, Cell Biology & Anatomy
Ms. Aspasia Luster, University Libraries
Mr. Michael McGrath, Cell Biology & Anatomy
Dr. Perenkita Mendiola, Physiology
Dr. Henry Moon, Pediatrics
Dr. Ruchi Patel, Physiology
Ms. Natalee Reese, University Libraries
Dr. Hasibur Rehman, Neuroscience & Regen. Med.
Dr. Carrie Reif-Stice, Communications
Dr. Shalini Saggu, Neuroscience & Regen. Med.
Dr. Robert Saunders, Music
Dr. Catherine Slade, Business

Dr. Kelly Stanek, Neurology
Dr. Kunat Vaibhav, Neurosurgery
Dr. Rongrong Wang, Biostatistics
Mr. Brad Warren, University Libraries

Poster Session Judges

Ms. Natalee Reese, University Libraries
Dr. Joshua Thomas, College of Nursing
Dr. Paul Langridge, Biological Sciences
Dr. Perenkita Mendiola, Physiology
Dr. Xuanyu Chen, Neuroscience & Regen. Med.
Dr. Dawn Langley-Brady, Nursing Sciences

Abstracts

Alphabetical by First Author

THE ARSENAL

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ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE ETHICS OF EMBRYO MODIFICATION

Tumi Adaramola and Maynard Lee

Citation

Adaramola, T., & Lee, M. (2023). The ethics of embryo modification. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 2-3. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.02>



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The Ethics of Embryo Modification

Presenter(s): Tumi Adaramola

Author(s): Tumi Adaramola and Maynard Lee

Faculty Sponsor(s): Maynard Lee, PhD

Affiliation(s): Department of English & World Languages

ABSTRACT

With 6 in 10 people worldwide affected by genetic disorders that can range from mild to life-threatening, how to treat or prevent these problems is an important issue. Medical approaches to address these genetic illnesses have proliferated as knowledge and technology have advanced. One of the most effective approaches, embryo modification, is also one of the most controversial. Embryo modification was first introduced to the world at the Second International Summit on Human Genome Editing by He Jiankui who claimed to have performed the technology on twin girls who were in the uterus at the time. Jiankui received a lot of backlash regarding the ethics of the procedure that he conducted, which thrust the embryo modification debate into the spotlight. Embryo modification is the process of genetically engineering the embryo to ensure the presence or removal of certain genes. To carry out this process, embryos are created through standard in vitro fertilization (IVF). After that, preimplantation genetic diagnosis (PGD) is used to screen for healthy embryos. When no healthy embryos are found after screening, embryo modification is then used. Through embryo editing, genetically ill couples can have biological children without risking the possibility of passing those diseases on to their offspring. This procedure offers a way to end the agony of these future children and can increase their life expectancy as well. After extensive research, new methods for modifying embryos have emerged recently, and they can be used to treat genetic abnormalities. For instance, Mitochondrial DNA Replacement Therapy, a form of embryo modification, has been proven in a research study to be a promising treatment for mitochondrial illnesses, despite the fact that there is currently no effective treatment for these conditions. Further research on the implications of embryo modification is necessary to reduce the economic sacrifices families will have to go through to provide treatment for

their children and improve the standard of living for embryos who will become children with genetic diseases. The purpose of this presentation is to introduce three embryo modification technologies: Mitochondrial DNA Replacement Therapy, Engineered Nucleases, and CRISPR-Cas9, and explain how these technologies can be used to treat real-life genetic disorders like Cystic Fibrosis and Duchenne's Muscular Dystrophy.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Tumi Adaramola, Augusta University, 1120 15th St. Augusta, GA 30912, OADARAMOLA@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
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THE EFFECTS OF ANTIRETROVIRAL THERAPY ON THE CARDIOVASCULAR AND METABOLIC HEALTH OF MICE

Priscilla Ajala, Taylor Kress, and Eric Belin de Chantemele

Citation

Ajala, P., Kress, T., & Belin de Chantemele, E. (2023). The effects of antiretroviral therapy on the cardiovascular and metabolic health of mice. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 4-5. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.04>



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The Effects of Antiretroviral Therapy on the Cardiovascular and Metabolic Health of Mice

Presenter(s): Priscilla Ajala

Author(s): Priscilla Ajala, Taylor Kress, and Eric Belin de Chantemele

Faculty Sponsor(s): Eric Belin de Chantemele, PhD

Affiliation(s): Department of Chemistry and Physics, Department of Vascular Biology Center

ABSTRACT

The Coronavirus Disease, identified in 2019 (COVID-19) became a Pandemic that challenged the healthcare industry to assume a new position of preparedness to respond quickly and purposefully amid mounting operational trials. Administrators were challenged to defend the safety of their patients and staff against a novel virus, equipped with little information about the virulence of SARS COV-2. Studying the virus' establishment among vulnerable populations will shed light on how to protect these groups. Research has demonstrated that COVID-19 has disproportionately affected the senior population (Centers for Disease Control and Prevention, 2020, Severe Outcomes Among Patients with Coronavirus Disease 2019), with adults over 65 years of age constituting 80% of hospitalizations and exhibiting a mortality rate 23 times higher than their counterparts under 65 (Mueller et al., 2020). As a subset of this population, residents of long-term care facilities are a particularly at-risk bracket of individuals. Long-term care facilities can include intermediate care facilities, nursing homes, assisted living communities, inpatient hospice, and community integration homes. For this study, nursing homes will be the primary subject of discourse. On December 28, 2020, at a Georgia Governor's press conference, Dr. Kathleen Toomey, commissioner of the Georgia Department of Public Health, affirmed that residents in nursing homes comprised greater than 95% of all COVID-19 deaths in Georgia, despite accounting for only 5% of positive cases in the state (Trubey & Sturgus, 2020). Also, in December 2020 (the peak of pandemic-related U.S. deaths), the United States Government Accountability Office reported 33,600 nursing home resident cases and 28,600 staff cases (Dicken, J. E., & United States, 2021, p. 4). It is crucial to learn from initial local responses to the novel coronavirus to understand how nursing homes can be equipped to respond to future emergencies. This study is in progress, and three out of four participants have responded to the survey thus far. As such, the introduction, background, and general data on the case rates in the Central Savannah River Area will be included in the poster. Additionally, a preliminary analysis of survey data will be included in accordance with the timeframe of coordination efforts with the Augusta University Biostatistics Department.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence Priscilla Ajala, Augusta University, 1120 15th St. Augusta, GA 30912, PAJALA@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

INTERSECTIONALITY BETWEEN MALE GAZE AND INTERNALIZED VIEWS OF TRANSFEMININE PERSONS

Ashland Amerson, Anita Singh, Ryan E. Flinn, and Lara M. Stepleman

Citation

Amerson, A., Singh, A., Flinn, R. E., & Stepleman, L. M. (2023). Intersectionality between male gaze and internalized views of transfeminine persons. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 6-7. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.06>



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Intersectionality Between Male Gaze and Internalized Views of Transfeminine Persons

Presenter(s): Ashland Amerson and Anita Singh

Author(s): Ashland Amerson, Anita Singh, Ryan E. Flinn, and Lara M. Stepleman

Faculty Sponsor(s): Lara Stepleman, PhD

Affiliation(s): Department of Psychological Sciences

ABSTRACT

The male gaze is defined as the understanding of how one views a person through a male lens, with variables including sexual objectification and internalization of standards. The male gaze has been shown to affect women in different ways, both negative and positive. There is limited research done on how the male gaze affects those who are transgender and gender diverse (TGD). We interviewed 18 TGD individuals from the southeastern United States and had researchers code through the transcripts of said interviews and found 3 underlying themes from the male gaze and transgender persons: (1) Stating an effect (negative or positive) from the male gaze on gender expression, identity, or affirmation, (2) stating no or neutral effects from the male gaze on gender expression, identity, or affirmation, and (3) stating that trying to identify with the male gaze affected one's gender expression, identity, or affirmation. Examples of having no effect from the male gaze included statements of "not caring what others think" or not caring about gender identity within partners. Some stated they did not cater to the male gaze. Negative effects included stating the male gaze makes them uncomfortable and unsure of how to act around men (the toxic male gaze- "I see you as someone to sexually please me or as a fetish"). Others stated the male gaze as the main reason why they knew they were not men, because they did not identify with it. Some stated that the way they affirmed their identity was through the expression of a heterosexual relationship, where they focused on the male gaze. Possible factors include age, sexual orientation, and gender identity when understanding how a transfeminine person identifies with the male gaze. These findings seem to suggest that the experience of male gaze and transwoman's identities and affirmations can vary and be complex, but most agree that a supportive male gaze aids in gender identity and expression while an unsupportive male gaze seems to worsen or delay one's transition. These themes can provide context when giving critical mental health aid to those who identify as transfeminine. Mindfulness meditation may benefit those who are affected negatively from the male gaze and this should be accounted for in future studies and literature.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Ashland Amerson, Augusta University, 1120 15th St. Augusta, GA 30912, asamerson@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

GENERATION OF HOMOZYGOUS TRANSPARENT TRANSGENIC ZEBRAFISH STRAIN TO STUDY CARDIOMYOCYTE ACTIVITY

Vaani Balyan, Keshu Bhat, Aiden Van Derhei, Raymond Chen,
Logan Ouellette, Taitum Gossman, Sai Nasanally, Karen Aikhionbare, Vishal
Arora, and Surendra Rajpurohit

Citation

Balyan, V., Bhat, K., Derhei, A., Chen, R., Ouellette, L., Gossman, T., Nasanally, S., Aikhionbare, K., Arora, V., & Rajpurohit, S. (2023). Generation of homozygous transparent transgenic zebrafish strain to study cardiomyocyte activity. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 8-9. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.08>



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Generation of Homozygous Transparent Transgenic Zebrafish Strain to Study Cardiomyocyte Activity

Presenter(s): Vaani Balyan

Author(s): Vaani Balyan, Keshu Bhat, Aiden Van Derhei, Raymond Chen, Logan Ouellette, Taitum Gossman, Sai Nasanally, Karen Aikhionbare, Vishal Arora, and Surendra Rajpurohit

Faculty Sponsor(s): Surendra Rajpurohit, PhD

Affiliation(s): Department of Biological Sciences, Georgia Cancer Center

ABSTRACT

The Zebrafish heart cells are similar to human heart cells at the molecular level and determine the function of genes that control cardiac function and dysfunction. In zebrafish, *myl7* is myosin light chain 7 gene and identified as a regulatory gene of heart orthologs to human MYL7. Our laboratory is developing transparent transgenic zebrafish cellular phenotype to study annexin-5 activity in the cardiovascular function under normal and in metabolic aberration and pathological circumstances by generating casper/*myl7*:RFP; annexin-5:YFP transgenic zebrafish. In vertebrates, including zebrafish, murine and human systems, the in-vivo spatial resolution is limited due to the normal opacification of skin and subdermal structures. For in-vivo imaging the skin transparency is primary requirement and to maintain the transparency, blocking the pigmentation needs to maintain. Blocking of the pigmentation can be maintained by chemical inhibition by block melanization. Chemical inhibitor PTU (1-phenyl 2-thiourea) is adequate to block the pigmentation in pigment epithelium melanization. Chemical inhibition treatment is temporary and possible till the organism treated with the chemical inhibitor agent. Zebrafish casper mutant maintain transparency throughout the life and serve as ideal combination of sensitivity and resolution for in-vivo stem cell analyses and in-vivo imaging. In this study, we established transparent transgenic zebrafish model and establishment of time lapse in-vivo confocal microscopy to study of cellular phenotype/pathologies of the cardiomyocytes to quantify changes in cardiomyocyte morphology and function overtime by comparing control and cardiac injury. Our strategist approach to yield crucial new insights into in-vivo cardiomyocyte imaging by confocal microscopy to observe and track the cell death pattern and cardio inflammatory pathways in cardiomyocyte and develop novel therapeutic approaches to treat cardio inflammatory pathology.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Vaani Balyan, Augusta University, 1120 15th St. Augusta, GA 30912, VBALYAN@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

EFFECTS OF POLYPROPYLENE MICROPARTICLES ON INFLAMMATORY CYTOKINES IN A549 CELLS

Ford Berger, Meghan Spence, and Jennifer Cannon

Citation

Berger, F., Spence, M., & Cannon, J. (2023). Effects of polypropylene microparticles on inflammatory cytokines in A549 cells. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 10-11. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.10>



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Effects of Polypropylene Microparticles on Inflammatory Cytokines in A549 Cells

Presenter(s): Ford Berger

Author(s): Ford Berger, Meghan Spence, and Jennifer Cannon

Faculty Sponsor(s): Jennifer Cannon, PhD **Affiliation(s):** Department

of Biological Sciences **ABSTRACT**

The COVID-19 epidemic sparked a rapid increase of mask wearers around the globe. Prior to the epidemic very few people outside of hospitals wore masks. Until now, many never questioned the filtration component of these single-use plastic masks. These masks contain non-woven polypropylene fibers, which have been shown to break down into smaller fragments, with some particles in the micro- and nanosized range. Previous studies in both rat and human-derived cells have shown that other microplastics promote an immune response. This study aimed to investigate the effects of polypropylene microparticles on the respiratory tract, specifically looking for increased inflammatory markers in lung derived A549 epithelial cells in response to polypropylene exposure. A549 (human alveolar type II epithelial) cells were treated with 50 µg/mL -1000 µg/mL of polypropylene microparticles in the size range of 25-85 µm. Cells treated with these concentrations of polypropylene for up to 24 h showed no decrease in viability compared to DMSO-treated controls. Additionally, cells were treated with 50 µg/ml and 500 µg/ml polypropylene microparticles and harvested after 6h exposure for gene expression analysis of the inflammatory cytokines IL-6, IL-8, and TNF α . Gene expression was determined by real-time RT-PCR using TaqMan Gene Expression Assays. Treatment of the cells for 6h with the aforementioned concentrations of polypropylene showed no increase in the expression of these three cytokines compared to DMSO-treated controls. Cells were treated with IL-1 β (1ng/ml) as a positive control. IL-1 β -treated cells showed a significant increase in the expression of IL-6, IL-8, and TNF α , 30-fold, 40-fold, and 11-fold, respectively. This initial data suggests that short-term exposure of A549 cells to polypropylene microparticles in the size range of 25-85 µm does not cause an inflammatory response. We are currently investigating whether 24 h exposure to the same concentration and size range of polypropylene microparticles induces increased expression of these inflammatory cytokines.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Ford Berger, Augusta University, 1120 15th St. Augusta, GA 30912, FBERGER@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

WATER-IMMERSION EFFECT ON FLEXURAL STRENGTH OF MILLED MONOLITHIC PMMA

Parker Blincoe, Shazeen Rattansi, Geoffrey Sheen, Don
Mettenburg, and Fred Rueggeberg

Citation

Blincoe, P., Rattansi, S., Sheen, G., Mettenburg, D., & Rueggeberg F. (2023). Water- immersion effect on flexural strength of milled monolithic PMMA. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 12-13. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.12>



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Water-Immersion Effect on Flexural Strength of Milled Monolithic PMMA

Presenter(s): Parker Blincoe

Author(s): Parker Blincoe, Shazeen Rattansi, Geoffrey Sheen, Don Mettenburg, and Fred Rueggeberg

Faculty Sponsor(s): Fred Rueggeberg, DDS

Affiliation(s): Department of Biological Sciences, Dental College of Georgia

ABSTRACT

OBJECTIVES: The first restoration step in implant-supported complete dentures often includes an inexpensive, monolithic PMMA denture base/teeth typically worn for only 3 months, while the implants osseointegrate and tissues heal. This project measured the flexural strength (FS) of a variety of commercially available monolithic PMMA products when water-stored up to 3 months.

METHODS: Bar-shaped PMMA specimens (39x4x8mm (± 0.02)) were milled from pucks of 6 materials typically used as short-term, white (shade B2), monolithic dentures: Aidite (A); Argen (AR); Huga (H and H2); Polident (P); Zubler (Z). The experimental control was milled Lucitone 199 (L). Thirty specimens of each material were produced. Ten of each product were tested (all in a randomized order) in the DRY condition, ten after 1 MONTH, and ten after 3 MONTHS water storage at 37°C. Testing was performed using a 3-point test jig on a universal testing machine (Instron 5544) at a cross head speed of 5mm/min. Flexural strength was determined from maximum load data and the formula from ISO specification 20795(1:2013E). Data analysis indicated non-normality, so parametric 1-way Kruskal-Wallis ANOVAs were performed using the Tukey test for post-hoc analyses at a pre-set alpha of 0.05.

RESULTS: For most products, DRY strength values were significantly higher ($p > 0.05$) than either the 1 or 3 month values, except for L and P, which showed no significant effect of storage condition. In general, there was no significant difference in FS between 1 MONTH or 3 MONTH durations among products. After 3 MONTHS storage, H2, H, Z, and P all showed highest strengths, significantly greater than the control: L.

CONCLUSIONS: Water storage significantly decreased flexural strength except for products L and P. Selected interim monolithic PMMA denture products produced significantly higher FS than did the more permanent milled base: L.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Parker Blincoe, Augusta University, 1120 15th St. Augusta, GA 30912, pblincoe@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

INFLAMMATORY RESPONSES TO CHORDA TYMPANI NERVE SECTIONING IN Tnfr1 KNOCKOUT MICE AND THEIR ROLE IN TASTEBUD DEGENERATION

Khaylie Boothe, Guangkuo Dong, Schuyler Kogan, and
Lynnette Phillips McCluskey

Citation

Boothe, K., Dong, G., Kogan, S., & McCluskey, L. P. (2023). Inflammatory responses to chorda tympani nerve sectioning in Tnfr1 Knockout mice and their role in tastebud degeneration. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 14-15. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.14>



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Inflammatory Responses to Chorda Tympani Nerve Sectioning in Tnfr1 Knockout Mice and their Role in Tastebud Degeneration

Presenter(s): Khaylie Boothe

Author(s): Khaylie Boothe, Guangkuo Dong, Schuyler Kogan, Lynnette Phillips McCluskey

Faculty Sponsor(s): Lynnette McCluskey, PhD

Affiliation(s): Department of Neuroscience and Regenerative Medicine

ABSTRACT

Cytokines such as tumor necrosis factor (TNF) play a key role in the development and maintenance of pain after peripheral nerve injury or infection. These are pro-inflammatory cytokines- small proteins that are crucial in controlling the proliferation, recruitment and activity of immune cells. Mechanisms responsible for taste bud regeneration are not fully understood, so this hinders strategies towards restoring natural taste sensation after trauma, cancer treatment, and even viral infection. A striking example of this is a loss of taste, commonly attributed to long-term SARS-CoV-2. Previous research conveys that TNF receptor signaling is required for taste bud regeneration after experimental nerve sectioning. Interleukin-1 (IL-1) receptor also showed that neural responses to taste were also affected after nerve sectioning. Based on this, we proposed that neutrophil recruitment due to CT nerve injury would be dampened in Tnfr1/2 knockout (KO) compared to the wild-type mice receiving injury. To test the hypothesis, CT nerve axotomy was performed in anesthetized C57BL/6J (wild-type mice) and Tnfr1/2 KO mice. Mice were euthanized 6 hours post-injury, and tongues were harvested, frozen, and cryosectioned. Hour 6 C57BL/6J (wild type mice) and Tnfr1/2 KO mice cryosections were stained with MPO+ neutrophil marker, and DAPI nuclei marker then analyzed for MPO+ neutrophil pixels using MetaMorph imaging software. Significant neutrophil responses were observed at a greater rate in TNFR KO mice than in the wild-type mice, which does not support the hypothesis. These findings suggest that other cytokines, like IL-1, can compensate for neutrophil recruitment. Further studies will focus on different time points after injury as well as observing the mucosa as a region of interest to observe the migration of neutrophils from the vasculature to the papillae.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Khaylie Boothe, Augusta University, 1120 15th St. Augusta, GA 30912, KHBOOTHE@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

DEVELOPMENT OF AN INTESTINAL BARRIER SYSTEM FOR THE STUDY OF DRUG PERMEABILITY

Kaylin Browning, Garima Paul, and Darren Browning

Citation

Browning, K., Paul, G., & Browning, D. (2023). Development of an intestinal barrier system for the study of drug permeability. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 16. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.16>



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Development of an Intestinal Barrier System for the Study of Drug Permeability

Presenter(s): Kaylin Browning

Author(s): Kaylin Browning, Garima Paul, Darren Browning

Faculty Sponsor(s): Darren Browning, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

In order to bring promising new therapeutics into the clinic to benefit patients, the safety and bioavailability of drug candidates must be evaluated preclinically using model systems. Drugs need to be absorbed through the intestinal lining to be effective, and the standard in vitro system to test this is a monolayer of differentiated Caco-2 colon cancer cells grown on a permeable filter. The goal of the present study is to establish the Caco-2 barrier model and compare it with a novel intestinal organoid-based system. Caco-2 cells were grown on 0.4 μ filters and barrier function was assessed using trans-epithelial electrical resistance (TEER). Organoids were cultured in 3D using Matrigel and similarly seeded onto filters using proliferation-promoting medium and subsequently differentiated. The Caco-2 cells exhibited minimal barrier function measured by TEER during the first week on the filter but increased to form a functional barrier (TEER > 1000 Ω .cm²) by 2 weeks and was stable for at least another week. No differences in barrier were observed between filter size (12 and 24 well plates) or composition (polycarbonate or polyester). Barriers were confirmed by treating with calcium-deficient medium that resulted in TEER < 400 Ω .cm². Changing medium to add drugs caused a transient decrease in TEER to approximately 700 Ω .cm² that recovered in an hour at 37°C. Human ileal and descending colon organoids similarly generated stable barriers that differed between proliferating and differentiating tissue. Both systems produced similar apparent permeability values for lucifer yellow. Our results demonstrate that we have established in vitro permeability models in our laboratory, and that human organoid-based barriers might offer a superior alternative for drug testing.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Kaylin Browning, Augusta University, 1120 15th St. Augusta, GA 30912, kabrowning@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

MODELING EMERGENT PATTERNS OF SYNTHETIC NOTCH SIGNAL TRANSDUCTION IN VIVO

Abby Bryant, Amber Ajamu-Johnson, and Paul Langridge

Citation

Bryant, A., Ajamu-Johnson, A., & Langridge, P. (2023). Modeling emergent patterns of synthetic notch signal transduction in vivo. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 17-18. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.17>



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Modeling Emergent Patterns of Synthetic Notch Signal Transduction In Vivo

Presenter(s): Abby Bryant

Author(s): Abby Bryant, Amber Ajamu-Johnson, Paul Langridge

Faculty Sponsor(s): Paul Langridge, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

Notch is a family of transmembrane receptors found in all multicellular animals. This receptor plays a key role in development, and mutations in the Notch system have been linked to many diseases, including cancer. Notch receptors are activated by mechanical force, where ligand-receptor binding causes endocytosis of the complex by the ligand cell, resulting in conformational change of the regulatory region that allows for a series of cleavages that result in the release of an intracellular transcription factor that alters gene expression. Recently this activation mechanism has been co-opted to produce synthetic Notch (synNotch) that can transduce a unique signal from a neighboring cell and produce a customized, and potentially therapeutic, response. SynNotch replaces ligand/receptor binding domains, regulatory regions, and transcription factors to alter receptor sensitivity and create unique signals and cellular responses. SynNotch has the potential to be used in future therapeutics. For example, classical tissue engineering approaches aim to correct structural cranio-facial defects using scaffolds or bioprinting to organize the patient's cells into desired shapes for repair. A future approach is to use cells that are capable of self-organizing into the required 3D tissue organization using developmental programs triggered by synNotch activation at precise times and locations. However, little is known about the capacity of synNotch to control cell behavior within a growing tissue. Many factors are likely to influence the position and time at which synNotch is turned on. This will be important to understand in the therapeutic use of synNotch. For instance, for engineering replacement cranio-facial tissues, synNotch could be used to control the shape of the tissue to suit the patient, but this would require the manipulation of developmental signaling pathways at a precise time of development and location within the tissue using synNotch. Here we aim to address this by producing a computational model of synNotch activation within a tissue. Previous research has established synNotch ligand and receptor fly lines that are known to recapitulate Notch signal transduction. Our overall aim is to produce multiple fluorescent microscopy images of synNotch signaling interfaces within this tissue at specific developmental stages. These images will then be quantitatively assessed and used to help build a computational model of the signaling events. Overall, this research aims to further the understanding of controlling synNotch in vivo.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Abby Bryant, Augusta University, 1120 15th St. Augusta, GA 30912, ABBRYANT@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE EFFECTS OF SOCIETAL PRESSURE UPON ADOPTING DIETING BEHAVIOR

Lia Carter and Tim Sadenwasser

Citation

Carter, L., & Sadenwasser, T. (2023). The effects of societal pressure upon adopting dieting behavior. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 19-20. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.19>



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The Effects of Societal Pressure Upon Adopting Dieting Behavior

Presenter(s): Lia Carter

Author(s): Lia Carter and Tim Sadenwasser

Faculty Sponsor(s): Tim Sadenwasser, PhD

Affiliation(s): Honors Program, Department of English & World Languages

ABSTRACT

The world is increasingly becoming dependent on technology and the media holds high expectations on how people should and should not look. This influence stresses many and makes them feel that they must change themselves to form society's wanted body image. There should not be people who view themselves as objects due to society's desires, but unfortunately, many believe their worth stems from judgments on their appearances and tie their self-worth with body image, or self-objectify. Even those who are not obese feel compelled that they are, thus being pressured to diet and become a "better version" of themselves. Additionally, many participate in dieting not because of the benefits they experience, but mainly due to social motivations and appearance. In the United States, obesity has been rapidly increasing, yet society has created an "ideal" body image. Due to society's desired body image, which is sometimes unattainable, many attempt to alter their appearance using harmful dieting methods. Pressures such as social media, editing, and the internet, have led to adopting these practices which have multiple negative mental and physical effects. Although many understand that some diets are unsustainable, they participate in them due to a false belief that they will lose unwanted weight quickly and easily, and that it will last in the long term. These 5 original poems written from different perspectives demonstrate the mental and physical effects of societal pressure upon adopting dieting behavior in adults and adolescents. Executed in poem form, to further portray emotion and pull the audience away from the recurring mundane papers, I will expand my knowledge about harmful dieting practices, and further, understand the psychological effects they have on a person and society. I will share this information with others and find potential solutions to this issue, such as teaching others to reduce the amount of social media content that is the source of their insecurities and attempting to dismantle the way society views body image. I will educate those who do decide they want to engage in dieting practices, for themselves and not society, to do so safely with the potential help of a nutritionist or take small steps instead of excessive action. I need others to understand that Rome wasn't built in a day and that changing their body is the same.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Lia Carter, Augusta University, 1120 15th St. Augusta, GA 30912, LCARTER1@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE ZEBRAFISH ENVIRONMENTAL CHALLENGES AND OPTIMIZATION

Raymond Chen, Logan Ouellette, Keshu Bhat, Aiden Van Derhei, Taitum Gossman, Sai Nasanally, Karen Aikhionbare, and Surendra Rajpurohit

Citation

Chen, R., Ouellette, L., Bhat, K., Derhei, A., Gossman, T., Nasanally, S., Aikhionbare, K., & Rajpurohit, S. (2023). The zebrafish environmental challenges and optimization. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 21.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.21>



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The Zebrafish Environmental Challenges and Optimization

Presenter(s): Raymond Chen and Logan Ouellette

Author(s): Raymond Chen, Logan Ouellette, Keshu Bhat, Aiden Van Derhei, Taitum Gossman, Sai Nasanally, Karen Aikhionbare, and Surendra Rajpurohit

Faculty Sponsor(s): Surendra Rajpurohit, PhD

Affiliation(s): Department of Biological Sciences, Georgia Cancer Center

ABSTRACT

The zebrafish housing is most important prerequisite to establish zebrafish modeling system in biomedical Research. Our laboratory is developing novel transparent transgenic zebrafish modeling system in Experimental Therapeutics, High Throughput Drug Discovery, Toxicology, Glioblastoma, diabetes, and cardio-oncology. Environment changes and temperature variation are most critical risk factors impending zebrafish housing. The aims of this study are to determine and maintain optimal zebrafish housing conditions. Because they are naturally from tropical environments, temperatures and other factors outside their normal range will significantly impact their development and behavior. We are conducting the study on weather temperature fluctuation, room temperature, system water temperature, system water pH, and system water conductivity of our zebrafish facility. These parameters are observing and recording over the course of a year. Weather (or campus) temperature is recorded via the weather app, and room temperature is measured using a thermometer kept in the fish lab. System water temperature, pH, and conductivity is measured and recorded using the recirculating system monitor device that is connected to the system water. pH of the system water is maintained using sodium bicarbonate while the conductivity is maintained using salts. The aims of this study are to determine and maintain optimal zebrafish housing conditions. Our observations established the lethal role of extreme low temperature on the zebrafish fertilization, development, and growth. Our method involves simulating a zebrafish's natural tropical habitat intact and optimization of environmental condition to keep the zebrafish housing in best conducive environment.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Raymond Chen, Augusta University, 1120 15th St. Augusta, GA 30912, RACHEN@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

PAINTING A 3D MODELING IN SUBSTANCE PAINTER DEMO

Hailey Dowdy and A.B. Osborne

Citation

Dowdy, H., & Osborne, A. B. (2023). Painting a 3D modeling in substance painter demo. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 22.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.22>



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Painting a 3D Modeling in Substance Painter Demo

Presenter(s): Hailey Dowdy

Author(s): Hailey Dowdy and A.B. Osborne **Faculty Sponsor(s):**

A.B. Osborne, MFA **Affiliation(s):** Department of Art and Design

ABSTRACT

Within animation there is a large production pipeline with thousands of professions that work together. One of the most important parts of the production pipeline is creating materials for characters and objects within a scene. Without 3D texture artists, 3D animated characters would not have any create color or life. Everything in a 3D animation needs color and textures. This is where 3D texture artists play the major role in the production pipeline. In this demo I will demonstrate the wonders of creating materials for a 3D model. To achieve that I will show the powers of the program, Substance painter, which is the main tool texture artists use to create 3D materials. For this demo, I will be using a production ready 3D model of a fun frog character, Slippy, and together with the audience we will bring this character to life by creating his colors and textures. I will first demonstrate how to set up a 3D workspace that is efficient to create materials by changing the workspace, and “baking” our project to prepare it for materials. Then, I will show how a grayscale 3D model can come alive with materials by creating masks, using materials built into the program, texture maps, paint brushes, etc. During the entire demonstration the judges and audience will have a say on what colors and texture maps we should choose, letting them have a say in how Slippy should look. That way everything in the audience feels as though they have created 3D materials just like a 3D texture artist.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Hailey Dowdy, Augusta University, 1120 15th St. Augusta, GA 30912, HDOWDY@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

INTRA-RENAL PRESSURES DURING WARM ARTERIAL AND VENOUS ISCHEMIA-REPERFUSION IN RATS

Priya Giddens and Paul O'Connor

Citation

Giddens, P., & O'Connor, P. (2023). Intra-renal pressures during warm arterial and venous ischemia-reperfusion in rats. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 24-25. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.24>



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Intra-Renal Pressures During Warm Arterial and Venous Ischemia-Reperfusion in Rats

Presenter(s): Priya Giddens

Author(s): Priya Giddens and Paul O'Connor

Faculty Sponsor(s): Paul O'Connor, PhD

Affiliation(s): Department of Biological Sciences, Department of Physiology

ABSTRACT

Red blood cell (RBC) trapping presents as expansion- and obstruction of-, the outer- medullary capillaries of the kidney with tightly packed RBCs. RBC trapping has been shown to contribute to kidney injury and glomerular filtration rate decline, however, the mechanisms mediating RBC trapping remain unclear. It's been proposed that swelling of tubular cells during warm-ischemia initiates RBC trapping by increasing intra-renal pressure. Increase in pressure is thought to compresses the vasa recta capillaries that drain the renal medulla, initiating RBC trapping in medullary circulation during reperfusion. The current study tested the hypothesis that 'Intra-renal pressure is increased during warm ischemia-reperfusion'. We tested our hypothesis using young male Wistar-Kyoto rats (n=6). We examined pressure changes in the left kidney during ischemia-reperfusion from warm arterial (n=3) and venous (n=3) clamping using micro-serrefines. Rats were anesthetized with isoflurane (2-5%), a midline abdominal incision and left artery and vein isolated. The left kidney was cleared of connective tissue and placed in a kidney-cup preventing movement. Intra-renal pressure was measured using a Millar micro-tip catheter pressure transducer which inserted into the kidney outer-medulla. Intra-renal pressure was recorded during baseline and following 45 minutes of ischemia and 1 hour of reperfusion. Body temperature was maintained throughout the study using a servo-controlled heating table and heat lamp. At the end of the study, the left kidney was harvested and correct catheter placement confirmed. The kidneys were then fixed for later histological analysis. Data were compared using 2-way RM ANOVA (Graphpad Prism). Arterial clamping significantly increased intra-renal pressure ($p < 0.001$). Following arterial clamping, intra-renal pressure rapidly increased reaching a peak of ~30mmHg above baseline after ~6 minutes. Intra-renal pressure then fell slightly averaging 17 ± 3 mmHg above baseline over the clamp period. Upon release of the arterial clamp, intrarenal pressure fell to below baseline levels within 270 seconds. Following clamping of the renal vein, intrarenal pressure increased, reaching a peak of 28mmHg above baseline. The increase in average intrarenal pressure across the clamp period was significantly greater with venous compared to arterial clamping ($p < 0.001$), averaging 25 ± 1 mmHg. Similar to arterial clamping, intra-renal pressure rapidly fell to baseline levels following removal of the venous clamp. Our data indicates that both arterial and venous clamping increase intra-renal pressure during clamp/ischemic period. As intra-renal pressure rapidly returns to baseline following removal of the clamp, however, compression of venous vessels that drain the renal medulla by high intra-renal pressures is unlikely to mediate RBC trapping during reperfusion.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Priya Giddens, Augusta University, 1120 15th St. Augusta, GA 30912, PGIDDENS@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

TRUENIVERSE COMICS: AN EXPLORATION OF HYPERMEDIA IN SEQUENTIAL ARTS

Tripp Gustin and A.B. Osborne

Citation

Gustin, T., & Osborne, A. B. (2023). Trueniverse comics: An exploration of hypermedia in sequential arts. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 26-27. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.26>



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Trueniverse Comics: An Exploration of Hypermedia in Sequential Arts

Presenter(s): Tripp Gustin

Author(s): Tripp Gustin and A.B. Osborne **Faculty Sponsor(s):**

A.B. Osborne, MFA **Affiliation(s):** Department of Art and Design

ABSTRACT

The digital age allows for new methods of storytelling in comics and sequential art beyond what can be printed on a page. My webcomic series Trueniverse Comics (www.trueniverse.com) has allowed me to expand my interest in exploring the bounds of what a comic can be, creating interconnected webcomics that tell a larger story while exploring different genres, formats, and multimedia elements. This self-run hub site keeps my work in one easy-to-navigate place while allowing me to explore unconventional formatting that most webcomic hosting sites do not allow for. I have been creating comics since I was 9, beginning with materials as simple as paper and pencil but quickly expanding to pixel art and digital illustration. My long-running webcomic True Colors began as a simple page-based webcomic using digital methods of creating webcomics that emulated more traditional printed comic books, but I quickly became interested in examining what new things can be done with the medium. To date I have created four different webcomics. True Colors, a more traditional page-based comic that tells a character-driven college coming of age story; CorpSet, a scifi/horror series incorporating animated gifs, reader interaction, and flash animation; Input Quest, an improvised series incorporating multiple storylines, animated gifs, randomly-selected reader submissions, and browser-based video games; and Comicstripp, a standalone gag-a-day comedy strip in the vein of newspaper funnies. These stories often have shared plot threads and background elements keeping them rooted in the same world, but stand alone to allow readers to pick and choose which stories they are interested in. In the future I plan to create additional comics that explore physical art media, photography, 3D modeling, nonlinear storytelling, postmodernism, metanarrative, and epistolary elements. I have worked on Trueniverse Comics in various forms for over a decade, and it is my most treasured personal passion project. Through these projects I not only create stories and characters that feel rich and alive, but also get to experiment with the medium and push digital storytelling to new levels. Although working in this degree has taken up much of the time I have for working on personal projects, I look forward to continuing to explore what comics can do while creating a world that is rich, interactive, and diverse for years to come.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Tripp Gustin, Augusta University, 1120 15th St. Augusta, GA 30912, RGUSTIN@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

DIETARY AND CAFFEINE INTAKES OF FIREFIGHTERS LOCATED IN THE SOUTHEAST

Garrett Hachem, Austin Kohler, Andrew Moore, and
Angelia Winkler

Citation

Hachem, G., Kohler, A., Moore, A., & Winkler, A. (2023). Dietary and caffeine intakes of firefighters located in the southeast. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 28-29. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.28>



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Dietary and Caffeine Intakes of Firefighters Located in the Southeast

Presenter(s): Garrett Hachem

Author(s): Garrett Hachem, Austin Kohler, Andrew Moore, and Angelia Winkler

Faculty Sponsor(s): Angelia Winkler, PhD

Affiliation(s): Department of Kinesiology

ABSTRACT

This project was an observational sub-study from a larger clinical trial conducted and lead by a master's student at Augusta University. The larger clinical trial was conducted to observe the health, physical activity, and sleep quality of firefighters in the southeast. This sub-study focused on the nutritional aspect and observed nutritional habits and aimed to quantify caloric, nutrient, and caffeine intake in local firefighters in the southeast. Firefighters are prone to coronary heart disease, cancer, obesity, and high blood pressure possibly due to the working conditions they face including irregular sleeping/eating habits, high-stress levels, and exposure to carcinogens. I hypothesize firefighters will have a high caloric intake (Over 3,000 kcal/day) and caffeine consumption (Over 400 mg/day) due to the aforementioned health factors. A total of 15 local firefighters participated in this study. Participants in this study were males between the ages of 18 and 55 and were firefighters in various departments in the southeast. Participants were recruited from gyms, fire stations, and through advertisements posted within the community. Although the overarching population of the study consisted of 15 participants, not all data was completely documented and gathered at the time of this sub-project. Therefore, the data and results section includes only participants whose data has been fully collected. Participants met for a familiarization visit in which they signed their informed consent document and were provided an opportunity to ask any questions. Participants were also given a Nutrition and Health Information Questionnaire as a self-assessment of their medical, nutritional, weight, and physical activity history. After this familiarization meeting, subjects consumed their normal diet for a week and results were recorded using MyFitnessPal or through hand written IRB approved food logs. If participants chose to use MyFitnessPal, they submitted an image of their "Nutrient" section from each day. If participants chose to use the food logs, this data would be translated into MyFitnessPal after the second visit. The participants' data, consisting of protein, carbohydrates, fats, fiber, sugar, cholesterol, sodium, and caloric intake was analyzed to determine the nutritional habits of a sample firefighters in the southeast. Caffeine intake was recorded separately and reported during the second visit with the nutrient intake.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Garrett Hachem, Augusta University, 1120 15th St. Augusta, GA 30912, ghachem@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

MENTOR SCIENCE IDENTITIES AND THEIR INFLUENCE ON STUDENT RELATIONSHIPS WITH SCIENCE

Melvin Hilson, Jerin Jamil, and Alexandra St. Louis

Citation

Hilson, M., Jamil, J., & St. Louis, A. (2023). Mentor science identities and their influence on student relationships on science. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 30. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.30>



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Mentor Science Identities and their Influence on Student Relationships with Science

Presenter(s): Melvin Hilson and Jerin Jamil

Author(s): Melvin Hilson, Jerin Jamil, and Alexandra St. Louis

Faculty Sponsor(s): Alexandra St. Louis, PhD

Affiliation(s): Center for Undergraduate Research

ABSTRACT

This qualitative study aims to investigate the individual properties present within science identities of undergraduate mentors. It also aims to inquire how these science identities are shared with students in the classroom and virtual classroom setting to improve learning in science education and STEM programming. This research is crucial because science identities strengthened through mentoring programs have correlated with increased GPAs and success in the field of research. In this study, data from the Fall 2021 cohort of the iBEARS program was utilized. This program consisted of undergraduate science mentors guiding K-12 classrooms through creating a research project utilizing project based learning. The constant comparison method was used to identify individual aspects of the science identities of undergraduate mentors participating in the iBEARS program over 15 weeks. Three classrooms were observed, with three undergraduate mentors assigned to each. Four prevalent themes emerged: a sense of community, being built by intrinsic and extrinsic attitudinal factors, a match between real science and school science, and perception of science. These themes are broken down further to emphasize the individual properties in our data set. The codes for this study were created using the in-vivo coding method. Our results primarily reflect the previous literature on science identities held by students, mentors, and teachers in the classroom and research laboratory setting. We look to investigate further components of science pedagogy that may explain the relationship between mentor science identity and student reactions.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Melvin Hilson, Augusta University, 1120 15th St. Augusta, GA 30912, mehilson@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE EFFECT OF LAVENDER ESSENTIAL OIL ON PRIMARY DYSMENORRHEA

Truc-Mi Hoang, Taylor Crawford, and Dawn Langley-Brady

Citation

Hoang, T., Crawford, T., & Langley-Brady, D. (2023). The effect of lavender essential oil on primary dysmenorrhea. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 31-32. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.31>



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The Effect of Lavender Essential Oil on Primary Dysmenorrhea

Presenter(s): Truc-Mi Hoang

Author(s): Truc-Mi Hoang, Taylor Crawford, and Dawn Langley-Brady

Faculty Sponsor(s): Dawn Langley-Brady, PhD

Affiliation(s): College of Nursing

ABSTRACT

Dysmenorrhea, commonly known as menstrual cramps, severely impacts the lives of almost 20% of women, causing symptoms like fatigue, pain, headaches, nausea, and vomiting. While competent pharmaceutical solutions exist to treat dysmenorrhea, so do unwanted effects like swelling, weight gain, reduced libido, and upset in the gastrointestinal tract. However, another method has been used to improve physical well-being and manage dysmenorrhea with all-natural, non-pharmaceutical approaches: aromatherapy. Aromatherapy utilizes extracts from plants in the form of essential oils, and we focused on the effects of *Lavandula angustifolia*, or lavender, essential oil on treating dysmenorrhea. With this systematic review, we hope to summarize and verify the effectiveness of lavender essential oils on primary dysmenorrhea and spread awareness of the positive results a nature-based, pharmaceutical alternative can have on the debilitating health condition plaguing many lives of women. In conducting our systematic review, we first submitted a systematic review application in PROSPERO before consulting a wide variety of Cochrane databases for reviews, such as PubMed, CINAHL, TRIP, and Web of Science. Using the key terms “*Lavandula*” or “lavender”, “menses” or “menstruation”, “pain”, and “dysmenorrhea”, we searched for peer-reviewed journal articles published in English between January 2000 and October 2022. After excluding “secondary dysmenorrhea” from the search results, we ran through the findings through the free web application Rayyan.ai for systematic reviewing purposes. Duplicate articles were filtered out, either automatically or manually, and we included or excluded blinded articles during the review. We also discussed any conflicting articles after being un-blinded to the titles and abstracts. Searching databases resulted in finding 238 articles, and after filtering out 126 duplicate articles, 112 articles remained. Reviewing titles and abstracts for inclusion and exclusion resulted in 27 articles for the systematic review.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Truc-Mi Hoang, Augusta University, 1120 15th St. Augusta, GA 30912, trhoang@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

BILE ACID-BASED THERAPIES TO TREAT RETINOPATHY OF PREMATURITY

Mindy Ho, Allston Oxenrider, Ravirajsinh Jadeja, Pamela Martin, and
Menaka Thounaojam

Citation

Ho, M., Oxenrider, A., Jadeja, R., Martin, P., & Thounaojam, M. (2023). Bile acid-based therapies to treat retinopathy of prematurity. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 33-34. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.33>



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Bile Acid Based Therapies to Treat Retinopathy of Prematurity

Presenter(s): Mindy Ho

Author(s): Mindy Ho, Allston Oxenrider, Ravirajsinh Jadeja, Pamela Martin, and Menaka Thounaojam

Faculty Sponsor(s): Menaka Thounaojam, PhD

Affiliation(s): Department of Biological Sciences, Department of Ophthalmology

ABSTRACT

There is not much known about some existing eye diseases, especially retinopathy of prematurity (ROP). Retinopathy of prematurity is defined as an eye disorder characterized by abnormal blood vessel growth, as a response to the sudden lack of nutrients received by the retina. Although ROP only affects one group, that group happens to be infants that are born prematurely. Some infants go untreated; however, when ROP is left untreated, it can lead to retinal scarring, which could then eventually lead to retinal detachment, which could then lead to childhood blindness. If ROP is treated, the prominent issue then lies within its current treatment methods: peripheral retinal ablation and injection of anti-angiogenic drugs. These therapies are considered invasive and non-resolving because of lack of advanced training for these procedures, lack of resources, and late treatment periods. On the other hand, bile acids (which are amphipathic sterols made in the liver from cholesterol and released in the lumen of the intestine upon food intake) have been recently reported to be successful in treatments for a variety of diseases, involving the heart, liver, and intestine. Due to these recent findings, there has been increasing research into using bile acids for eye diseases since they are important signaling molecules involved with several cell processes in retinal cells. Ursodeoxycholic acid (UDCA) was chosen since it has a long history in medicine, aiding illnesses with its antioxidant effects. To assess the efficacy of administering UDCA, an FDA-approved secondary bile acid that is a part of natural human bile, treatment through priming, I assessed the effects of priming UDCA on mouse retinas, following a standard mouse model procedure for ROP, called the oxygen-induced retinopathy (OIR) model. ROP progression is characterized by abnormal blood vessel growth and increase in avascular areas within the retina. The intent for use of UDCA through priming is to assess the effects of UDCA treatment that is administered earlier on in disease progression, rather than during the serious stages. The main outcome from this project was that priming UDCA did have desired protective effects against progression of ROP. Early UDCA supplementation provided beneficial effects on retinal neovascularization, along with significantly improved long-term ROP consequences.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Mindy Ho, Augusta University, 1120 15th St. Augusta, GA 30912, minho@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

SOCIODEMOGRAPHIC INFLUENCES ON OPINIONS ABOUT PHYSICIAN ASSISTED SUICIDE

Makenzie Jane and Angela Bratton

Citation

Jane, M., & Bratton, A. (2023). Sociodemographic influences on opinions about physician assisted suicide. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 35. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.35>



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Sociodemographic Influences on Opinions about Physician Assisted Suicide

Presenter(s): Makenzie Jane

Author(s): Makenzie Jane and Angela Bratton

Faculty Sponsor(s): Angela Bratton, PhD

Affiliation(s): Department of History, Anthropology, and Philosophy

ABSTRACT

Physician-assisted suicide (PAS) is the voluntary termination of one's life via administering a lethal substance with a physician's direct or indirect assistance. In the U.S., only nine states legally offer assisted suicide. These "right to die" states have death with dignity laws that seek to help individuals with terminal illnesses take their own lives to avoid suffering. In general, public opinion regarding the legality of PAS seems to be divided. This medical anthropology research paper aimed to analyze the influence of various sociodemographic factors on people's opinions regarding physician-assisted suicide, focusing specifically on religious identity, income, and age. The study implemented 45 detailed questions to voluntary participants 18 years or older. The questions served to sort the participants into demographics and gather information on their opinions about PAS and different conditional circumstances. The study's results suggested that most of the sample supported the idea of "dignity over death," a common argument for proponents of PAS. The detailed analysis confirmed the belief that approval of PAS is dependent mainly on the patient's autonomy and mental state. Age also influenced the participant's support of PAS to end one's suffering. Additionally, the religious affiliation also affected people's beliefs, with some stating their spiritual authority as the only one with control over life and death, and others citing their religious ruler's mercy as a reason why they support the procedure. This study also discussed the role of income in people's medical discussions regarding end-of-life support. This study furthers understanding of how people's social status may influence their opinions about life-ending procedures and medical decisions.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Makenzie Jane, Augusta University, 1120 15th St. Augusta, GA 30912, mjane@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

ANALYZING THE EFFICACY OF THE EMBEDDED TUTOR PROGRAM

Makenzie Jane and Charlotte Christy

Citation

Jane, M., & Christy, C. (2023). Analyzing the efficacy of the embedded tutor program. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 36-37.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.36>



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Analyzing the Efficacy of the Embedded Tutor Program

Presenter(s): Makenzie Jane

Author(s): Makenzie Jane and Charlotte Christy **Faculty Sponsor(s):**

Charlotte Christy, PhD **Affiliation(s):** Department of Biological

Sciences

ABSTRACT

The Course Learning Assistant (CLA) program was a new program implemented into all biology classes (1101 and 1107) for the fall 2022 semester. This program was designed to facilitate student learning and provide academic support inside and outside the classroom. Embedded tutoring is a form of supplemental instruction where academic tutors work closely with instructors to provide individualized support and targeted, early-on interventions for struggling students. The CLA program was dissolved after one semester at Augusta University because of cost constraints. However, no significant information was released regarding the program's effectiveness. This study set out to analyze the efficacy of the course learning assistant program regarding relative achievement. Information about exam scores from the fall 2022 semester (class with CLA) and the spring 2023 semester (class without CLA) was used to compare the semesters. The four comprehensive exams for a biology 1102 course were juxtaposed to ensure that the students from both semesters were asked the same questions. The exams were then analyzed by looking at the correct percentage for each question. The results of this analysis concluded that across all four exams, almost 50% of the questions were answered more correctly by the class with the embedded tutor relative to the class without the tutor. To further the understanding of the success of this program, the questions in which the percentage correct were drastically different between semesters were considered. The goal was to determine if there were any specific question types that one semester demonstrated a higher level of understanding compared to the other semester. The question types include content recall, conceptual understanding, and content application. Preliminary results suggest no specific question types that one semester outperformed the other on. This may

indicate that the level of comprehension was the same across the two semesters. However, further analysis must be completed to determine the exact difference in the level of question comprehension. These results are significant to understand further the efficacy of one of the implemented tools for student success on the Augusta University campus and further demonstrate the success of embedded tutoring programs even at the college level.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Makenzie Jane, Augusta University, 1120 15th St. Augusta, GA 30912, mjane@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

FILTRATION IS ABSENT IN THE RAT KIDNEY EARLY IN REPERFUSION

Chloe Johnson and Paul O'Connor

Citation

Johnson, C., & O'Connor, P. (2023). Filtration is absent in the rat kidney early in reperfusion. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 38-39. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.38>



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Filtration is Absent in the Rat Kidney Early in Reperfusion

Presenter(s): Chloe Johnson

Author(s): Chloe Johnson and Paul O'Connor

Faculty Sponsor(s): Paul O'Connor, PhD

Affiliation(s): Department of Biological Sciences, Department of Physiology

ABSTRACT

Ischemic acute kidney injury (AKI) occurs following a period of ischemia and is a major clinical problem. In AKI, the cellular structure of the kidney often appears relatively normal, despite the almost complete loss of kidney function. Red blood cell (RBC) trapping occurs in AKI and is the trapping of RBC in the capillaries of the kidney medulla. As RBC trapping increases pressure in the kidney, this increased pressure may obstruct the tubules, limiting kidney filtration even when cellular injury is mild. In the rat ischemic reperfusion model of AKI, RBC trapping is most prominent early in kidney reperfusion (2-6 hours) before dissipating. As this is before most tubular injury is evident, if RBC trapping is responsible for the decline in kidney function, glomerular filtration rate (GFR) should be most reduced early in reperfusion. Therefore, the current study tested the hypothesis that 'the greatest reductions in glomerular filtration rate following ischemia occur early in reperfusion'. The rat warm bilateral arterial clamp model of ischemia reperfusion injury (IRI) was used. 4 male rats underwent IRI surgery and 3 rats were used as controls. GFR was determined early (2-4 hours) and late (24-25 hours) in the reperfusion period. The rats were anesthetized and the renal artery of each kidney was then clamped for a period of 45 minutes before removing the clamps and allowing the animals to recover. To measure GFR, sinistrin (20mg) was administered via the tail vein. Sinistrin is a molecule excreted by the kidney. The clearance of sinistrin from the blood can be used to estimate GFR. The clearance of fluorescent sinistrin from the blood was measured across the skin using a device stuck to the back of the rat (Medibeacon). As expected, glomerular filtration rate was markedly reduced following IRI compared to control rats with the $\frac{1}{2}$ life of sinistrin in the blood of control rats being 23.6 minutes versus 2246 minutes for IRI rats. Importantly, the greatest reductions in GFR occurred early in reperfusion with the $\frac{1}{2}$ life of sinistrin in the blood being 3728 mins between 2-4 hours of reperfusion before falling to 765 mins by 24 hours of reperfusion ($P < 0.001$ (Paired t-test)). Our data are consistent with RBC trapping promoting the functional decline of the kidney following ischemia. Understanding the relationship between vascular congestion and renal functionality is essential for the development of clinically effective treatment options for acute kidney injury.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Chloe Johnson, Augusta University, 1120 15th St. Augusta, GA 30912, chljohnson@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

ADAM PROTEASE KUZBANIAN CLEAVES MULTIPLE UNRELATED PROTEIN DOMAINS

Trevor Jordan and Paul Langridge

Citation

Jordan, T., & Langridge, P. (2023). Adam protease kuzbanian cleaves multiple unrelated protein domains. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 40. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.40>



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Filtration is Absent in the Rat Kidney Early in Reperfusion

Presenter(s): Trevor Jordan

Author(s): Trevor Jordan and Paul Langridge **Faculty Sponsor(s):**

Paul Langridge, PhD **Affiliation(s):** Department of Biological Sciences

ABSTRACT

Notch receptors and ligand proteins are involved in many cell signaling processes. Receptors have four domains: a ligand/receptor binding domain, a Negative Regulatory Region (NRR), a transmembrane region, and an intracellular transcription domain. The receptor is activated by proteolytic cleavage at the NRR domain, but only when force is applied to the receptor following a pull from ligand attached to a neighboring cell. Cleavage is performed by Kuzbanian, an Adam family protease, but the mechanics of this process are not well understood, particularly as Kuzbanian can cleave many different surface proteins with widely varying amino acid sequences and cleavage following the application of force appears to be a mechanism specific to Notch receptors. We have produced multiple modified Notch receptors with different protein domains from a variety of sources in place of the NRR and expressed them individually in the *Drosophila* wing. We examined whether or not Kuzbanian cleaves these receptors by genetically removing Kuzbanian from the receptor cells and measuring receptor activation. This experiment is still on-going, but thus far, all the receptors tested rely on Kuzbanian for cleavage, despite each cleavage domain consisting of a different sequence and structure. This suggests that Kuzbanian may have a central role in detecting protein domains under tension and inducing cleavage or that multiple proteins possess Kuzbanian cleavage sites that are exposed in response to force.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Trevor Jordan, Augusta University, 1120 15th St. Augusta, GA 30912, trejordan@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE THERAPEUTIC POTENTIAL OF CANNABIDIOL IN THE TREATMENT OF HEAD AND NECK CANCER

Katie Ko, Sahar Emami Naeini, Bidhan Bhandari, Zoya Kurago, Andrew Yuedall, Babak Baban, Linah Shahoumi, and Evila Salles

Citation

Ko, K., Naeini, S. E., Bhandari, B., Kurago, Z., Yuedall, A., Baban, B., Shahoumi, L., & Salles, E. (2023). The therapeutic potential of cannabidiol in the treatment of head and neck cancer. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 41-42. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.41>



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The Therapeutic Potential of Cannabidiol in Treatment of Head and Neck Cancer

Presenter(s): Katie Ko

Author(s): Katie Ko, Sahar Emami Naeini, Bidhan Bhandari, Zoya Kurago, Andrew Yeudall, Babak Baban, Linah Shahoumi, and Evila Salles

Faculty Sponsor(s): Babak Baban, PhD

Affiliation(s): Department of Biological Sciences, Dental College of Georgia

ABSTRACT

Tongue tumor is a type of head and neck cancer that begins to spread in the cells of the tongue. There are several types of cancer that can affect the tongue. However, the most common and prevalent type of tongue cancer is squamous cell carcinoma (SCC). Tongue tumors are a form of head and neck cancer within the oral cavity. The most common and prevalent type of tongue cancer is squamous cell carcinoma (SCC). SCC are thin, flat cells that are found on the surfaces of the skin and tongue, in the lining of the digestive and respiratory tracts, mouth, throat, thyroid, and larynx. Cannabidiol (CBD) has been a sensational topic for researchers as many recent studies have shown that it has anti-inflammatory and immunomodulatory properties, which correlates with the studies of tumor suppression. CBD is isolated from the Cannabis sativa plants, such as hemp and marijuana. Studies show CBD maybe able to help in the treatment for some type of cancer. For example, CBD may be beneficial for cancer patients and their cancer-related side effects. Also, CBD showed effect on decreasing cancerous cells in tumors. With increasing number of cases with head and neck cancer worldwide, it is unavoidable to do a research study on their interactions. Therefore, under the guidance of Dr. Baban, I will be conducting a research study that focuses on the therapeutic potential of Cannabidiol in the treatment of tongue tumor. The research experiment will use tumor murine cell lines to generate the experimental model of tongue tumor in the mice and analyze how Cannabidiol (CBD) affects the tongue tumor development. The cell line for mice experimental model has been developed at the department of Oral Biology and Dx Sciences, Dental College of Georgia (DCG) at Augusta University. The goal of this research is to explore the role of inhaling CBD in mice to provide a new therapeutic option to target and decrease the tongue tumors. We will be assessing imaging, Flow Cytometry, and Immunohistochemistry to examine and evaluate the consequences of CBD. All the protocols in our research studies were relied on and approved by IACUC at Augusta university

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Katie Ko, Augusta University, 1120 15th St. Augusta, GA 30912, kko@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

MONARCHS – THEY'RE JUST LIKE US: PEOPLE MAGAZINE ARTHUR

Elana Koehler and Blair Zeiders

Citation

Koehler, E., & Zeiders, B. (2023). Monarchs—they're just like us: People magazine Arthur. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 43-44. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.43>



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Monarchs—They’re Just Like Us: People Magazine Arthur

Presenter(s): Elana Koehler

Author(s): Elana Koehler and Blaire Zeiders

Faculty Sponsor(s): Blaire Zeiders, PhD

Affiliation(s): Department of English & World Languages

ABSTRACT

Among scholars of Arthurian literature, Richard Johnson’s *Tom a Lincoln*, initially published in 1599 and 1607, is often referred to as an example of a depiction of King Arthur that strays far from the generous, glorious, and chivalrous depictions of Arthur in other literature of its time. While I agree that *Tom a Lincoln* is discussed as a branching off from the traditional depictions of monarchs, I maintain that the 1668 republishing of *Tom a Lincoln* presents the opportunity for investigating the anticipated views of its readers, as well as their perceived opinions on the monarchy given the post-Restoration climate. I argue that Johnson has created a “People Magazine Arthur” through which the general masses of people in Britain can see a representation of a monarch making many human errors and can then project their issues with their monarch onto him. I highlight the aspects of manuscript culture within the 1668 *Tom a Lincoln* and how they emphasize the facade of a perfect monarchy. I connect Johnson’s depiction of King Arthur with the more modern *People Magazine*’s methods of anticipating audiences latching on to the scandals of famous political and entertainment figures. I maintain that by analyzing 1668 *Tom a Lincoln* through Roger Chartier’s method of looking to the text to construct a perceived readership, as well as his use of Michel de Certeau’s “mystical reader” concept (Chartier 51), the perceived readership of *Tom a Lincoln* becomes clearer: a community of readers that were familiar with the errors of monarchs and were looking for somewhere or someone onto which to project their frustration after the Restoration of the monarchy. I posit that “People magazine Arthur” in Johnson’s 1668 work epitomizes the use of a familiar celebrity or familiar character to capture the attention of a predicted readership, while the plot of the text emits the important theme of not blindly trusting a leader simply because they demand it. Simultaneously, Johnson’s work epitomizes the idea that the general populous not only appreciates, but relishes in the publicizing of the scandalous activities of those in power, especially when they have previously been depicted as free from fault.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Elana Koehler, Augusta University, 1120 15th St. Augusta, GA 30912, ELKOEHLER@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

SELF DISCOVERY THROUGH CHARACTER CREATION

Max Leverett and A. B. Osborne

Citation

Leverett, M., & Osborne, A. B. (2023). Self-discovery through character creation. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 45.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.45>



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Self-Discovery through Character Creation

Presenter(s): Max Leverett

Author(s): Max Leverett and A. B. Osborne

Faculty Sponsor(s): A. B. Osborne, MFA

Affiliation(s): Department of Art & Design

ABSTRACT

Many artists use their art as a way to understand and work through complex thoughts and emotions, allowing the creative process to become an outlet for and directly inspired by such thoughts. Often this idea is associated with fine art, where every brushstroke is assumed to have some grand meaning behind it, but the same can be said of any creation really. It's easy to overlook the thought put into something as seemingly simple as an original character, beyond that of its actual aesthetic ideas. Speaking personally, I have always gravitated towards character creation as my favorite creative outlet, and in looking back at my art over the years I realized a trend. My growth and development not only as an artist, but as a person as well, can be seen within my characters. My style changed overtime, my skills got better, but so too did my identity and how that's expressed. For me and others, creating characters serves as a way to experiment and explore different identities in a safe and controlled environment. It's almost a play of sorts, each character playing its own role but all serving the same story. Characters who are present for longer experience the most growth, but those who are only in a few scenes still serve to advance the story. In this sense, I owe a lot of how my identity has changed over the years to being able to create a wide variety of characters.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Max Leverett, Augusta University, 1120 15th St. Augusta, GA 30912, anleverett@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

BEYOND GAME ENGINES

Patricia Marcano and A. B. Osborne

Citation

Marcano, P., & Osborne, A. B. (2023). Beyond game engines. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 46.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.46>



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Beyond Game Engines

Presenter(s): Patricia Marcano

Author(s): Patricia Marcano and A. B. Osborne

Faculty Sponsor(s): A. B. Osborne, MFA

Affiliation(s): Department of Art & Design

ABSTRACT

When one thinks for the term game engine the first thought that usually comes to mind is video games. Nowadays game engines go far beyond just a program that is solely for making games. A great example is Unreal Engine made by Epic Games, the creators of Fortnite. Unreal Engine has also been used to make well-known movies, tv shows, and used by various companies. Some examples of the use of Unreal Engine outside of games are, The Mandalorian, Westworld, animated series Big City Greens, Matrix Resurrection. Unreal can also be used to render images in real time, at times only taking only minutes, compared to some programs that hours. Recently they have created life like humans called, MetaHumans. They are hyper realistic computer-generated characters that are used in video games and tv/film productions. When it comes to The Mandalorian and Westworld Epic was asked to create huge LED walls. The purpose of the walls was to cut down on the cost of building sets. They use multiple cameras to achieve effects that would formally need massive sets and visual effects. As previously mentioned, MetaHumans are one of the newest ventures that Epic is embarking on. MetaHumans were recently used in Netflix show, Love, Death, and Robots. They were able to use the MetaHumans to create the life like characters with already created skeletons, known as rigs. They were also able to fully animate the characters. To get the realistic movements they used called motion capture, also known as MoCap. This may sound familiar as MoCap was used in films like Lord of the Rings and various Marvel films. It involves someone wearing a suit that may be covered in dots or various wires, to accurately capture the movements and then placed on the digital character. Unreal engine is changing the entertainment and art industry and is now being seen as something beyond just a tool to make video games.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Patricia Marcano, Augusta University, 1120 15th St. Augusta, GA 30912, pmarcano@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

NADPH OXIDASE 1 INCREASES REACTIVE OXYGEN SPECIES IN PANCREATIC ADENOCARCINOMA

Lyndsay Martin, Henry Knox, Gabor Csanyi, and Maria Sabbatini

Citation

Martin, L., Knox, H., Csanyi, G., & Sabbatini, M. (2023). NADPH oxidase 1 increases reactive oxygen species in pancreatic adenocarcinoma. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 47-48. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.47>



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NADPH Oxidase 1 Increases Reactive Oxygen Species in Pancreatic Adenocarcinoma

Presenter(s): Lyndsay Martin

Author(s): Lyndsay Martin, Henry Knox, Gabor Csanyi, and Maria Sabbatini

Faculty Sponsor(s): Maria Sabbatini, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

Patients suffering from chronic pancreatitis (CP) have a higher risk of pancreatic ductal adenocarcinoma (PDAC) compared to the general population. For instance, the presence of an activated pancreatic stellate cell (PaSC)-rich stroma in CP has facilitated the progression of non-invasive pancreatic intraepithelial neoplasia (PanIN) lesions to invasive PDAC. A critical barrier to progress in preventing the CP-to-PDAC transition is the limited knowledge regarding the mechanism by which quiescent PaSCs become activated by inflammatory mediators. Among the inflammatory mediators of CP are reactive oxygen species (ROS), which activate PaSCs. ROS generation can occur as a primary product of NADPH oxidase (Nox) enzymes. Previously, we showed that Nox1 signaling in CP-activated PaSCs forms stroma and facilitates the invasion of pancreatic cancer cell lines in vitro and in vivo. Because the lack of Nox1 in PaSCs impairs CP-induced ROS generation, and a PaSC-rich stroma is abundant in PanIN lesions, we assessed the extent to which the lack of Nox1 reduces ROS generation in KPC (mouse model of PDAC) and no carrier for Pdx1-Cre mice (healthy mice) using two approaches: ROS generation in vivo: We intraperitoneally injected nitron electron paramagnetic resonance spin trap 5,5-dimethyl-1-pyrroline N-oxide (DMPO) or saline (control mice) to the Nox1-competent KPC, Nox1-null KPC and no carrier for Pdx1-Cre mice before euthanasia. We removed the pancreas and using a mouse monoclonal anti-DMPO antibody, we carried out western blotting. ROS generation in vitro: We isolated PaSCs from Nox1-competent KPC, Nox1-null KPC and no carrier for Pdx1-Cre mice and measured ROS generation using L-012 chemiluminescence. Although PaSCs express two isoforms of Nox (Nox1 and Nox4), we found that Nox1 is relevant in the generation of ROS in PDAC because the lack of Nox1 in KPC mice reduced nitron-biomolecular adducts in vivo and the lack of Nox1 in PaSCs reduced L-012 chemiluminescence signal in vitro.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Lyndsay Martin, Augusta University, 1120 15th St. Augusta, GA 30912, lynmartin@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

ARE ANNUAL OVERDOSE DEATHS FOR HIGH-RISK DRUGS IMPACTING GOOGLE SEARCH FREQUENCIES?

Kaamyia Mehra, Pierce Brody, Mehul Mehra, Rishab Chawla, and
Vanessa Spearman-McCarthy

Citation

Mehra, K., Brody, P., Mehra, M., Chawla, R., & Spearman-McCarthy, V. (2023). Are annual overdose deaths for high-risk drugs impacting google search frequencies? *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 49-50.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.49>



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Are Annual Overdose Deaths for High-Risk Drugs Impacting Google Search Frequencies?

Presenter(s): Kaamya Mehra

Author(s): Kaamya Mehra, Pierce Brody, Mehul Mehra, Rishab Chawla, and Vanessa Spearman- McCarthy

Faculty Sponsor(s): Vanessa Spearman-McCarthy, MD

Affiliation(s): Department of Biological Sciences, Department of Psychiatry & Health Behavior

ABSTRACT

The CDC reports over 75,000 attributable to overdoses in the 12-month period between March 2019 and March 2020. Previous studies have examined internet searches as predictors of opioid-related emergency department visits and hospital admissions, finding high correlations between internet searches and prescription utilization. However, no studies have linked Internet GT scores or score seasonality to deaths associated with overdoses of medications more generally. The CDC disaggregates ICD-10 accidental deaths due to medication overdose by demographic variables such as age, race, and gender from 1999 to 2019. We conducted a retrospective analysis correlating deaths associated to specific drugs with Google Trends (GT) scores of corresponding drug topics. Though the sizeable majority of deaths is attributable to legal and illegal opioid overdoses, a growing percentage is also due to nonopioid classes of medications, such as benzodiazepines. This novel study links United States trends in online interest toward a particular drug class or medications with the number of overdose deaths. The findings may help researchers and policymakers with outreach programs and surveillance-related public health initiatives targeted toward certain communities. From 2004-2019, a Pearson's correlation coefficient concluded a moderately strong positive correlation between USA "Overdose" scores and Total Overdose Deaths ($R^2=0.723$). The correlation coefficients between GT scores and deaths for drug categories Any Opioids and Benzodiazepine were 0.951 and 0.929, respectively. Further analysis of 2004-2019 GT scores and deaths revealed a strong positive correlation for Fentanyl ($R^2=0.989$) and a moderately strong positive correlation for Heroin ($R^2=0.741$). Overdose deaths and GT scores have a direct relationship showing that, for overdose overall and our drug classes' overdoses, the public is actively seeking out information more when the overdoses increase, regardless of drug legality. As awareness is appropriately changing, further investigation should target evaluating the quality and accessibility of online information to ensure optimal self- education for patients, patient's families, and the general public as the overdose situation continues. Overall, this study displays that public awareness of Overdose, Opioids, Heroin, Fentanyl, and Benzodiazepines in the United States is proportionally changing based on the annual incidence of corresponding overdose deaths.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Kaamya Mehra, Augusta University, 1120 15th St. Augusta, GA 30912, kmehra@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

GOOGLE TREND ASSOCIATION FOR DSM-V PREVALENT DISORDERS AND SUICIDE FREQUENCY

**Kaamyia Mehra, Pierce Brody, Mehul Mehra, Rishab Chawla, and
Vanessa Spearman-McCarthy**

Citation

Mehra, K., Brody, P., Mehra, M., Chawla, R., & Spearman-McCarthy, V. (2023). Google trend association for DSM-V prevalent disorders and suicide frequency. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 51-52. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.51>



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Google Trend Association for DSM-V Prevalent Disorders and Suicide Frequency

Presenter(s): Kaamya Mehra

Author(s): Kaamya Mehra, Pierce Brody, Mehul Mehra, Rishab Chawla, and Vanessa Spearman- McCarthy

Faculty Sponsor(s): Vanessa Spearman-McCarthy, MD

Affiliation(s): Department of Biological Sciences, Department of Psychiatry & Health Behavior

ABSTRACT

This investigation aims to determine USA seasonal search popularity of DSM-V prevalent disorders and correlation to USA rising suicide rates. Disease search popularity historically follows disease incidence, and the investigated disorders are associated with suicide. The COVID-19 Pandemic caused an increase in both mental health distress and awareness. However, the incidence of suicide remained stagnant. As 35% of patients with health conditions search Google for information, Google Trends (GT) reflects the public's self-education patterns. We hypothesize that pre-COVID-19 search popularity correlates with seasonal and annual changes in suicide rates, reflecting disorder incidence. Additionally, we hypothesize that COVID-19 era search popularity will increase with disorder incidence despite the stagnating suicide incidence. Analysis of 2004-21 GT search popularity scores with filter "Mental Health" and region "USA" of DSM-V disorders "Schizophrenia" (SCZ), "Major Depressive Disorder" (MDD), and "Bipolar Disorder" (BD) and American Health Rankings' 2011-20 USA suicide rates. Statistical tests ($\alpha=0.05$) assessed search seasonality, popularity, and associations. One- way ANOVA revealed that each term's 2004-21 (with COVID-19 era) mean change in month- specific popularity is not the same (SCZ $p=1.09E-17$; MDD $p=1.95E-13$; BD $p=9.73E-8$). Specific months (01-12) had significant variability for each search term (SCZ: All but 02,07; MDD: 02,05,06,09,10,12; BD: 04-06,09,10,12), confirming annual patterns via average z-scores, or seasonality. Each term's pre-COVID-19 (2004-19) analysis shows unequal mean change and MDD/BD month-specific variability (all previous+07). Two- tailed two-sample z-tests detected differences between 2004-19 & 2020-21 average month-specific z-scores (SCZ-04; MDD-05; BD-03). Pre-COVID era Pearsons' correlation coefficients were calculated for suicide rates (general & by sex) and popularity correlations (R^2 values <0.7). DSM-V disorders' search seasonality analysis show winter peaks and summer troughs, as disorder incidence drives online self-education seasonality. Countering our hypothesis, pre-COVID era average annual popularities did not increase with suicide rates (R^2 values <0.7). Additionally, annual popularities did not increase in the COVID-19 era despite increases in mental health distress. Future work should examine the unorthodox relationship between patient self-education and suicide rates that is inconsistent with that of disorder incidence and suicide rates. A possible explanation is recent disorder reclassifications and corresponding efforts contributing to inconsistency, but this requires further investigation.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Kaamya Mehra, Augusta University, 1120 15th St. Augusta, GA 30912, kmehra@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

SYNTHESIS OF SILDENAFIL ANALOGS FOR THE PREVENTION OF COLON CANCER

Colin Miller Jr., Shaobin Miao, and Darren Browning

Citation

Miller Jr., C., Miao, S., & Browning, D. (2023). Synthesis of sildenafil analogs for the prevention of colon cancer. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 53. <http://doi.org/10.21633/issn.2380.5064/s.2023.054.01.53>



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Synthesis of Sildenafil Analogs for the Prevention of Colon Cancer

Presenter(s): Colin Miller Jr.

Author(s): Colling Miller Jr., Shaobin Miao, and Darren Browning

Faculty Sponsor(s): Shaobin Miao, PhD

Affiliation(s): Department of Chemistry and Physics

ABSTRACT

Sildenafil is a drug commonly used for the treatment of erectile dysfunction. It has been known to have many beneficial effects, such as its aid in helping to prevent heart failure. Many of these effects occur due to Sildenafil working as a drug known as phosphodiesterase-5 (PDE5) inhibitor. PDE5 is an enzyme that facilitates the control of blood flow and cell signaling. By inhibiting the PDE5 enzyme, muscles and blood vessels tend to relax, increasing blood flow. Recently, it has been discovered that PDE5 inhibitors can prevent colorectal cancer in animals, and recent evidence suggests that these drugs will also be effective in humans. A problem with repurposing contemporary PDE5i such as Sildenafil for colon cancer prevention is the drug's side-effects and drug-drug interactions. In this project we aim to create novel PDE5i drugs that eliminate these unwanted effects by keeping the drugs in the colon, where they can work their magic, minimizing or completely avoiding leakage into the bloodstream. This project is exploring Sildenafil alongside other PDE5 inhibitors designed to remain in the GI tract. By modifying the structure of Sildenafil, we aim to create novel drug candidates, that are expected to remain/ localize in the colon, keeping its beneficial effects of increasing blood flow. As a result, the onset of colon cancer in humans can be prevented.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Colin Miller Jr., Augusta University, 1120 15th St. Augusta, GA 30912, colmiller@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THE ROLE OF KCTD17 IN STRIATAL G-PROTEIN COUPLED RECEPTOR SIGNALING

Saniya Momin and Brian Muntean

Citation

Momin, S., & Muntean, B. (2023). The role of KCTD17 in striatal G-protein coupled receptor signaling. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 54-55. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.54>



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The Role of KCTD17 in Striatal G-Protein Coupled Receptor Signaling

Presenter(s): Saniya Momin

Author(s): Saniya Momin and Brian Muntean

Faculty Sponsor(s): Brian Muntean, PhD

Affiliation(s): Department of Biological Sciences, Department of Pharmacology and Toxicology

ABSTRACT

Many neurological disorders cause a wide array of detrimental effects, such as movement disorders. Despite an extensive amount of research on the underlying structure and signaling of neurodevelopmental disorders, such diseases remain largely uncured. After decades of unclear etiology, we now know of numerous genetic markers essential for disease progression. Unfortunately, this revelation has not yet enhanced patient outcomes, suggesting precedence to investigate novel genetic players. Research is currently rising upon the potassium channel tetramerization domain (KCTD) family due to neurological diseases from patients with mutations in various KCTD genes. Yet, our understanding on the roles of KCTD proteins is in its infancy. However, several KCTDs (KCTD2, 5, 8, 12, and 16) have been shown to interact with components of the protein network that interrogate neuromodulatory signals through G Protein Coupled Receptors (GPCRs). Abundant evidence indicates an essential role in neuromodulatory GPCR signaling across a spectrum of movement disorders. Intriguingly clinical variations in KCTD17, which has a high level of homology to KCTD2/5, is causal of movement disorders. Therefore, we will examine KCTD17's role in the GPCR signaling pathway. In addition, previous reports have demonstrated a relationship between primary cilia and KCTD17. Intriguingly, components of the GPCR signaling pathway have been localized to primary cilia, however the role of primary cilia in neuromodulatory signaling has not yet been explored. We tested the significance of this pathway by observing the effects of cilia on KCTD17 to help us better understand the function of primary cilia to KCTD17 regarding neuromodulatory signaling. I will be working in Dr. Muntean's lab to observe more of the KCTD17 effect in GPCR signaling and see what processes can cause the deregulation. The focus is to analyze how the loss of KCTD17 can affect motor control. We will be using the CRISPR/Cas9 approach to see how KCTD17 can affect the neuronal activity via GPCR signaling and primary cilia disruption. We hope that observing the processes of the GPCR signaling pathway in KCTD17 will shed light to find further treatment in the neurodevelopmental disorders associated with the protein.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Saniya Momin, Augusta University, 1120 15th St. Augusta, GA 30912, Samomin@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

DESIGN AND SYNTHESIS OF POTENTIAL ANTIVIRAL DRUG CANDIDATE

Jade Moore and Siva Panda

Citation

Moore, J., & Panda, S. (2023). Design and synthesis of potential antiviral drug candidate. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 56.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.56>



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Design and Synthesis of Potential Antiviral Drug Candidate

Presenter(s): Jade Moore

Author(s): Jade Moore and Siva Panda

Faculty Sponsor(s): Siva Panda, PhD

Affiliation(s): Department of Chemistry and Physics

ABSTRACT

Design and Synthesis of Potential Antiviral Drug Candidates Jade Moore, Siva S. Panda Department of Chemistry and Physics, Augusta University As nonliving entities, viruses do not have organelles and rely solely on the host for survival and reproduction. Once in the body, viruses hijack the cells of the host and force them to reproduce more viral particles that will be used to spread the infection. As the infection spreads and symptoms arise and worsen, if not prevented, the virus will eventually kill the host. As a way to help strengthen the body's natural immune system, antiviral drugs and vaccines have been developed to combat viral infections. However, developing these treatments requires a lot of research, time, and money. The lack of organelles and heavy reliance on the host makes it challenging to develop antiviral drugs that only target and kill the virus and do not affect the host cells. In efforts to reduce time and cost, we have adopted the molecular hybridization approach using important medicinal scaffolds (indole, rhodanine, and phthalimide) to develop potential drug candidates for COVID-19. We have optimized the reaction condition and synthesized several hybrid molecules. All the synthesized molecules were characterized using spectral studies. The detailed biological outcomes will be discussed at the conference.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Jade Moore, Augusta University, 1120 15th St. Augusta, GA 30912, jadmoore@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

BMAL2 IN ENDOTHELIAL CIRCADIAN RHYTHM AND REMODELING

Jordan Moratin, Qimei Han, and Dan Rudic

Citation

Moratin, J., Han, Q., & Rudic, D. (2023). BMAL2 in endothelial circadian rhythm and remodeling. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 57. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.57>



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BMAL2 in Endothelial Circadian Rhythm and Remodeling

Presenter(s): Jordan Moratin

Author(s): Jordan Moratin, Qimei Han, and Dan Rudic

Faculty Sponsor(s): Dan Rudic, PhD

Affiliation(s): Department of Biological Sciences, Department of Pharmacology and Toxicology

ABSTRACT

Cardiovascular disease remains the number one cause of mortality in humans. An important influence in the progression of artery disease is the long-term effect of disruptions in daily patterns or circadian rhythms. For example, bad sleep and a blood pressure reading that does not fall at night worsen or even cause cardiovascular disease. The molecular mechanism that controls these activity-rest cycles is called the circadian clock and includes a key component transcription factor Bmal1. Previously, I have found that Bmal1 has an important vascular-specific role with controlling hypermuscularization and scarring in the blood vessel in a process called pathological remodeling or stiffening, using mouse models of genetic disruption. I also found that the endothelial cell layer of arteries contributed to the disease in Bmal1 knockout (KO) mice. While Bmal1 is found throughout the body, its functional and much less understood parlor, Bmal2, is more selectively expressed in the endothelium. To understand the role of Bmal2 in vascular disease, I have implemented a widely used experimental animal model of arterial ligation to induce vascular remodeling. I have ligated the left common carotid artery (LC) in two groups of mice, control wild-type mice (no genetic mutation) and the experimental Bmal2- KO (global knockout) mice. After two weeks, I isolated the LC and fixed the arteries in O.C.T. and conducted histological processing (cut cross sections with a cryotome and staining with hematoxylin and eosin). I then quantified the changes in structure in the artery using the imageJ program on digitized microscope images. My preliminary results suggest pathological thickening of the artery in Bmal2-KO mice compared to wild-type mice, thus indicating Bmal2 may have a role in vascular remodeling. Future studies will assess the endothelial specific knockout mouse of Bmal2.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Jordan Moratin, Augusta University, 1120 15th St. Augusta, GA 30912, jmoratin@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

ARDUINO-BASED TURBIDIMETER

Jazmine Neal and Joseph Hauge

Citation

Neal, J., & Hauge, J. (2023). Arduino-based turbidimeter. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 58.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.58>



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Arduino-Based Turbidimeter

Presenter(s): Jazmine Neal

Author(s): Jazmine Neal and Joseph Hauger

Faculty Sponsor(s): Joseph Hauger, PhD

Affiliation(s): Department of Chemistry and Physics

ABSTRACT

Turbidity, measured in nephelometric turbidity units (NTU), is commonly used to assess water quality. Turbidity is determined using a turbidimeter, which measures how much light is scattered by material suspended in a water sample. This project aimed to develop a low-cost open-source portable turbidimeter using next-generation light sensors. The tabletop Arduino-based turbidimeter was tested using various turbidity solutions made from 2% milk in distilled water for proof of concept. For each sample, a digital output response was measured for two sensors, one at 900 and one at 1800, and turbidity was measured using a commercially available turbidimeter. Combining data from the tabletop Arduino-based turbidimeter, an average calibration was found to convert the digital output to a Turbidity value in NTU. The Arduino-based measured Turbidity was within 0.5 standard deviations of a widely used commercial turbidimeter. The table-top Arduino-based Turbidimeter proved to be successful in converting the digital output to a standard turbidity value for a fraction of the cost. Final testing is being conducted on the portable Arduino-based turbidimeter which will be available for a live demonstration.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Jazmine Neal, Augusta University, 1120 15th St. Augusta, GA 30912, JANEAL@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

COVID-19 IN NURSING HOMES: A COMPREHENSIVE SURVEY OF HEALTHCARE MANAGEMENT PRACTICES

Anabelle O’Keefe and Barbara Manley-Smith

Citation

O’Keefe, A., & Manley-Smith, B. (2023). Covid-19 in nursing homes: A comprehensive survey of healthcare management practices. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 59-60. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.59>



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COVID-19 in Nursing Homes: A Comprehensive Survey of Healthcare Management Practices

Presenter(s): Anabella O’Keefe

Author(s): Anabella O’Keefe and Barbara Manley-Smith

Faculty Sponsor(s): Barbara Manley-Smith

Affiliation(s): Undergraduate Health Professions, Office of the Senior Vice President for Research

ABSTRACT

The Coronavirus Disease, identified in 2019 (COVID-19) became a Pandemic that challenged the healthcare industry to assume a new position of preparedness to respond quickly and purposefully amid mounting operational trials. Administrators were challenged to defend the safety of their patients and staff against a novel virus, equipped with little information about the virulence of SARS COV-2. Studying the virus’ establishment among vulnerable populations will shed light on how to protect these groups. Research has demonstrated that COVID-19 has disproportionately affected the senior population (Centers for Disease Control and Prevention, 2020, Severe Outcomes Among Patients with Coronavirus Disease 2019), with adults over 65 years of age constituting 80% of hospitalizations and exhibiting a mortality rate 23 times higher than their counterparts under 65 (Mueller et al., 2020). As a subset of this population, residents of long-term care facilities are a particularly at-risk bracket of individuals. Long-term care facilities can include intermediate care facilities, nursing homes, assisted living communities, inpatient hospice, and community integration homes. For this study, nursing homes will be the primary subject of discourse. On December 28, 2020, at a Georgia Governor's press conference, Dr. Kathleen Toomey, commissioner of the Georgia Department of Public Health, affirmed that residents in nursing homes comprised greater than 95% of all COVID-19 deaths in Georgia, despite accounting for only 5% of positive cases in the state (Trubey & Sturgus, 2020). Also, in December 2020 (the peak of pandemic-related U.S. deaths), the United States Government Accountability Office reported 33,600 nursing home resident cases and 28,600 staff cases (Dicken, J. E., & United States, 2021, p. 4). It is crucial to learn from initial local responses to the novel coronavirus to understand how nursing homes can be equipped to respond to future emergencies. This study is in progress, and three out of four participants have responded to the survey thus far. As such, the introduction, background, and general data on the case rates in the Central Savannah River Area will be included in the poster. Additionally, a preliminary analysis of survey data will be included in accordance with the timeframe of coordination efforts with the Augusta University Biostatistics Departmen

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Anabella O’Keefe, Augusta University, 1120 15th St. Augusta, GA 30912, anokeefe@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

DEVELOPMENT OF NON-SYSTEMIC PHOSPHODIESTERASE INHIBITORS FOR THE TREATMENT OF GASTROINTESTINAL DISEASES

Hailey Ramos, Vani Senthil, Herjot Cheema, Iryna Lebedyeva, and Darren
Browning

Citation

Ramos, H., Senthil, V., Cheema, H., Lebedyeva, I., & Browning, D. (2023). Development of non-systematic phosphodiesterase inhibitors for the treatment of gastrointestinal diseases. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 62. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.62>



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Development of Non-Systemic Phosphodiesterase Inhibitors for the Treatment of Gastrointestinal Diseases

Presenter(s): Hailey Ramos

Author(s): Hailey Ramos, Vani Senthil, Herjot Cheema, Iryna Lebedyeva, and Darren Browning

Faculty Sponsor(s): Darren Browning, PhD

Affiliation(s): Department of Biological Sciences, Department of Biochemistry and Molecular Biology

ABSTRACT

An abundance of preclinical and clinical evidence indicates therapeutic effects of increasing cGMP in the intestinal epithelium. Phosphodiesterase 5 inhibitors (PDE5i) increase cGMP by blocking breakdown, but contemporary PDE5i are limited for diseases such as colon cancer prevention due to side effects and drug-drug interactions. The goal of the present study was to create non-systemic analogs of sildenafil and vardenafil to reduce membrane permeability. Negative and positive charges were introduced to the parent compounds by adding carboxyl, phosphate, and amino groups (respectively). The pharmacological ability of the compounds to inhibit PDE5 was first tested using in vitro assays, and then the permeability was measured in colon cells in vitro and in mice. Negatively charged compounds retained activity but the positively charged amino- sildenafil was 100-fold less effective. The charged compounds were 100-fold less efficient in increasing cGMP in the colon cells. Oral administration of both negatively charged compounds increased cGMP in the intestines of mice, but the carboxyl containing analog was more effective in the colon. The carboxyl analog did not appear in the plasma following oral administration of mice but was detected in the feces. Taken together the results demonstrate that charged PDE5i are capable of increasing cGMP in the intestinal epithelial cells of mice without entry to circulation. Since PDE5i charged are expected to have less side effects and drug-interactions, they might be developed as novel treatments for gastrointestinal diseases.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Hailey Ramos, Augusta University, 1120 15th St. Augusta, GA 30912, HRAMOS@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

SIMULATING WOUND HEALING WITH VARIABLE INTERCELLULAR CONTACT ADHESION

Tom Rusch, Abdul Malmi-Kakkada, and Jonathan Dawson

Citation

Rusch, T., Malmi-Kakkada, A., & Dawson, J. (2023). Simulating wound healing with variable intercellular contact adhesion. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 63. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.63>



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Simulating Wound Healing with Variable Intercellular Contact Adhesion

Presenter(s): Tom Rusch

Author(s): Tom Rusch, Abdul Malmi-Kakkada, and Jonathan Dawson

Faculty Sponsor(s): Abdul Malmi-Kakkada, PhD and Jonathan Dawson, PhD

Affiliation(s): Department of Chemistry and Physics

ABSTRACT

The means and variables through which the cellular wound healing process is affected are fundamental tenets of human physiology whose study has far-reaching, interdisciplinary implications. The contact-dependent adhesive forces present at intercellular junctions are one such variable and understanding their role in supporting or hindering wound healing is of immense interest. To assess the impact of variable cell-cell contact adhesion, we utilized a professional-grade in silico modeling framework called Chaste (Cancer, Heart and Soft Tissue Environment) to run and analyze wound progression simulations. These simulations are underlined by vertex dynamics and a modified force model derived from Nagai, Honda et al. Vertex dynamic modeling involves representing cells as polygonal elements whose vertices may move with our force model defining how vertices favor mechanical equilibrium. To implement these simulations, we created tailored novel C++ test classes in the Chaste environment including simulation libraries to run them. We quantified time-dependent wound healing as a function of variable intercellular contact-dependent adhesion parameter, utilizing custom Python and MATLAB scripts to analyze the simulation output. We discover that enhanced cell-cell contact lengths correlates with accelerated wound area reduction due to increased cell shape changes and movements. Our work demonstrates the potential applications of augmenting the cell-cell adhesive parameters in order to facilitate quicker wound healing.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Tom Rusch, Augusta University, 1120 15th St. Augusta, GA 30912, trusch@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

CRYOPRESERVATION OF ZEBRAFISH GERM CELLS BY VITRIFYING GONADS

Mark Shearer, Binnur Eroglu, Rupa Lavarti, and Ali Eroglu

Citation

Shearer, M., Eroglu, B., Lavarti, R. & Eroglu, A. (2023). Cryopreservation of zebrafish germ cells by vitrifying gonads. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 64-65. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.64>



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Cryopreservation of Zebrafish Germ Cells by Vitrifying Gonads

Presenter(s): Mark Shearer

Author(s): Mark Shearer, Binnur Eroglu, Rupa Lavarti, and Ali Eroglu

Faculty Sponsor(s): Ali Eroglu, PhD

Affiliation(s): Department of Biological Sciences, Department of Medicine

ABSTRACT

Zebrafish are an indispensable model system for biomedical research including human diseases. As the number of mutant and transgenic zebrafish lines exponentially grows, so does the cost of labor and space to maintain these models. Successful cryopreservation of zebrafish germ cells that give rise to healthy offspring upon transplantation would significantly reduce such maintenance costs, avoid risks of infection and genetic drift associated with continuous breeding, and serve as a major steppingstone towards conservation of other fish species under threat of extinction. Hence, the aim of this study was to develop a viable cryopreservation method for zebrafish germ cells by vitrifying gonads. Vitrification is an ice-free cryopreservation method requiring the presence of high concentrations of cryoprotective agents (CPAs) that are toxic to cells and tissues. To minimize CPA toxicity, Dr. Eroglu's lab developed a novel propriety vitrification medium that was used in the present study along with a conventional vitrification medium. In order to fulfill the aim of this study, gonads of both male and female zebrafish models were explored, and viability of zebrafish germ cells were assessed after exposure to conventional and propriety vitrification media, as well as after vitrification with the propriety vitrification medium. The CPA exposure experiments basically simulate the vitrification process except the cooling and warming steps, and thus help to decouple the effect of CPA toxicity from thermal events. Our CPA exposure experiments showed that when compared to untreated controls, treatment of zebrafish gonads with a conventional vitrification medium caused a significant CPA toxicity to germ cells (86-95% vs. 58-66% germ cell viability). In contrast, the same exposure steps to the propriety vitrification medium did not induce any significant toxicity resulting in ~95% germ cell viability.

Importantly, a vast majority of germ cells (88-93%) remained viable after vitrification of zebrafish gonads using the propriety vitrification medium. Taken together, these findings suggest that cryopreservation of zebrafish germ cells is feasible using the propriety vitrification medium.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Mark Shearer, Augusta University, 1120 15th St. Augusta, GA 30912, mshearer@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

THERMAL EXPANSION COEFFICIENT OF BK7 OPTICAL GLASS

Samuel Sherman and Thomas Colbert

Citation

Sherman, S., & Colbert, T. (2023). Thermal expansion coefficient of BK7 optical glass. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 66.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.66>



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Thermal Expansion Coefficient of BK7 Optical Glass

Presenter(s): Samuel Sherman

Author(s): Samuel Sherman and Thomas Colbert

Faculty Sponsor(s): Thomas Colbert, PhD

Affiliation(s): Department of Chemistry and Physics

ABSTRACT

Thermal expansion of materials occurs when materials are heated. This expansion can change physical properties, cause stress, or damage components of many physical system. We measure the thermal expansion of a lens with approximately 1.00cm thickness, undergoing a change in temperature of approximately 40 Celsius. Under these conditions the lens is expected to increase in thickness by approximately 3.3 microns. The lens is placed in a home built heated oven. The heating element, small fan and temperature sensors are controlled and read by an Arduino microcontroller. The Arduino is also used to read the output of an optical sensor. The Arduino is programmed to ramp up the temperature of the lens over approximately 20 minutes, while reading temperature and light intensity. The thermal expansion of the lens is monitored using an interference pattern formed from Helium Neon Laser light reflecting off the front and back surfaces of the lens. Monitoring of interference fringes during the heating allows for observation of changes in thickness on the order of about 2.0 nm. The results of preliminary measurements. Preliminary results give values for the thermal expansion coefficient between $8.5 \times 10^{-6}/C^{\circ}$ and $9.1 \times 10^{-6}/C^{\circ}$. This is in good agreement with accepted values. Our apparatus and method may allow for detailed observation of the thermal expansion coefficient changing with temperature as these investigations continue.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Samuel Sherman, Augusta University, 1120 15th St. Augusta, GA 30912, sasherman@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

MINDFULNESS SERVING AS MEDIATION FACTOR FOR DEPRESSION AND SUICIDAL RISKS

Anita Singh, Ashland Amerson, Ryan Flinn, Lara Stepleman, and
Cristopher Drescher

Citation

Singh, A., Amerson, A., Flinn, R., Stepleman, L., & Drescher, C. (2023). Mindfulness serving as mediation factor for depression and suicidal risks. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 67-68. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.67>



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Mindfulness Serving as Mediation Factor for Depression and Suicidal Risks

Presenter(s): Anita Singh and Ashland Amerson

Author(s): Anita Singh, Ashland Amerson, Ryan Flinn, Lara Stepleman, and Cristopher Drescher

Faculty Sponsor(s): Lara Stepleman, PhD

Affiliation(s): Department of Psychological Sciences, Department of Psychiatry and Health Behavior

ABSTRACT

The LGBTQ+ community faces tremendous amounts of discrimination. Youth identifying as LGB had increased rates of generalized anxiety disorder, conduct disorder, and depression compared to their heterosexual peers. Transgender and gender diverse people face high rates of depression and suicidality explained by minority stress processes. The minority stress theory is a model which explains the adverse health effects that sexual minority individuals face, with experiences of marginalization, stigmatization, or prejudice increasing the likelihood of depression or suicide compared to their heterosexual and LGB cisgender counterparts. Little research has been completed for transgender and gender diverse persons regarding this particular issue. We conducted a study with a sample of 96 transgender and gender diverse individuals from the Southeastern United States to test the mediating relationship of mindfulness with depressive symptoms and suicide risk. Our study used assessments that measured an individual's depression level, mindful awareness, emotional dysregulation, along with any substance use or alcohol dependency. In our study, depression and suicidal endorsement are positively associated. Using test bivariate associations, two-block multiple regression, and a mediation analysis, we tested the hypothesized mediation of the significant relationship between depressive symptoms (the "independent variable") and suicide risk factor endorsement (the "dependent variable"), by mindful attention (the hypothesized mediator). With this, we generated a significant, indirect effect of depressive symptoms and suicidality through mindful attention. In our results, mindfulness contributed to roughly 14.5% of the link between depressive symptoms and suicide risk. This suggests that the practice of mindfulness can help transgender, gender diverse, and sexual minority individuals be more aware of their coping mechanisms, such as substance abuse or loneliness through self-isolation. In this study, mindfulness correlated with less depressive symptoms, which in turn can lead to a decreased risk of suicide or suicidal ideation for transgender and gender-diverse people. Mindfulness-based feminist therapies show a possible aid for transgender and gender diverse individuals, and future research should focus on mindfulness and other mindfulness-based feminist therapies as mediators to reduce suicidal ideation among sexual minority and transgender individuals.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Anita Singh, Augusta University, 1120 15th St. Augusta, GA 30912, ansingh@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

TERRACOTTA POTS AND MANURE COMPOST ENHANCE GROWTH AND SURVIVABILITY OF A RARE PLANT SPECIES, *PEDIOMELUM PIEDMONTANUM* (*FABACEAE*)

Gabsu Smallwood and Stacy Bennetts

Citation

Smallwood, G., & Bennetts, S. (2023). Terracotta pots and manure compost enhance growth and survivability of a rare plant species, *pediomelum piedmontanum* (*Fabaceae*). *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 69.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.69>



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Terracotta Pots and Manure Compost Enhance Growth and Survivability of a Rare Plant Species, *Pediomelum Piedmontanum* (*Fabaceae*)

Presenter(s): Gabsu Smallwood

Author(s): Gabsu Smallwood and Stacy Bennetts

Faculty Sponsor(s): Stacy Bennetts, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

Pediomelum piedmontanum, “Dixie Mt. Breadroot” is a rare legume species which has only three known populations, a serpentine population in Georgia, and two populations located on phyllite soil in South Carolina. In previous experiments, seedlings from both soil types displayed nutrient deficiency symptoms with high mortality when grown in plastic pots in potting soil. The current experiment was conducted to determine if porous terracotta clay pots and the addition of a manure compost will contribute to greater growth and survivability in a phyllite population. The controls consisted of seedlings grown in plastic pots with only potting soil. The experimental seedlings were grown in one of the following variables: terracotta pots with potting soil; plastic pots enriched with manure compost; terracotta pots enriched manure compost. Each control/variable group consisted of 15 seedlings /5 replicate 8 cm pots grown in a 1200 watt full-spectrum growth room. Survivability was highest in the terracotta pots with potting soil, and the overall biomass was greatest in terracotta pots enriched with compost. The results indicate that this rare and unique species requires a more porous, water-retaining environment with nutrient enrichments.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Gabsu Smallwood, Augusta University, 1120 15th St. Augusta, GA 30912, GASMALLWOOD@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

ARTIST TALK - PRISMATIC WIDOW

Ashlynn Sparrow and A. B. Osborne

Citation

Sparrow, A., & Osborne, A. B. (2023). Artist talk-prismatic window. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 70-71.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.70>



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Artist Talk – Prismatic Widow

Presenter(s): Ashlynn Sparrow

Author(s): Ashlynn Sparrow and A. B. Osborne

Faculty Sponsor(s): A. B. Osborne, MFA

Affiliation(s): Department of Art and Design

ABSTRACT

I try to see life in the lens of both my childhood self, and present self, pursuing art as a career is an intersection of both. My love of the human figure, accuracy, and life drawing, along with living as an invisibility disabled individual have led me to pursue medical illustration. Because hEDS is a fairly rare condition, finding clear educational materials has been difficult. The resources available to me took time to fully understand and digest as I am a very visual person. I plan to help other people understand hEDS and other conditions through illustration, especially including what these conditions may look like for people with various skin tones, body types and presentations. Many of my personal pieces tend to veer on the macabre, however I also have works which appear bright and happy - until the deeper story is unearthed. This large oil painting is entitled “Prismatic Widow”. It is one in a series of paintings which explore childhood ‘flashbulb’ memories. This is a vivid memory that you can see, hear, feel and remember details from. I depicted myself as I was, a 8 or 9 year old kid, playing outside in a lush green yard, wet from the contestant rain in Oregon. I had a game; I would pick up stones and play with the bugs and insects that lived there. My favorite being the black widows. Honestly, I’m lucky I was never bit and still have all my limbs intact, but as a kid I didn’t understand their danger. I just thought they were beautiful. Looking back, I can see the danger, but this painting was a memory of my 9-year-old self, so the black widow has become a prism of color, creating colorful ‘light’ which is reflected around the painting. To make this painting feel like a memory, I wanted to make sure the experience was in a ‘bubble’. I started working in the background, with little saturation and a lot of moodiness. The sky on the far right reflects the danger, while on the left it is idealistic and reminiscent of childlike drawings. As the painting gets closer the viewer, the saturation starts to jump up to unrealistic colors and more expressive, thick paint application. This is a reflection of how I saw the world as a child, I think I literally perceived colors brighter. But I also had on rose tinted glasses and didn’t understand the complicated life events that were happening at that time.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Ashlynn Sparrow, Augusta University, 1120 15th St. Augusta, GA 30912, ASparrow@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

Analysis of Seasonal Diversity of Ciliate Species from Local Waterways

Shelton Swint, Josiah Barnes, and Jessica Reichmuth

Citation

Swint, S., Barnes, J., & Reichmuth, J. (2023). Analysis of seasonal diversity of ciliate species from local waterways. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 72-73. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.72>



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Analysis of Seasonal Diversity of Ciliate Species from Local Waterways

Presenter(s): Shelton Swint and Josiah Barnes

Author(s): Shelton Swint, Josiah Barnes, and Jessica Reichmuth

Faculty Sponsor(s): Jessica Reichmuth, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

Unicellular eukaryotes, such as ciliates, vary in size and ecology and are present in aquatic environments. The present study is aimed to investigate the diversity of ciliate species from different water systems, man-made vs. natural, and how their diversity varies by time of year, in terms of species richness and relative abundance in the Augusta, GA area. Based on field conditions and the history of the waterways, we expect to find more abundance in the natural waterways than in man-made waterways. Sample sites were divided into natural or man-made, based on their history: Rae's Creek (natural), Butler Creek (natural and reference creek), and the Augusta Canal (man-made). To collect samples of ciliates from freshwater ecosystems in the Augusta area, a D-ring net was used at least one meter away from the shore at a depth of 0.3 meters where three full swipes of the net were made. Each sample was taken from the same spot at each respective sampling site. Samples were taken once every other month from June 2022 – January 2023, within the first 10 days of the month. Water samples were brought back to the lab where organisms were identified to genus, when possible, using microscopy and field guides. Relative abundance, species richness, and Shannon-Weaver diversity indices were computed. On average, a higher abundance was recorded in Butler Creek. The factors of diversity such as the water temperature and amount of sunlight can be seen in the Shannon-Weaver indices of the ciliate species. The Shannon-Weaver index shows a higher value in October 2022, while there was a higher relative abundance in June 2022. Samples from Butler Creek showed, on average, the highest diversity on the Shannon-Weaver Index, while the Augusta Canal showed the lowest diversity. Of note, Rae's Creek had the highest recorded diversity in August 2022. We have plans to treat the ciliate samples with heat to simulate climate change through increasing temperatures to be used as bioindicators. Ciliate species have been used in numerous studies as ecological indicators, as well as being an important component of energy flow in aquatic systems.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Shelton Swint, Augusta University, 1120 15th St. Augusta, GA 30912, sheswint@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

A SEX-DIVERGENT RESPONSE TO ALDOSTERONE ANTAGONISM IN THE KIDNEY OF SPONTANEOUSLY HYPERTENSIVE RATE

Bianca Tubalinal, Sati Alexander, Irina Baranovskaya, Alena Cherezova, Vadym Buncha, Mikhail Fomin, and Mykola Mamenko

Citation

Tubalinal, B., Alexander, S., Baranovskaya, I., Cherezova, A., Buncha, V., Fomin, M., & Mamenko, M. (2023). A sex-divergent response to aldosterone antagonism in the kidney of spontaneously hypertensive rat. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 74. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.74>



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A Sex-Divergent Response to Aldosterone Antagonism in the Kidney of Spontaneously Hypertensive Rat

Presenter(s): Bianca Tubalinal

Author(s): Bianca Tubalinal, Sati Alexander, Irina Baranovskaya, Alena Cherezova, Vadym Buncha, Mikhail Fomin, and Mykola Mamenko

Faculty Sponsor(s): Mykola Mamenko, PhD

Affiliation(s): Department of Biological Sciences, Department of Physiology

ABSTRACT

Hypertension remains a major public health problem, affecting nearly half of the adults in the USA. In most cases there is no readily identifiable cause and hypertension is referred to as essential. Spontaneously hypertensive rat (SHR) is a model of essential hypertension. Blood pressure (BP) elevation in SHR is reportedly dependent on mineralocorticoid, aldosterone, and positively correlates with the expression and activity of the amiloride-sensitive epithelial Na⁺ channel (ENaC) in the kidney. Here, we tested if inhibition of mineralocorticoid receptors (MR) affects BP, circulating aldosterone and renal electrolyte handling and ENaC activity in 10-15-week-old male and female SHR. Spironolactone administration resulted in a twofold sustained increase in circulating aldosterone in SHR females, but not in males. Plasma renin activity was low in SHR rats of both sexes regardless of the treatment status. Spironolactone did not substantially affect renal MR expression in male and female SHR. However, SHR females had a ~50% higher expression of HSD11b2, maintaining higher availability of MR to aldosterone or its antagonists. Renal ENaC activity was insensitive to spironolactone and remained low in SHR of both sexes. At the systemic level, spironolactone did not affect amiloride-sensitive Na⁺ or K⁺ excretion and BP in SHR. Higher levels of HSD11b2 in SHR females increase MR bioavailability. MR inhibition in SHR females, likely, leads to a transient elevation in plasma K⁺ that is later compensated by increased aldosterone. MR blockade is not an effective antihypertensive strategy in 10-15 weeks old SHR, due to low activity of systemic renin-angiotensin system and renal ENaC.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Bianca Tubalinal, Augusta University, 1120 15th St. Augusta, GA 30912, BTUBALINAL@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

REVERSING ALZHEIMER'S DISEASE PATHOLOGY IN ZEBRAFISH BY APPLYING PHOTOBIO-MODULATION TREATMENT

Daniela Velez, Binnur Eroglu, and Ali Eroglu

Citation

Velez, D., Eroglu, B., & Eroglu, A. (2023). Reversing Alzheimer's disease pathology in zebrafish by applying photobiomodulation treatment. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 75-76. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.75>



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Reversing Alzheimer's Disease Pathology in Zebrafish by Applying Photobiomodulation Treatment

Presenter(s): Daniela Velez

Author(s): Daniela Velez, Binnur Eroglu, and Ali Eroglu

Faculty Sponsor(s): Ali Eroglu, PhD

Affiliations: Department of Biological Sciences, Department of Neuroscience and Regenerative Medicine

ABSTRACT

Zebrafish (*Danio rerio*) are one of the widely used research models due to their characteristics such as being transparent during development, sharing 70% of genes with humans, and having conserved features of vertebrate aging including deterioration of cognitive function. Neurodegenerative diseases including Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's Disease (HD) are associated with aging, cognitive deficits, and deterioration of the memory. AD affects millions of people worldwide and is characterized by amyloid plaques and tau tangles resulting in the loss of neuronal connections and brain atrophy. There are currently no cures available for neurodegenerative diseases which is why the following research was conducted with two main aims. The first aim was to generate a pharmacological zebrafish model of AD. This was done by adding small amounts (100 nM) of okadaic acid (OKA) directly to fish tanks for 9 days. The second aim was to reverse the AD pathology and impaired cognitive function by applying a sequential photobiomodulation (PBM) therapy that employs red or near-infrared light to activate beneficial signaling pathways. We hypothesized that the PBM therapy will result in partial reversal of the AD pathology and impaired cognitive function by improving mitochondrial function, reducing inflammation, and supporting cell survival. To test our hypothesis, male and female zebrafish were randomly distributed into control and treatment groups. Following the treatment period, Congo red staining of the brains revealed that only OKA-treated zebrafish had deposits of β -amyloid plaques. OKA treated zebrafish also displayed significantly increased phospho-GSK3 β immunostaining, further suggesting amyloid plaque formation and tau accumulation. Once sequential PBM therapy took place, the number of β -amyloid plaques and p-GSK3 β positive cells were significantly reduced, indicating the beneficial effect of the PBM therapy. In addition, we conducted behavioral studies after the OKA and PBM treatments using a T-maze and by comparing the time spent on the reward arm. These studies showed that OKA treated zebrafish spend significantly less time in the reward arm compared to controls (15.2% vs. 50%). Upon undergoing two different sequential PBM therapies at 3J/cm² and 4.5J/cm², OKA-treated zebrafish showed improved cognitive function by being able to recall the reward arm and spending more time there (55% and 57%, respectively) similar to controls. Taken together, these findings suggest that (1) OKA is useful for generation of a pharmaceutical model of AD in zebrafish and (2) PBM therapy reverses AD-like pathology in an OKA-induced AD model.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Daniela Velez, Augusta University, 1120 15th St. Augusta, GA 30912, DAVELEZ@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

TRANSCENDENTAL RELATIONSHIPS: ART, SCIENCE, AND RELIGION

Andrew Vincent and Jennifer Onofrio

Citation

Vincent, A., & Onofrio, J. (2023). Transcendental relationships: Art, science, and religion. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 77-78.

<http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.77>



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Transcendental Relationships: Art, Science, and Religion

Presenter(s): Andrew Vincent

Author(s): Andrew Vincent and Jennifer Onofrio

Faculty Sponsor(s): Jennifer Onofrio, MFA

Affiliation(s): Department of Art and Design

ABSTRACT

Art, science, and religion have something in common: transcendental relationships. I created an art piece in a project to be of themed and narrated wearable sculpture fashioned from remnant materials (a project called “fashion trashin”). The inspiration for this piece stems from three disparate perspectives: In art, the conveyance of beauty in contemplation or meditation can be an experience that transcends simple words. In science, mathematical constants occur that are termed transcendental, not able to be simply represented in exact numbers. In religion, the existence of spirit and its power transcends physical understanding lending special experience to the limited human constructs of science and art. The art piece is a full-length handmade coat with large colorful geometric shapes and sculptural paper, which offers a multifaceted (front, back, interior, and exterior) canvas upon which these concepts can be presented. Designs on the front, back, and surrounding areas of the coat stem from the mathematical values of π , ϕ , e , and ∞ . The circles on the coat have a characteristic ratio of circumference to diameter of π (pi, 3.34159...). An isosceles triangle intersects the circles which has a hypotenuse to base of the value of the golden ratio ϕ (phi, 1.618...). Euler’s Number e (2.7182...) is represented by a “tetragram” formed around a pair of conjugate rectangular hyperbolas with tangents allowed to intersect the asymptotes, and with transverse axes of one-unit length. The resultant star shape has an area of “ e ”. The non-number infinity (∞) is a concept of something that is unlimited, endless, without bound. Materials are adhered to the coat area surrounding the geometric figures made of many strands of shredded paper, alluding to the notion of infinity in a seeming endlessness of printed numbers. These are figures that constitute singular values that themselves cannot be presented entirely due to their transcendental, irrational, or exceptional qualities. When the coat is opened, what is exposed is a frontal panel of dense mathematical values and formulae expressive of the beauty of science that is associated with the chosen parameters both numerically and in scientific notation. The narrative of the artwork is threefold: The aesthetics of the painted and sculpted coat, the beauty of the transcendental numbers inherent in the designs, and the net art experience when given contemplation on the intangibles of art and science. The geometric shapes and the shredded paper read iconographically in their transcendent formulations, and math when written in full is itself approaching calligraphy. Math takes the form of art. The specific numerical values are themselves transcendental (π and e), or irrational (ϕ), or the single symbol for the unbounded infinite (∞). Appreciation of the beauty from the creative process in and of artwork can be an experience in liminality, entering into the threshold between concrete and a transforming emotional or spiritual state and is alluded to in use of transcendental relationships. In such a meditation even, the peace of God that transcends understanding is at hand.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Andrew Vincent, Augusta University, 1120 15th St. Augusta, GA 30912, anvincent@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

WATER LEVEL EFFECTS ON WETLAND BIODIVERSITY – NORTH AMERICAN RIVER OTTER

Cheyenne Voorhies, Cheyenne Kent, and Robert Cromer

Citation

Voorhies, C., Kent, C. & Cromer, R. (2023). Water level effects on wetland biodiversity – North American river otter. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 79. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.79>



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Water Level Effects on Wetland Biodiversity – North American River Otter

Presenter(s): Cheyenne Voorhies and Cheyenne Kent

Author(s): Cheyenne Voorhies, Cheyenne Kent, and Robert Cromer

Faculty Sponsor(s): Robert Cromer, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

The intended purpose of this research was to establish whether there is a relationship between water levels in a palustrine wetland, Reed Creek Nature Park and Reserve, and migratory patterns of local *Lontra canadensis* (North American River Otter) populations. This was an area of interest because two drains were built into the wetland and its corresponding bioretention pond in 2018. These were installed to limit water level and beaver activity within the surrounding area in an effort to decrease pipe erosion. This has caused the wetlands water levels to shift in the prior years and the amount of eyewitness meso-mammal presence. From May 2022 - January 2023, water level measurements were taken weekly at two locations within the wetland to detect fluctuations. The local Savannah River Site population of North American River Otters was initially observed through the wetland by surveying for tracks and scat. Later, cameras were implemented to further record movements within the wetland. Due to unforeseen critical weather conditions in the area from May 2022 - November 2022; a lack of observational data was obtained to support any relationship conclusions between the wetland water levels and river otter migratory patterns. Despite the lack of otter presence in the wetland, consumer biodiversity was observed and documented to study relationships between biodiversity and water levels. A series of ANOVA and t-tests were performed to reveal whether there was a significant change in biodiversity as water levels increased in the palustrine wetland.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Cheyenne Voorhies, Augusta University, 1120 15th St. Augusta, GA 30912, CVOORHIES@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

INFLUENCE OF THE CIRCADIAN CLOCK ON MOTOR LEARNING PATHWAYS

Josephine Widjaja, Douglas Sloan, Joseph Hauger, and Brian Muntean

Citation

Widjaja, J., Sloan, D., Hauger, J., & Muntean, B. (2023). Influence of the circadian clock on motor learning pathways. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 80-81. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.80>



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Influence of the Circadian Clock on Motor Learning Pathways

Presenter(s): Josephine Widjaja

Author(s): Josephine Widjaja, Douglas Sloan, Joseph Hauger, and Brian Muntean

Faculty Sponsor(s): Brian Muntean, PhD

Affiliation(s): Department of Biological Sciences, Department of Pharmacology and Toxicology

ABSTRACT

The circadian clock is an important regulator of biological processes in living organisms. The canonical mechanism for this cycle is driven through negative feedback loops formed by key transcription factors and their effectors. Recent studies have demonstrated the vast influence of these circadian feedback loops on immunology, metabolism, and even behavioral processes. Thus, the efficacy of therapies that target such proteins under the influence of the circadian clock are especially profound and largely unexplored. Here, we investigated the circadian clock's influence on the ability to learn a motor skill through the utilization of transgenic mice that lack BMAL1 (BMAL1-KO), an essential regulatory component of the circadian clock's transcriptional timing mechanism. In our study, we first designed and built a custom behavior apparatus, commercially known as a rotarod, to quantify motor learning in mice. We then leveraged this technology to uncover that BMAL1-KO exhibited compromised motor ability as well as impaired learning rates at specific time points compared to its wild-type littermate controls. As our studies exemplified impaired motor learning in BMAL1-KO and because dopamine is a critical player in motor behavior, we analyzed levels of key proteins involved in dopamine signal transduction including Gai, Gb, phosphodiesterase 10A (PDE10A), and adenylyl cyclase 5 (AC5). Through Western blot analysis of samples collected over a 24-hour period, we found alterations in the enzymes that maintain homeostasis of the intracellular second messenger cyclic AMP (cAMP) in BMAL1-KO brain samples. Thus, by directly probing cAMP levels in brain lysates, we report downregulation of the cAMP pathway in BMAL1-KO compared with the littermate controls. We expect these observations to be a key starting point in determining molecular mechanisms that link the circadian clock to motor learning pathways as they feature the unique differences in motor ability and relevant proteins in BMAL1-KO groups and their littermate controls. Moreover, our observations in regard to the timely fluctuations of prominent proteins over a 24 hour period may act as a stepping stone to further discoveries on the impact of the circadian clock. Finally, our findings may provide insight toward the potency and efficacy of neuropharmacological agents that play crucial functions in treating motor-related disorders such as in cases for Parkinson's and Alzheimer's disease.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Josephine Widjaja, Augusta University, 1120 15th St. Augusta, GA 30912, jwidjaja@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

EXAMINING THE FUNCTION OF ELAVL GENES DURING NEURONAL REPROGRAMMING

Christine Williams, Natalie Mseis, Na Jiang, Mei Jiang, Xuanyu
Chen, and Hedong Li

Citation

Williams, C., Mseis, N., Jiang, N., Jiang, M., Chen, X., & Li, H. (2023). Examining the function of elavl genes during neuronal reprogramming. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 82-83. <http://doi.org/10.21633/issn.2380.5064/s.2021.05.01.82>



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Examining the Function of ELAVL Genes During Neuronal Reprogramming

Presenter(s): Christine Williams

Author(s): Christine Williams, Natalie Mseis, Na Jiang, Mei Jiang, Xuanyu Chen, and Hedong Li

Faculty Sponsor(s): Hedong Li, PhD

Affiliation(s): Department of Chemistry and Physics, Department of Neuroscience and Regenerative Medicine

ABSTRACT

Spinal cord injuries often impair a person's daily life by limiting mobility. While potential treatments such as stem cell transplantation are being investigated in animal models, these treatments have not translated in clinical trials and entail risks including triggering an immune response and tumorigenesis. Neuronal reprogramming has emerged as an alternative method of aiding spinal cord injuries to restore the mobility lost by patients. When an injury to the spinal cord occurs, reactive astrocytes surround the site of injury where neurons are dead. Neuronal reprogramming involves the reprogramming of those surrounding glial cells into functional neurons. When neuronal reprogramming is done in vivo, this potentially eradicates the chances of triggering an immune reaction which results in a less risky treatment. While neuronal reprogramming has great potential in treating neurological diseases, the underlying molecular mechanisms of this unique biological process are still not fully elucidated. Previous research has shown that when overexpressed, the transcription factor, NeuroD1 can convert reactive astrocytes into functional neurons at a high conversion efficiency. NeuroD1 is a critical neurogenic transcription factor that is expressed during the development of the central nervous system. The overexpression of NeuroD1 leads to upregulation of other genes including the two genes, ELAVL2 and ELAVL4. These two genes are known for their active role in neuronal development especially when it comes to neuronal differentiation. Here, we aim to determine if the two genes are capable of reprogramming on their own. Upon cloning these two genes into overexpression vectors, the vectors were virally infected into glial cells. Using techniques like western blot and immunocytochemistry, the cells overexpressing these genes were then analyzed. The function of ELAVL2 and ELAVL4 in the reprogramming of glial cells (U251 glioblastoma cell line) was examined. Our studies have led us to conclude that the overexpression of the ELAVL genes does not induce the reprogramming of U251 glioblastoma cells to neurons on their own. During NeuroD1-mediated neuronal reprogramming, six days post-infection is enough time to start seeing DCX expression, indicative of the presence of young neurons. Both cells infected with the vectors containing the ELAVL2 or ELAVL4 plasmid did not have expression of DCX. As a result, it was concluded that there were no young neurons present and neuronal reprogramming did not occur by overexpressing the ELAVL genes themselves.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Christine Williams, Augusta University, 1120 15th St. Augusta, GA 30912, chwilliams4@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

EFFECTS OF CLIMATE CHANGE ON FIDDLER CRAB LIMB REGENERATION RATES

Issac Williams and Jessica Reichmuth

Citation

Williams, I., & Reichmuth, J. (2023). Effects of climate change on fiddler crab limb regeneration rates. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 84. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.84>



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Effects of Climate Change on Fiddler Crab Limb Regeneration Rates

Presenter(s): Issac Williams

Author(s): Issac Williams and Jessica Reichmuth

Faculty Sponsor(s): Jessica Reichmuth, PhD

Affiliation(s): Department of Biological Sciences

ABSTRACT

This study will focus on how climate change effects, increased water temperatures and ocean acidification, affect fiddler crab limb regeneration rates primarily in the mud fiddler (*Uca Pugnax*) and the sand fiddler (*Uca pugliator*). Both are found in the salt marshes on the eastern coast of the United States and serve vital roles for their environments. These roles include but are not limited to, aerating the surrounding sediment by burrowing and serving as food for other wildlife including other crabs. Crabs will be collected from Hunting Island, South Carolina and brought to the lab where they were separated based on sex and species. Crabs were placed in mesocosms for investigation under various conditions. Tested conditions were salt water (25 ppt) the control group (pH ~8, ~24°C), increased water temperature (~26°C), 7.2 and 7.1 pH water. Male crabs had big claws removed or right claws removed for females and will be observed for 7 weeks for budding, molts, deaths, and claw regrowth. The control groups exhibited more claw regrowth while the most acidic conditions caused a higher amount of mortality. More bud growth was found under slight acidic conditions, pH 7.2. Males were less affected by warming temperatures and acidic condition compared to females. Since highly acidic conditions affect mortality and fiddler crab abundance could be reduced, salt marsh plant growth would be negatively affected which could have negative implications for salt marsh communities.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Issac Williams, Augusta University, 1120 15th St. Augusta, GA 30912, ISWILLIAMS@augusta.edu

THE ARSENAL

Augusta University's Undergraduate Research Journal

ISSN 2380-5064 | The Arsenal is published by the Augusta University Libraries | <http://guides.augusta.edu/arsenal>

**Volume 5, Issue 1 (2023) Special
Edition Issue**

3D ANIMATION

Jordan Womack and A. B. Osborne

Citation

Womack, J., & Osborne, A. B. (2023). 3D animation. *The Arsenal: The Undergraduate Research Journal of Augusta University*, 5(1), 85. <http://doi.org/10.21633/issn.2380.5064/s.2023.05.01.85>



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3D Animation

Presenter(s): Jordan Womack

Author(s): Jordan Womack and A. B. Osborne

Faculty Sponsor(s): A. B. Osborne, MFA

Affiliation(s): Department of Art and Design

ABSTRACT

It took me a long time to complete this piece of animation, but it was an interesting process that I was involved in daily from the beginning. Getting the idea of what goes into making a character move for a few seconds in Maya, the animation application I use, can be a fantastic but stressful experience. It took some time for me to figure out how to incorporate the various pans and keyframes of each character I wanted to employ in the animatic process while using a character's rigging to push out a movement or expression.

Received: 02/15/2023 Accepted: 03/29/2023

Correspondence: Jordan Womack, Augusta University, 1120 15th St. Augusta, GA 30912, jwomack@augusta.edu