25th Annual Gemstone Honors Program Thesis Conference

Friday, April 12, 2024
University of Maryland, College Park

GEMSTONE
HONORS COLLEGE
UNIVERSITY OF MARYLAND

Thesis Conference Schedule

Time	Team	Link
9:00 a.m	Aloesporin	https://go.umd.edu/AloeSporin
	UNITED	https://go.umd.edu/UNITED
10:15 a.m.	ChargeX	https://go.umd.edu/ChargeX
	MARINE	https://go.umd.edu/MARINE
	VERDANT	https://go.umd.edu/VERDANT
1:30 p.m.	FUSE	https://go.umd.edu/FUSE
	HiveMIND	https://go.umd.edu/HiveMIND
	SOLAR	https://go.umd.edu/teamSOLAR
2:45 p.m.	DOC	https://go.umd.edu/DOC
	SAND	https://go.umd.edu/SAND
	TRANSPORT	https://go.umd.edu/TRANSPORT
4:00 p.m.	PILLS	https://go.umd.edu/PILLS

Aloesporin: Addressing Antimicrobiral Resistance: *Aloe vera*'s Potential for Bacterial inhibition and Dermal Fibroblast Regeneration

Research Team

Nadia Arango, Public Health Science
Alexandra DeBus, Biochemistry
Natalie Lim, Cell Biology and Genetics
Iman Mansoor, Physiology and Neurobiology, Nonprofit Leadership and Social Innovation minor
Joshua Mohammed, Information Systems
Mateo Noguera, Operations Management and Business Analytics
Nimisha Rangachar, Physiology and Neurobiology, Public Health Science
Ruth Tesfamariam, General Biology, Public Health Science
Aditi Thangavelu, Bioengineering

Faculty Mentor

Dr. Kan Cao, Professor and Associate Chair, *Department of Cell Biology and Molecular Genetics*

Librarian

Ms. Judy Markowitz, Gender and Sexuality Studies Librarian III, *University Libraries, UMD*

Discussants

Ms. Jasmin El Kordi, Chief Executive Officer, *MBlue Labs*
Dr. David Straney, Associate Professor and Associate Chair for Undergraduate Programs, *Cell Biology and Molecular Genetics, UMD*
Dr. Joseph Rom, Field Application Scientist, *Bio-Rad Laboratories*
Ms. Heather Teitelbaum, Physician Assistant, *Clinical Director (University Health Center), UMD*

Research Description

Antimicrobial resistance has been an emerging global issue over the last several decades. Acquired resistance renders antimicrobial agents useless, with a recent report projecting ten million deaths by 2050 caused by drug-resistant infections. In response, research output on biomedical and public health solutions to AMR has significantly increased, including investigations on active compounds in medicinal plants. *Aloe vera* is known for anti-inflammatory, antibacterial, and cell proliferative properties stemming from its anthraquinones, flavonoids, and polysaccharides. In this review, Team Aloesporin applied qualitative and quantitative techniques to characterize the state of AMR awareness and discuss *Aloe vera*'s capacity for serving as an antimicrobial, wound-healing agent. First, a public opinion survey was distributed at the University of Maryland, College Park to assess community knowledge of antimicrobial resistance and related practices. *Aloe vera*'s potency was then investigated through a minimum inhibitory concentration assay with Staphylococcus aureus and *Staphylococcus epidermidis*. Lastly, a cell proliferation assay was designed for dermal fibroblasts with 2.5% *Aloe vera*, 100 nM methylene blue, and 100 nM bacitracin-supplemented media. Though the public opinions survey provided insight into the gaps in knowledge surrounding antimicrobial resistance and consumer practices, the preliminary bacterial and dermal fibroblast assays yielded inconclusive results regarding *Aloe vera*'s respective antibacterial and proliferative effects. This research suggests a need for further investigation of the optimal state and concentration of *Aloe vera* for wound-healing and effective

antimicrobial stewardship to address the escalating issue of antimicrobial resistance.

Acknowledgements

We would like to thank our mentor Dr. Kan Cao for her support and encouragement throughout our time in the Gemstone Honors program. We would also like to thank Dr. Amy Sapkota and her lab members, Ms. Leena Malayil and Ms. Suhana Chattopadhyay, for their support and lab space regarding our bacterial experiments and Ms. Elizabeth Izydore for her assistance with our dermal cell experiments. We would like to thank our panel discussants Ms. Jasmin El Kordi, Dr. Norma Andrews, Dr. David Straney for their time, and a special thanks to our discussant Dr. Joseph Rom for his guidance. Finally, we would like to thank our librarian Ms. Judy Markowitz and the Gemstone staff.

ChargeX: Exploring Vehicle-to-Vehicle Charging Technology for Sustainable Transportation

Research Team

Samarth Modh, Mechanical Engineering
Garett Hatz, Mechanical Engineering
Levi Scarpelli, Biochemistry

Faculty Mentor

Dr. Brian Beaudoin, Associate Research Professor, *Institute for Research in Electronics & Applied Physics, UMD*

Librarian

Ms. Zaida Diaz, Business & Economics Librarian, *University Libraries, UMD*

Discussants

Mr. Manish Mody, Technical Specialist, *Intel*
Mr. Aditya Dave, Founder/CEO, *Cibos Techno Solutions Pvt Ltd*
Mr. Michael Galczynski, Keystone Instructor, *A. James Clark School of Engineering, UMD*

Research Description

As widespread electric vehicle (EV) adoption faces hurdles due to limited charging accessibility, this research explores the potential of Vehicle-to-Vehicle (V2V) charging technology, particularly for residents in multi-unit dwellings. To assess the feasibility of this concept, we constructed a functional V2V charger prototype through multiple iterations. Our initial attempt involved an Arduino project utilizing Pulse Width Modulation (PWM) and a charging circuit, but this design encountered limitations. Through perseverance and exploration of various Arduino projects focused on PWM and charging circuits, we ultimately achieved a successful V2V charger prototype, enabling data collection to inform future advancements in this promising technology.

Acknowledgements

Team CHARGEX members would like to give special thanks to Dr. Brian Beaudoin for guiding us throughout the project as our mentor; Mr. Bryan Quinn, for helping us defend our proposal as our expert; Ms. Zaida Diaz, for providing us with valuable resources as our librarian; Dr. Kristan Skendall, Dr. David Lovell, Vicky Carter, Aashka Patel, and the remainder of the Gemstone staff who made this project possible. Special thanks also go out to Klaus Wood and Peter Gomes, who, in the early stages, helped put this proposal together.

DOC: Enhancement of Detection and Diagnosis of Non-Small Cell Lung Cancer through the Improvement of Machine Learning and AI Models

Research Team

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George Cancro, Computer Science
Darren Chang, Computer Science
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Vanshika Mehta, Computer Science
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Faculty Mentor

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Discussants

Dr. Chahat Deep Singh, Postdoctoral researcher, *Computer Science, UMD*
Dr. Kenneth Frauwirth, Professor, *Cell Biology & Molecular Genetics, UMD*
Dr. Christopher Metzler, Assistant Professor, *Computer Science, UMD*
Mr. Sean Rao, Doctoral student, *Government and Politics, UMD*

Research Description

Due to low survival rates and an unparalleled burden of non-small cell lung cancer on underserved communities, there is great urgency for innovative and accessible methods that will improve healthcare access for lung cancer patients. To combat this inequity, Team DOC aims to develop an AI model that is able to not only improve lung cancer diagnoses but also predict the progression of non-small cell lung cancer. We intend to evaluate the performance of a convolutional neural network on the LIDC-IDRI dataset and retrain the final layers of the model to improve its performance on the same dataset. Repeating this process on different model architectures allows us to determine which model performs optimally, providing a foundation to develop an end-to-end explainable AI workflow that can extract clinically relevant predictions of cancer progression for further analysis. Throughout our training process, we resolve to address the accuracy and potential for bias. Additionally, we are carrying out a survey among underserved populations and communities to discern the need for our improved cancer detection and prediction model. We hope that our model will be able to be implemented in communities with lack of access to healthcare systems to bridge the gap between underprivileged communities and unbiased care.

Acknowledgements

We extend our sincere appreciation to Dr. Soheil Feizi, our esteemed mentor, for his unwavering support and invaluable guidance throughout the entire research process. Additionally, we express our gratitude to Milan Budhathoki, our diligent team librarian, for his indispensable assistance in the thesis writing process. Our heartfelt thanks also go to the members of the Thesis Defense Panel for generously dedicating their time to delve into our research, providing constructive feedback, and guiding us toward future directions. We would also like to acknowledge the Gemstone Program staff for their consistent support over the past four years, contributing significantly to the success of our academic endeavors. Lastly, we would like to express our deepest gratitude to our family and friends who have stood by us, offering encouragement and support throughout our research journey at the University of Maryland. Your encouragement has been instrumental in our success, and we are truly thankful for your unwavering support.

FUSE: Fusion-Powered Upgrades to Space Exploration

Research Team

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Faculty Mentor

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Discussants

Dr. Brent Barbee, Flight Dynamics Engineer, *NASA Goddard Space Flight Center*
Dr. Jason Cassibry, Professor, *Mechanical and Aerospace Engineering, University of Alabama in Huntsville*
Dr. Robert Adams, Advanced Propulsion Technologist, *NASA Marshall Space Flight Center*
Dr. Jerry Carson, Faculty Assistant, *UMD Space Power and Propulsion Lab*

Research Description

Nuclear-fusion-based power generation has a multitude of potential applications, one being spacecraft propulsion. The extreme specific impulse achievable with fusion products provides for large total momentum changes while using substantially less propellant. Several auxiliary subsystems are required to support the application of fusion-based power to spacecraft propulsion. These subsystems include one for efficient propellant heating, one for power generation, and one for reactor shielding and structural integrity. Two centrifugally-confined magnetic mirror configurations are utilized, one to confine the fusion plasma and one to trap and heat an auxiliary propellant in order to increase thrust. Estimates on propellant mass requirements and design constraints on the propellant chamber are derived. Power generation techniques utilizing byproduct radiation from the fusion process are integrated into the reactor structure. Waste heat from neutron power conversion provides preheating of propellant, and a radiator was optimally sized for removing the remaining waste heat. Solid-state thermionic power conversion technology is explored to utilize bremsstrahlung radiation. Models for the magnet shielding are created, and the rate of neutron absorption and energy deposition for several different shielding materials are determined. In order to address the tensile and compressive stresses resulting from the fusion reactor magnets, support beam cross-sections are optimized. A system of heat pipes, magnets, and an enclosing shroud is designed to support reactor functions and prevent damage to system components. Comparisons are drawn between existing propulsion systems and a model fusion system. The viability of our model fusion system for solar

system exploration is discussed.

Acknowledgements

We'd like to extend our gratitude towards our mentor, Dr. Sedwick, who was an exemplary role model and a guiding light to all of us in our endeavors. His eagerness to share with us his profound knowledge base in everything science and engineering consistently motivated us to aim higher. In addition, we'd like to extend our gratitude to the remaining members of the Space Power and Propulsion Laboratory, who were always willing to set time aside to assist us in our efforts and were very welcoming and supportive of our team throughout the entire lifetime of the project.

HiveMIND: Analyzing Honeybee Flight with Event-Based Vision

Research Team

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Dr. Giacomo Indiveri, Professor, *Institute of Neuroinformatics, ETH Zürich*
Ms. Karen Rennich, Project Director, *UMD Bee Lab, UMD*

Research Description

An estimate of bee hive activity allows beekeepers and researchers to better understand trends in a colony's health. This work presents a system utilizing an event-based vision sensor (e.g., Dynamic Vision Sensor) to track flying bees in real-time with the intent of accurately monitoring the flow of bees in and out of an *Apis mellifera* colony. Neuromorphic event-based vision sensors like the DVS are well-suited to the detection of small, fast-moving bees with minimal latency due to the asynchronous pixels. Rather than processing and transferring full images, these pixels detect changes in brightness independently, allowing faster updates where movement occurs. Using this spatio-temporal input, event-based algorithms track bee flight to determine the position of the bee relative to the hive entrance. Once a bee is tracked, the system can determine when it flies towards or away from the hive. A bee's wingbeat frequency can also be detected based on changes in their flight pattern while tracked. To evaluate the proposed event-based tracking system, side-by-side recordings with a frame-based camera at an active beehive were manually tallied. With a controlled background, the algorithm is capable of recognizing trends in overall hive activity. This work also proposes and assesses three potential methods for wingbeat frequency detection on tracked bees.

Acknowledgements

Team HiveMIND would first like to thank Dr. Timothy Horiuchi for his unwavering support, technical assistance, and invaluable mentorship throughout our project. His support was critical to our team's project direction and its success. Jordan Sly and Amber Pierdinock-Weed, our team librarians, have also been instrumental in navigating UMD's library resources and finding reliable references for literature reviews and background research. We would also like to thank Dr. Allison Lansverk, Dr. David Lovell, and the rest of the Gemstone office for supporting our project from purchasing equipment to assistance in fundraising. Thank you all for your crucial support and contributions.

MARINE: Modification of a Nile Red Staining Method for Microplastic Detection in Environmental Media

Research Team

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Dr. Fred Pinkney, Fish and Wildlife Biologist, US Fish and Wildlife Service
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Research Description

Numerous methods have been developed for microplastics isolation and quantification in various environmental media, many of which require elaborate/expensive analytical equipment and decontaminated lab space. This study seeks to create a reproducible and economical method for isolating microplastics in surface water and sediment samples that rely on Nile Red staining. We use a Nile Red pre-staining step prior to sample digestion, density separation, and filtration to mitigate downstream in-lab contamination. To test the method generated, we seasonally collected replicate surface water samples from urban streams in the Chesapeake Bay Watershed, USA for one year and quantified microplastic concentrations via fluorescent microscopy. We investigated spatial and temporal microplastic concentrations with the goal of estimating the impact the University of Maryland College Park campus has on microplastic abundance. The proposed sampling and quantification method found some success in surface water samples with specific microplastics (≥20 μm) able to be enumerated.

Acknowledgements

Team MARINE would like to extend our deepest gratitude to all who helped make this research possible. We would like to first and foremost thank our incredible mentor Dr. Lance Yonkos for his unwavering support and encouragement throughout this process and for the expertise he brought to our research, as well as Sabine Malik and Rosie Vichi for their assistance in developing our methodology. We would like to thank the Maryland Sea Grant and our donors for their financial support. Thank you to Wenyu Chen, Matt Chiasson, Ryan Haili, Nicholas Portwood, and Andrew Zhou for their contributions to the team. Finally, we would like to extend our gratitude to our librarian Ben Shaw, Dr. David Lovell, Dr. Allison Lansverk, and the entire Gemstone Program and its many staff members, both present and past, for helping make this incredible research program possible and for providing us with this opportunity.

PILLS: Pharmaceutical Innovation through Laser Lithography Strategies

Research Team

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Miss Kimia Forghani, Ph.D. Student, Bioinspired Advanced Manufacturing (BAM), *UMD*
Dr. Sunandita Sarker, Postdoctoral Researcher, Bioinspired Advanced Manufacturing (BAM), *UMD*

Research Description

The Human Immunodeficiency Virus (HIV) is an autoimmune disease in which the immune system is destroyed by the body's white blood cells. Developments have been made in long acting treatment so that patients can now take one injection every other month rather than a pill every day. This relies on controlled release technology that releases a steady amount of the active ingredient throughout the course of the two months. Controlled release systems are used in drug delivery to ensure that drug levels in the bloodstream stay within the therapeutic window. Targeting the therapeutic window makes the drug more effective by improving its bioavailability and reducing many toxic side effects. However, a constant rate of release can become problematic for children who need a release rate that accounts for their growth and increasing drug metabolism. Here we show the use of additive manufacturing for the development of biodegradable capsules with controlled release capabilities. Utilizing multi-material additive manufacturing (3D nanoprinting), capsules can be manufactured with varying cap thicknesses that allow for a controlled release of the pharmaceuticals within. By determining the degradation rate of the cap material, the rate of release for varying cap thicknesses can be calculated allowing for the design of capsules with long-acting controlled drug release. This will allow for fine-tuned release rates that can be modified for the needs of growing children.

Acknowledgements

We would like to thank our mentor, Dr. Ryan Sochol, and the BAM Lab. In particular, Dr. Sunandita Sarker, Kimia, and Jack of the BAM Lab for all of their guidance and support. We would also like to thank Dr. Sharon Flank and Dr. Stephen Hoag for their expertise. We thank our librarian, Ms. Nedelina Tchangalova. Lastly, we would like to thank the Gemstone staff, in particular Dr. Lovell and Dr. Lansverk.

SAND: Prototyping a Programmable Matter System

Research Team

Lucas Armyn, Aerospace Engineering (Space Track)
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Mateo Lim, Electrical Engineering
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Faculty Mentor

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Librarian

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Discussants

Mr. Joshua Little, Ph.D. Student, *Chemical & Biomolecular Engineering, UMD*
Dr. Sahil Shah, Assistant Professor, *Electrical & Computer Engineering UMD*
Dr. Wesley Grant Lawson, Professor, *Electrical & Computer Engineering, UMD*
Dr. Michael Otte, Assistant Professor, *Aerospace Engineering, UMD*

Research Description

Programmable matter is a field of interest to many scientists and researchers for its potential applications in medicine, robotics, and engineering. Our aim was to marry various aspects of prior programmable matter robots into a new design. We created this prototype by investigating simple options for each component of the system: the physical bot structure, method of actuation, internal electronics, and programming for assembly and movement. We used a quasi-spherical shape to maximize force generated from each face and minimize required energy for movement. The actuation is driven by electromagnets due to their accessibility and ease of use. The bots contain a custom PCB housing a microcontroller with Bluetooth capability and demultiplexers to efficiently utilize the pins controlling the magnets. A basic assembly algorithm for a two-dimensional grid, distributed to the bots via Bluetooth, allows for simple movement patterns. This basic system can be modified by downscaling prototype size, improving electrical components, adding sensors, and developing the algorithm to work in three dimensions with more complicated restrictions. Ultimately, our work is an important step towards realizing the widespread benefits and applications of programmable matter.

Acknowledgements

We would like to sincerely thank Dr. Po-Yen Chen, our mentor, for graciously offering us resources, feedback, and guidance throughout our project. We would also like to give many thanks to Mr. Joshua Little, whose input and advice helped improve many aspects of our research. Additionally, we are grateful to the Gemstone staff for giving us the opportunity to pursue our research interests and a funding platform through Launch UMD. We would also like to thank our discussants for their time and feedback. We also greatly appreciate our generous donors for funding our project. Furthermore, we would like to recognize our librarian, Ms. Sarah Weiss, for providing advice on our thesis. Lastly, we wish the best to our Gemstone cohort and extend our thanks for being so supportive throughout our research journey.

SOLAR: Cleaning Up Clean Energy: Sustainable End-of-Life Practices for Photovoltaics

Research Team

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Shannon Ganley, Chemistry; English Language & Literature
Vikram Hanspal, Fire Protection Engineering
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Christine Zhou, Chemical Engineering; Computer Science minor

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Librarian

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Discussants

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Dr. Raymond Adomaitis, Professor, *Chemical & Biomolecular Engineering, UMD*
Dr. Oded Rabin, Associate Professor, *Materials Science & Engineering, UMD*
Dr. Kiran Raj Goud Burra, Post-Doctoral Associate, *Mechanical Engineering, UMD*

Research Description

As the first generation of large-scale solar installations begins to reach the end of their 25-year lifespan, solar waste becomes an increasingly pressing global issue, and will only continue to grow as solar technologies become more common. Solar panels are difficult to disassemble and often end up in landfills, where they leach toxic metal compounds into the environment after disposal. Solar panel recycling can help ameliorate these environmental impacts, but existing recycling techniques often employ harmful chemicals or thermal treatments, which produce undesirable byproducts. This project aims to address environmental concerns associated with ethylene vinyl acetate (EVA) removal, one of the most challenging aspects of solar cell recycling. EVA is an adhesive polymer that joins the glass, silicon solar cell, and backsheet layers together. In this work, we investigate the EVA dissolution abilities of five chemical alternatives to toluene. Gasification and pyrolysis are also explored as an alternative to chemical dissolution methods. Although two chemicals (d-limonene and 2-methyl tetrahydrofuran) display a comparable performance to toluene when dissolving EVA sheets, only 2-methyl tetrahydrofuran has an effect when tested on solar panel fragments. These findings underscore the difficulty of developing a solar panel recycling process free from harmful chemical waste and demonstrate the need to design panels with recycling in mind, especially through the use of alternative encapsulant and backsheet materials. We identify multiple solvents which are exciting candidates for the chemical treatment of solar cells for recycling purposes,

whose environmental impacts are lower than those currently used in industry.

Acknowledgements

The members of Team SOLAR would like to give special thanks to the following individuals: Dr. Bao Yang, for guiding us through our project and serving as the team mentor; Dr. Xinan Liu and Dr. Gupta, for providing laboratory space; Ms. Jodi Coalter and Ms. Sarah Weiss for serving as the team librarians; Dr. Ingrid Repins, Dr. Mike Kempe, and Dr. John Magnum at the National Renewable Energy Laboratory, for their advice on our project direction; and Dr. David Lovell, Dr. Allison Lansverk, Dr. Kristan Skendall, Dr. Vickie Hill, Ms. Leslie Lizama, Jon Brodsky, and the remainder of the Gemstone staff. Finally, we would like to thank our discussants Dr. Raymond Adomaitis, Dr. Oded Rabin, Dr. Joe Sullivan, and Dr. Kiran Raj Goud Burra.

This report was prepared by Gemstone Team SOLAR under awards NA14OAR4170090 and NA18OAR4170070 from Maryland Sea Grant, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. We would also like to thank the University of Maryland Sustainability Fund, Sigma Xi Undergraduate Research Grant, and the Do Good Institute for the delegation of funds from their grants.

The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of Maryland Sea Grant, the National Oceanic and Atmospheric Administration, or the U.S. Department of Commerce. The Sustainability Mini-Grants are intended to provide funding to encourage the development or maintenance of projects or programs that improve the sustainability of the UMD campus and/or enhance opportunities for students to learn about sustainability issues.

TRANSPORT: Anti-pancreatic Cancer Effects of Novel Artemisinin-containing Nanogels

Research Team

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Kayla Guralnik, Chemistry
Natasha Oberoi, Bioengineering
Elisa Pierpaoli, Bioengineering and Violin Performance Majors
Warren Stewart, Electrical Engineering
Mukti Trivedi, Neuroscience

Faculty Mentor

Dr. Tao Lowe, Frederick G. Smith, MS, DDS and Venice K. Paterakis, DDS Professor of Oral & Maxillofacial Surgery, *School of Dentistry, UMB*; Professor, *Fischell Department of Bioengineering, UMD*

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Discussants

Dr. Feyruz Rassool, Professor, Radiation Oncology, University of Maryland School of Medicine
Dr. Hem Shukla, Assistant Professor, Radiation Oncology, University of Maryland School of Medicine
Dr. Gregg Duncan, Associate Professor, Fischell Department of Bioengineering, *UMD*
Dr. Won Jon Ho, Assistant Professor, Johns Hopkins Sidney Kimmel Comprehensive Cancer Center
Dr. Matthew HG Katz, Professor and Chair, Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center

Research Description

Pancreatic cancer is the third leading cause of cancer death in USA with a five-year survival rate of 13%. Current treatments of pancreatic cancer include chemotherapy with and without radiation therapy, targeted therapy or surgery. However these treatments have low efficiency and adverse effects. In this research, we investigate the efficiency of a proprietary technology (PCT/US2023/019974) NanoART631 invented by our advisor Dr. Tao Lowe and her collaborator Dr. Curt Civin in treating pancreatic cancer. The NanoART631 is a nanogel system composed of thermoresponsive poly (N-isopropylacrylamide) and biodegradable dextran-lactate-2-hydroxyethyl-methacrylate and encapsulated with an artemisinin (ART) dimer with a molecular weight of 631 Da via UV emulsion polymerization technique. NanoART631 previously demonstrated effective killing of human leukemia cells and sustained the release of ART631 for more than one month in the Lowe lab. However, NanoART631 has not been tested in regards to pancreatic cancer. In our study, we used Fourier transform infrared spectra (FTIR) to characterize the chemical structures of NanoART631s containing different amounts of ART631: 0, 2, and 5 wt%. We also used Zetasizer

Ultra to characterize the hydrodynamic particle size, polydispersity index (PDI) and zeta-potential of NanoART631s in water and two culture media for human pancreatic PANC-1 and MiaPaCa2 cells. The results showed that NanoART631s were monodisperse with hydrodynamic diameters between 100 and 230 nm and PDI <0.25 at 37 ºC. Both the cell culture media decreased the particle size and there was no difference of the effects of the two cell culture media on the particle size. We additionally used MTT assay to study the cytotoxicity of NanoART631s to PANC-1 and MiaPaCa2 cells as a function of concentration and determined the effectiveness of NanoART631s in killing the two cells by calculating their IC50s. NanoART631s effectively killed both PANC-1 and MIA PaCa-2 cells with IC50s at nM, and more effectively killed MIA PaCa-2 cells than PANC-1 cells with increasing the amount of ART631 in the nanoparticles. The NanoART631s have potential as an effective novel therapy to treat pancreatic as well as many other cancers.

Acknowledgements

We would like to thank our mentor, Dr. Tao Lowe, for her support and guidance throughout our entire research process, from developing our cutting-edge thesis ideas to experimental designs to results analysis to thesis production and defense. We would also like to extend thanks to members of Lowe Lab, Noha Ghonim, Sangyoon Kim, and Eman Mirdamadi for their help. We are beyond grateful to the Gemstone program for their support during the past four years and for giving us the opportunity to engage in novel research. Thank you to our discussants, Dr. Feyruz Rassool, Dr. Hem Shukla, Dr. Gregg Duncan, Dr. Matthew Katz, and Dr. Won Jin Ho for their time and feedback, and our team librarian, Ms. Nevenka Zdravkovska. Lastly, we'd love to thank Samat Borbiev and Emily Lin for all the help they provided throughout this process.

UNITED: Evaluating the Perceptions of Disordered Eating in Men and Its Impacts on Health-Seeking Behaviors

Research Team

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Faculty Mentor

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Discussants

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Dr. Tracy Zeeger, Assistant Dean, Office of Public Health Practice & Community Engagement, UMD
Dr. Héctor Alcalá, Assistant Professor, Behavioral & COmmunity Health, UMD
Dr. Lisa Tuchman, Pediatrician/Adolescent and Young Adult Medicine Physician, Eating Recovery Center Pathlight

Research Description

Disordered eating (DE) is a term that captures all maladaptive attitudes and behaviors around food consumption, often as a result of poor body image. The continuation of DE can progress into an eating disorder (ED), which results in inadequate nutrition. Individuals with ED are also at a higher deposition for developing psychiatric and medical comorbidities. Current research on DE and ED has historically centered on skinny, White, affluent girls (SWAG), inherently excluding marginalized identities from the majority of existing literature. Furthermore, there exists a severe gap in knowledge regarding ED and DE in boys and men. Factors that contribute to this gap include the underdiagnosis of ED, stigma towards masculine identities, barriers to care, and health literacy. The purpose of this study was to establish the relationship between the negative perceptions associated with DE and ED and its impact on the prevalence of DE symptoms and ability to engage in health-seeking behaviors among young men and those with marginalized identities. Data on DE, stigma, access to health care services, and general help-seeking was collected from a sample of college-aged undergraduate students at the University of Maryland, College Park ($N = 257$). Participants assigned male at birth (AMAB) were roughly twice as likely than participants assigned female at birth (AFAB) to be seen as weak for having a mental health problem (OR = 1.996, 95% CI = 1.10-3.62, $p = .023$). Findings indicate a cultural adherence to hegemonic ideals of masculinity which is a major aspect contributing to the stigma surrounding ED/DE in males. With the focus of this study being on a campus community, destigmatization efforts in male spaces and educational

wellness resources that target at-risk individuals should be implemented. Future studies may examine the benefits and efficacy of such intervention and educational programs.

Acknowledgements

We would like to extend our sincerest appreciation and gratitude to our mentor, Dr. Elizabeth Aparicio, for guiding us through this project. Her unwavering support over these past three and a half years has been tremendously generous and pivotal in the progression of this project. We would also like to thank our Librarian, Ms. Celina McDonald, as her assistance has been of utmost importance in the literal creation of our work. Furthermore, we would like to thank each and every panelist discussant for dedicating time and effort to meet with us to strengthen our project. Lastly, we would like to thank the entirety of the Gemstone Honors Staff, past and present, including Dr. David Lovell, Dr. Allison Lansverk, Dr. Kristen Skendall, Dr. Leah Tobin, Dr. Vicky Hill, Jalah Townsend, Leslie Lizama, and Brianna Lucas for their encouragement and assistance over the past four years.

VERDANT: Utilizing Green Walls for In-situ Treatment of Greywater for Non-potable Reuse

Research Team

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Research Description

Agricultural industrialization in the 21st century has presented acute strains on freshwater globally, and population growth has driven modern farming practices towards the overuse of already scarce water resources. This coupled with the increased popularity of extremely water-intensive green infrastructure has led to the focus of this project: integrating greywater recycling through vegetated walls in order to minimize freshwater use and promote sustainable wastewater management. This is beneficial on two fronts, where the purification of greywater through a green wall requires less energy than traditional wastewater treatment, and the use of greywater in irrigating green infrastructure alleviates pressure on water resources while achieving the other benefits of green walls such as air filtration, acoustic insulation, and improving well-being. The goal of our research was to construct green walls consisting of Maryland native plants that could flourish while filtering greywater to non-potable reuse standards. By selecting wetland species accustomed to a saturated environment, we designed walls that were well suited to absorbing the varied contaminants of greywater, which was modeled after effluent from sources like laundry machines, showers, and dishwashers. We evaluated the treatment performance of the walls through EPA and MDE guidelines for pH, TOC, TN, COD and turbidity, and plant health was monitored through qualitative metrics. The development of green walls with region-specific native plants will allow for greater accessibility in communities local to Maryland, and can be used in future applications of green

infrastructure planning.

Acknowledgements

We would like to thank our mentor, David Kriesberg, for his guidance and support throughout our research, and our team librarian, Suzy Wilson, for her insights into our project design. We want to also acknowledge Ms. Marya Anderson for training, supporting, and troubleshooting equipment with the team in the Persistent Organic Pollutants and N.E.S. Labs. The Team extends its thanks to former member and team lead Shane Querubin for proposing this research direction and shaping its conceptual stage. Further thanks go to our discussants, Ms. Marya Anderson, Dr. Natasha Andrade, Dr. Peter May, Dr. Rachel Rosenberg Goldstein, and Dr. David Tilley for their expertise and invaluable feedback. We are also very grateful to all of our LaunchUMD contributors for their generous support and encouragement. Finally, we would like to thank Dr. Lovell, Dr. Skendall, Dr. Lansverk, Dr. Hill, Dr. Tobin, Ms. Leslie Lizama, and the entire Gemstone Staff for their support throughout this project.

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