Virginia Commonwealth University

24th Annual Graduate Student Research Symposium & Exhibit

Sponsored by the Graduate Student Association and The Graduate School

April 20, 2021

Virginia Commonwealth University

VCU Graduate School

gsa Graduate Student Association at VCU

VCU Graduate School

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April 20, 2021

Dear Participants and Guests:

I am pleased to welcome you to the 24th Annual Graduate Student Research Symposium and Exhibit sponsored by the Graduate Student Association (GSA) at Virginia Commonwealth University. The Symposium is organized by graduate students and provides an opportunity to showcase their scholarly work and cutting edge research.

The Research Symposium and Exhibit also gives our undergraduate students, faculty, staff and the University community a chance to witness the outstanding work of our graduate students. The work being presented today covers an array of topics from many academic disciplines and is representative of the high quality of VCU's graduate student body. I congratulate all of this year's presenters for their contribution to the success of this important program.

I would particularly like to thank Shabana Shaheen, chairperson of the Symposium, and the officers of the GSA who have helped in planning this Symposium. This event is an excellent example of how an active GSA can benefit all graduate students.

Thank you for attending this year's Symposium. I hope that you enjoy the event.

Sincerely,

Daniel C. Bullard, Ph.D.
Dean, Graduate School

VCU Graduate Student Association

Virginia Commonwealth University

What is the GSA?
The Graduate Student Association (GSA) provides many valuable services to the graduate student body at Virginia Commonwealth University (VCU). The GSA organizes numerous events throughout the academic year including Graduate Student Orientation, several Meet & Greet events and social mixers, and the Graduate Research Symposium & Exhibit in the spring. The GSA also appropriates funds for graduate student organizations to enhance the quality of the graduate student experience at VCU. The GSA also helps to place graduate students on campus wide committees, where they represent the voice and express the concerns of VCU's graduate student body.

Our Mission:
The purpose of the GSA is to serve as an advocate for the issues and needs of the graduate students at VCU. The GSA is committed to facilitating programs that enhance the academic skills, professional development, and social environment of all graduate students. There is no fee to join the GSA, every graduate student is a member and eligible to participate in and contribute to the GSA and GSA activities. However, the GSA sponsored events are not limited to only graduate students – all students and faculty are welcome.

Executive Committee:
The purpose of the GSA Executive Committee is to represent, advocate, facilitate communication and provide social activities for the VCU graduate community. The Committee is responsible for distributing 10% of the SGA Activities fees to graduate student organizations.

2020–2021 GRADUATE STUDENT ASSOCIATION OFFICERS

Sarah Saunders, President
College of Engineering

Jair Lecky, Vice President
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Ann Kee, Communications Chair
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Shabana Shaheen, Symposium Chair
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Jackie Knight Wilt, Event Chair
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GSA Council:
The purpose of the GSA Council members is to represent VCU graduate schools, programs, and departments by relaying student concerns to the GSA and the Executive Committee. The GSA is looking for representatives from each school to form the Graduate Student Council. Applications may be found at: https://graduate.vcu.edu/life/graduate-student-association/.

More Information:
For more information on how to join the GSA and our numerous events please visit: https://graduate.vcu.edu/life/graduate-student-association/.

Connect with us on:
RamsConnect: https://vcu.campusgroups.com/student_community?club_id=21903
Facebook: Facebook.com/VCUGraduateStudentAssociation
Twitter: VCUGSA
Instagram: VCUGSA
Email: gsa@vcu.edu

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Ashley Tubbs: *Extending Single Entity Electrochemistry Towards the Detection of Single Bacteria in Micro Volumes*

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Sam Gottlieb: *SELECTIVE GSK3B DELETION IN CamkIIa FOREBRAIN NEURONS OR INHIBITION VIA TIDEGLUSIB, DECREASES ETHANOL CONSUMPTION IN C57BL/6J MICE*

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Jessica Kiernan: *Racial and ethnic disparities in access to primary care among men who have sex with men (MSM) in the US, a population at high-risk of HIV infection*

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11:40am
Awards

Featured Speaker

Nicole O'Donnell
VCU Votes: Making VCU a Voter-Friendly Campus

The Common Book Program is pleased to recognize our collaborative partnership with VCU's Graduate School, a partnership that welcomes both entering undergraduate and entering graduate students by providing copies of the VCU Common Book to all new undergraduates and graduate students. VCU Votes: Making VCU a Voter-Friendly Campus ties closely to the 2020 Common Book, One Person, No Vote, by Carol Anderson, Ph.D., which explores the history of efforts to suppress African American voting participation. Dr. Nicole O'Donnell is an assistant professor of public relations in the Richard T. Robertson School of Media and Culture. Her primary research focuses on emerging new technology in the context of health and environmental communication campaigns.

College of Engineering

Amir Esmaeili
The critical role of dynamic surface tension of surfactants on the impact dynamics of water droplets

Due to their time-dependent surface tension, the addition of surface-active agents or surfactants to water for specific applications has made controlling the impact dynamics of these droplets a complex phenomenon. This work investigates the influence of the molecular weight, concentration, and ionic nature of the surfactants as well as the substrate surface characteristics on the impact dynamics of surfactant-laden droplets using a high-speed camera at 10000 frames per second. Sodium dodecyl sulfate, hexadecyltrimethylammonium bromide, and n-decanoyl-n-methylglucamine were used as anionic, cationic, and nonionic surfactants, respectively. We used hydrophilic glass slides, hydrophobic polytetrafluoroethylene, and superhydrophobic alkyl ketene dimer (AKD) as substrates. The results show that the efficiency of the surfactant addition in increasing the maximum spreading diameter is significantly influenced by the molecular weight and ionic nature of the solutions as well as the nonwettability of the substrate. Among all of the surfaces examined, the concentration and ionic nature of the solutions were found to be more dominant parameters in determining the energy dissipation in the retraction phase of the droplet impact on the superhydrophobic AKD surfaces. As the concentration decreases or positive charges are present in the solution, it is more likely to observe a similar retraction dynamic to pure water when the droplet hits the superhydrophobic AKD having negatively charged surface sites. Finally, in terms of the impact outcomes of the surfactant-laden droplets on the superhydrophobic AKD, it is shown that the influence of the surfactant addition is more noticeable at lower Weber numbers, where the droplet tries to rebound by overcoming the energy loss that occurred in the spreading.

Shuyu Tian
Machine Assisted Experimentation for Extrusion-based Bioprinting

Three-dimensional (3D) bioprinting is a bottom-up fabrication approach to create tissue-mimetic structures through precise deposition of biomaterials. Extrusion-based bioprinting (EBB) is a

subset of this technique, dispensing biomaterials through a container using pressure exerted pneumatically or mechanically. When live cells are embedded within the biomaterials used, a combination of material parameters and printer settings impact the cells' viability when extruded, including nozzle outlet diameter, material concentration, and operating temperature. In addition, these parameters affect the ability of the biomaterials to produce precise geometries. Thus far, the optimization of EBB parameters has been conducted through systematic wet-lab experimentation. This process can be laborious, and the information gained can be hard to translate towards different biomaterials and printers. A potential solution to expedite EBB experimental design is through machine learning. Machine learning models can analytically identify relationships among input parameters and predict desired outcomes based on said relationships.
In this project, the objective is to create a cell viability and printability prediction model by training machine learning algorithms through using material concentration, printing settings, viability, and printability results accrued from 47 EBB manuscripts over the past 13 years. Feature selection shows relatively major effects from specific material concentrations, nozzle diameters, printing pressure, and desired tissue construct thickness. Framing the prediction models as classification models shows relatively high prediction accuracy on test set data (average accuracy range of 77 to 75%) can be achieved for cell viability outcomes while framing filament diameter prediction models through regression shows relatively high coefficients of determination (0.86). Ongoing work involves validating prediction results from testable parameter combinations.

College of Health Professions

Muhammad Quraishi
Machine Assisted Experimentation for Extrusion-based Bioprinting

According to the CDC, the rates of overdose deaths involving fentanyl and fentanyl analogs, such as butyrylfentanyl, has increased over 16% from 2018 to 2019, making overdose deaths in 2019 almost a 12-fold increase from 2013. In 2018, nearly 70% of all drug overdose deaths in the United States involved an opioid, according to the DEA's 2020 National Drug Threat Assessment. Abuse and misuse of prescription fentanyl have been a well-studied issue for some time. However, in recent years we have seen the emergence of illegally manufactured synthetic opioids, fentanyl and fentanyl analogs. These analogs share the same core structure to fentanyl but have modifications on key sites which often bestow different properties such as increased potency and longer half-life. It is necessary to develop a method that can reliably and accurately detect and identify fentanyl and newly emerging fentanyl analogs. Liquid Chromatography-Mass Spectrometry (LC-MS) is the current gold standard for detecting and identifying drugs of abuse in forensic and toxicology labs around the world. Here we present a method for the detection and identification of fentanyl and the butyryl fentanyl class of analogs using LC-MS. Separation and identification was achieved using a Waters TQS-micro Ultra Performance Liquid Chromatography tandem Mass Spectrometry (UPLC-MSMS) with a Waters BEH C18 UPLC column. Using a gradient elution of mobile phase consisting of acetonitrile:water (85:15), 13 of the 17 butyryl fentanyl analogs were able to be separated and identified using Liquid Chromatography – Mass Spectrometry, with the exceptions of o-Fluoroisobutyryl fentanyl, m-Fluoroisobutyryl fentanyl, p-Fluorobutyryl fentanyl, and m-Fluorobutyryl fentanyl.

College of Humanities and Sciences

Junaid Ahmed
Collisions or Adsorption? An Electrochemical Random Walk Decides

Current-time recordings of toluene microdroplets emulsified in water and containing 20 mM Ferrocene (Fc), show multiple electrochemical peaks from oxidation of Fc on disk microelectrodes (5mm-diameter). The average droplet diameter (~0.7 mm) determined from area integration of the peaks was close to Dynamic Light Scattering measurements (~1 mm). Random walk simulations were performed deriving equations to simulate droplet electrolysis using the diffusion and thermal velocity expressions established by Einstein. The simulations show that multiple droplet-electrode collisions, lasting ~0.11 ms each, occur before a droplet wanders away. Updating the Fc-concentration at every collision shows that a droplet only oxidizes ~0.58% of its content in one collisional journey. In fact, it would take ~5.45 x 10 6 collisions and ~1.26 h to electrolyze the Fc in one droplet with the collision frequency derived from the thermal velocity (~0.52 cm/s) of a 1mm-droplet. To simulate adsorption, the droplet was immobilized at first contact with the electrode while the electrolysis current continued to be iteratively computed until the end of the simulation. This approach along with modeling of instrumental filtering, produced the best match of experimental peaks, which were attributed to electrolysis from
single adsorption events instead of elastic collisions. These results point to a heightened sensitivity and speed when relying on adsorption instead of elastic collisions. The electrochemical current for the former is limited by the probability of adsorption per collision, whereas for the latter, the current depends on the collision frequency and the probability of electron transfer per collision (JACS, 2017,139, 16923-16931).

Jayani Christopher
Improving the sensitivity of macrolide antibiotic biosensor protein MphR

Macrolide antibiotics, synthesized via giant polyketide synthases (PKS) are in high demand for clinical applications. Due to the growing resistance of bacteria towards antibiotics there is an urgent need of novel macrolide antibiotics. Combinatorial biosynthesis is an approach to reprogram the PKSs, however it is challenging due to their size and complexity. Directed evolution is an alternative approach where large libraries of enzyme variants that lead to functional group modifications in macrolides are evolved. Hence, it is important to develop high throughput screening methods to screen these enzyme libraries. MphR is a transcriptional repressor protein which undergoes transcriptional de-repression upon binding to macrolides
such as erythromycin. The biosensor in this study consists of a two plasmid system, in which upon binding of macrolide to MphR a gene cassette is transcribed expressing green fluorescent protein (GFP). A gene knockout approach where genes expressing proteins that are involved in antibiotic transport were disrupted in the E.coli chromosome was used in order to improve the sensitivity of the biosensor. The tolCΔ single gene knockout strain and bamBΔtolCΔ double knockout strain along with the two plasmid system showed improved sensitivity due to high influx and retaining more macrolide in the cell. Furthermore, theses sensor systems were used to create an orthogonal biosensor pair, capable of reporting differential concentrations of erythromycin and its semi synthetic derivative clarithromycin.

Kalyn Coghill
World Wide Wake: A look into digital wake work in response to the murder of Breonna Taylor

In Christina Sharpe's, In the Wake, she refers to “wake work” as conscious work. Wake work is making a conscious and intentional effort to celebrate one's life as they are passing and after they have transitioned on. Wake work includes grief, sadness, reminiscing, happiness, laughter, and many more emotions. We think of wake work happening in the physical but I want to look at how weight work exists in the digital. In this paper, I will discuss the ways in which wake work is done in digital spaces such as social media. I

will also be looking at how social movements such as black lives matter can act as a place for wake work to begin. I have created four sections that will talk about wake work in digital spaces. Hashtag activism, memorializing death, Fugitivity, and Black Dignity are some of the ways that wake work is done in these virtual communities. I will investigate and provide examples of how each aligns with wake work in particular to the death of Breonna Taylor.

Andrea Ferrer-Vega
Development of liposomal nanoparticles for the targeted delivery of hydrophilic FoxO1 inhibitors

Background: Polymers like poly (lactic-co-glycolic acid) (PLGA) have been used to safely encapsulate drugs for delivery. These drugs are usually hydrophobic due to the hydrophobic nature of PLGA. Dipalmitoylphosphatidylcholine (DPPC) and 1,2-Dimyristoyl-sn-glycero-3-phosphocholine (DMPC) are lipids approved by the United States' Food and Drug Administration that can encapsulate both hydrophilic and hydrophobic drugs. Drugs for various medical treatments have been encapsulated in liposomal nanoparticles for targeted delivery and reduction of unwanted side effects.
Methods: An ethanol injection method for synthesizing liposomes containing FoxO1 inhibitors and adipose vasculature targeting agents was developed. A set of nanoparticles including DPPC, DMPC, DPPC-PEG-P3 and DMPC-PEG-P3 unloaded and drug loaded (Bafilomycin A1 or CL 316,243) were generated. The particles were characterized by Dynamic Light Scattering to measure their size and polydispersity index.
Results: Nanoparticle hydrodynamic diameters ranged from 100 d.nm to 217 d.nm while the polydispersity index was less than 0.5 for all samples. Stability testing confirmed that size remained unchanged for up to 4 weeks.
Conclusion: The hydrophilic drugs Bafilomycin A1 and CL 316243 can be encapsulated and paired with a targeting peptide P3 using liposomes. Further research involves determining the encapsulation efficiency of the drugs in the liposomes. In addition, dialysis studies are underway to establish the drug release profile.

Rebecca Hoppe
The family caregiver's transition to a cancer diagnosis

Background: Hematologic malignancies are life-threatening cancers associated with high mortality, numerous symptoms, and lengthy hospitalizations (Noone, 2018). Family caregivers (typically family members or friends; FC) of adults with various diseases experience negative quality of life and poor psychological well-being (Bevans et al., 2016; Ferrell & Kravitz, 2017; Reblin et al., 2018; Shaffer et al., 2017). However, there is scant research exploring the experience of the FC of adults with newly diagnosed hematological malignancies (HM).
Objective: The purpose of this study was to learn how FCs adapt to patients' diagnosis of hematological malignancies and to their caregiver role.
Methods: This study is part of a larger longitudinal mixed methods project aimed to understand the changes and challenges to the quality of life and psychological well-being for patients diagnosed with hematological malignancies and their family caregivers (partner, parent, spouse, friend). This study used a qualitative descriptive design (Sandelowski, 2010) to analyze the semi-structured interview responses from FCs (N=28) within six weeks of the patients' HM diagnosis. A content analysis was conducted to generate common themes (Vaismoradi et al., 2013).
Findings: Several salient themes emerged from the semi-structured interviews related to the family caregivers' (FC) psychological adjustments to their loved one's illness (HM). Markers of positive adaptation included accepting help from others, feeling empowered by how they have managed, and being at peace with someone else being in control (e.g., medical staff, higher power). Poor adaptation to the transition was reflected in references to pre-diagnosis identity rather than the current ill state of the HM and indicating feeling heightened stress specifically related to the loss of power and control in their

own and/or the HM's lives. This also manifested in potentially maladaptive tendencies to attempt to protect the HM and family members by gatekeeping information and protective buffering (e.g., hiding worries, denying concerns, faking optimism in an effort to reduce stress for others). Often, FCs ruminated over why the HM was diagnosed and how the HM was particularly undeserving of the diagnosis. Reports of positivity and hope were accompanied by endorsements of easing stress about the HM's future and aiding the FC coping. Finally, our findings suggest that FC's are uncomfortable with uncertainty for their future and the logistical challenges they face.
Implications: These results foster understanding of the psychological complexities of caregiver burden as they adapt to the diagnosis, and their new supportive role as a caregiver for their loved one with HM. This highlights the need to assess and support FCs during this time. For example, palliative care principles can be leveraged to promote healthy acceptance of the diagnosis, preparation for caregiving, burden prevention, and targeted coping strategies.

Jonathan Kenyon
Validity of the Actigraph GT9X Accelerometer Step-Count Function in Adults with Heart Failure with Preserved Ejection Fraction

Low physical activity is associated with heart failure with preserved ejection fraction (HFpEF). Step-counts, a measure of physical activity, can be estimated via accelerometry. To date, few studies have examined validity of accelerometer-derived step-counts in the adults with heart failure with preserved ejection fraction (HFpEF).
PURPOSE To assess criterion validity of the Actigraph GT9X accelerometer step-count function in adults with HFpEF via ankle, waist, and wrist placement, compared with observed steps.
METHODS Six adults with HFpEF (age: 57.2 ± 9.4 y; African American: 50%; females: 100%) completed a cardiopulmonary exercise test (CPET) on a treadmill while wearing synchronized GT9X accelerometers on the ankle, waist, and wrist. Steps during CPET were estimated by using the step-count function on the GT9X at 60Hz sampling and data were downloaded into 1-second and 10-second epochs. Hand-tallied, directly observed steps (OS) was the criterion measure. Criterion validity was assessed via paired t tests to determine whether mean total steps (TS) from the three devices were significantly different from the mean TS from OS, and Pearson correlations were used to determine associations between device-measured TS and the total OS.
Simple linear regression models were used to assess the effect of walking speed on absolute percentage error of the devices compared to OS. Agreement of the devices throughout the duration of the CPET was examined using Pearson correlations. Alpha was set at 0.05 for all statistical analyses.
RESULTS Mean TS from waist-worn ($t = -5.29$, $p = .001$) and wrist-worn ($t = -12.50$, $p < .001$) devices were significantly lower than mean TS from OS. Only TS from the ankle GT9X was significantly associated with TS from OS ($r = 0.974$, $p = .001$). GT9X-estimate steps from the ankle ($r = 0.869$, $p < .001$), waist ($r = 0.600$, $p<.001$), and wrist ($r = 0.869$, $p <.001$) were all significantly associated with OS-measured steps. Absolute percentage error was significantly and negatively associated with treadmill speed for devices on the ankle ($b = -10.70$, $p < .001$), waist ($b = -32.49$, $p < .001$) and wrist ($b = -10.08$, $p < .001$).
CONCLUSION Our results suggest that accelerometer-derived TS may be a better estimate of TS when the device is worn on the ankle rather than waist or wrist, and that measurement error is higher at lower walking speed.

John Lutkenhaus
Activity of Saccharomyces cerevisiae by Single Entity Electrochemistry

According to the Centers for Disease Control and Prevention, antibiotics decrease in effectiveness as bacteria gain resistance for previously treatable illnesses. Currently, antibiotic susceptibility is typically carried out via the Kirby-Bauer method. Even with automation, this process requires two incubation periods so a less time-consuming technique is desirable. Single entity electrochemistry (SEE) detects real-

time changes in current when collisions of individual particles at an ultramicroelectrode (UME) are linked with an electrochemical event. In experiments lasing less than 20 minutes, cells at the UME surface, such as Saccharomyces cerevisiae, can produce step-like and spike-like responses through adsorption and desorption, respectively. Our first goal is to examine the factors relating to this process and the resulting signal responses as understanding adsorption selectivity may be necessary for electrochemical study of biofilms which are especially resistance to antibiotics. This will be carried out experimentally using SEE, through the use of cells of differing size, shape, and health. Time-scale differences between the step and spike events may also be explored using COMSOL Multiphysics software which can model if the cells are arriving at the UME by mainly by diffusion, migration, or convection. Future work includes investigating cell activity using a two-mediator system with SEE. A hydrophilic mediator alone will only be reduced by extracellular redox sites along the plasma membrane. A lipophilic mediator, on the other hand, may cross the membrane and be reduced by intracellular sites. When used simultaneously, reduction can occur by both cell sites as well as by the other mediator. The rate at which the mediators are reduced by the cell and each other would be indicative of cell health. Finally, an array of these mediators may be developed so that the differences in current response identifies cell species in clinical samples like taking fingerprints.

Nathaniel Thomas

PRINCIPAL COMPONENTS ANALYSIS CORRECTS COLLIDER BIAS IN POLYGENIC RISK SCORE EFFECT SIZE ESTIMATION

BACKGROUND: Genome-wide polygenic scoring has emerged as a way to predict psychiatric and behavioral outcomes and identify environments that promote the expression of genetic risks. An increasing number of studies demonstrate that the effects of polygenic risk scores (PRS) may be biased by the inclusion of heritable environments as covariates when the environment is influenced by unmeasured confounding variables, an example of collider bias. Inclusion of the principal components of observed confounders as covariates may correct for the effect of unmeasured confounders.
METHODS: A simulation study was conducted to test principal components analysis (PCA) as a correction for collider bias. Data were sampled from a model which tested different values for the effect of the polygenic risk score on the heritable environment, the correlation structure of the unmeasured confounding data, and the proportion of the confounding data that is used to construct the principal components. Other model parameters were fixed across all simulation iterations.
RESULTS: Modeling the first PC of observed confounders as a covariate recovers the PRS effect size estimate under reasonable assumptions about the proportion of the confounding data that is measured or the correlation structure of the confounding data. Required assumptions become stricter as the effect of PRS on environment (and the magnitude of bias) increases.
CONCLUSION: Inclusion of the first PC of observed confounders as a covariate may improve the accuracy of PRS effect size estimation when heritable environments are included in the model as covariates. Future directions include application of this method in observed data.

Ashley Tubbs

Extending Single Entity Electrochemistry Towards the Detection of Single Bacteria in Micro Volumes

Single entity electrochemistry (SEE) is an emerging electroanalytical technique with the ability to push the limit of detection of electrochemical sensors to the single particle level. It measures the change in current over time, making SEE rapid, simple, and cost-effective. The type of current response observed in the scan can provide information about the physiochemical processes underlying the signal. While SEE was originally developed to detect single molecules and nanoparticles, it has been widely applied to micron-sized particles, including emulsion droplets, bacteria, viruses, and mammalian cells. Some recent advances in this technique have focused on the detection of microscopic quantities of cells, with the goal of detecting bacteria in

agricultural samples. Picomolar levels of detection were recently achieved for single bacterial cells in bulk solution (Anal. Chem. 2018, 90, 20, 12123-12130). To further lower the level of detection, we have demonstrated that SEE can successfully detect Escherichia coli bacterial cells trapped in a micron-sized droplet at the surface of the electrode. In contrast to the bulk solution, the micro-sized droplet depresses the level of detection by two orders of magnitude: to the femtomolar level. Moreover, we have observed a four-fold decrease in the current response time in the microenvironment vs the bulk.

Alexandra Wynn

The Effect of Self-Rated Health and Race/Ethnicity on the Relationship Between Feelings of Content and Frequency of Seeing their Primary Care Provider

Racial and ethnic minorities face significant health disparities as they are less likely to receive preventive health services, receive lower-quality care and have worse health outcomes for many chronicconditions than White people (Hostetter, Klein, 2018). Thus, it is important to analyze what psychological and social factors affect these populations and how they contribute to healthcare engagement. One psychological correlate that has not been focused on is self-rated health. Self-rated health has mainly been analyzed for its relationship with personality and physiological factors but little research has focused on how it influences seeking medical care. Fair/poor self-rated health was found to be associated with greater distrust in the health care system in a primarily White sample (Armstrong et al., 2006). In this way, self-rated health impedes health as it is associated with failing to follow physician's advice, failure to seek medical care when they needed it and delays in seeking care (LaVeist, Isaac, & Williams, 2009). In a majority Hispanic/Latinx and White sample, self-rated health was significantly correlated with better patient provider relationships and there was no significant difference in self-rated health among races (Kamimura et al., 2020). The aim of this study was to investigate how an individual's self-rated health and race/ethnicity influences the relationship between feelings of content and the frequency at which one sees their primary care provider (PCP) for a checkup. We hypothesized that racial/ethnic minorities who rate their health higher, would see their PCP for a health visit less often when they are more content. Using Amazon's Mechanical Turk, the researchers administered a questionnaire to 1210 participants measuring demographic information, self-rated health, number of visits to their PCP per year and the World Health Organization Quality of Life- Feeling or Experiences Subscale. Our study used one item from the Feeling or Experiences Subscale referring to how often the participant felt content over the past two weeks. A moderated moderation using Hayes'(2020) PROCESS macro was conducted. There was a significant main effect of self-rated health on frequency of seeing their PCP, $b = 0.12$, $p < .001$. Additionally, there was a significant main effect on the difference between how many Black participants compared to White participants went to see their PCP, $b = -0.21$, $p = .0265$. There was a significant three way interaction between feelings of content, self-rated health and being Black on seeing their PCP for a checkup (Figure 1). When a Black individual's self-rated health is low, they are less likely to visit their PCP for a checkup when they are more content, $b = -0.07$, $p = .0421$. These results significantly add to the literature as it provides more clarity on how individuals perceive their health affects the rate in which they see their PCP. Our hypothesis was supported for White participants as feelings of content and self-rated health did not affect the rate in which they sought medical attention. However, our hypothesis did not support all racial/ethnic minorities outside of Black participants as feelings of content and self-rated health did not moderate the relationship between feeling content and seeing their PCP. These results are similar to prior research as African Americans have been studied to delay or avoid seeking care due to discriminatory and biased past health care experiences. If a Black individual rates their health as high, they are less likely to go to the doctor due to lack of trust in health professionals and the health care system. More research needs to be conducted in other racial/ethnic minorities to identify what factors influence seeking medical care. Identifying these experiences and perceptions of health in marginalized populations can help advance the patient-provider relationship and improve the importance of maintenance of good health.

School of Education

Monica Grillo

Course Design Decisions: Preparing Culturally Competent STEM Teacher Candidates to Advocate for Social Justice and Equity in High-need Schools

Given that there is a shortage of teachers willing to teach in high-need schools, teacher candidates need learning opportunities to develop strength-based perceptions of these contexts. This manuscript describes the rationale for the evolution of a one-credit seminar course called *Theory and Reality: Practicum in Math and Science Teaching in High-Need Schools* within the context of a predominately white teacher preparation program. The first author describes changes that she made to promote cultural competence and agency for teacher candidates interested in teaching in schools that face poverty. We highlight teacher candidates' reflections to evidence salient experiences in the course that supported their understanding of teaching STEM in high-need schools.

Christina Tillery

She's Not Forgotten: Ending the School Push Out of Black Girls

Professional school counselors play a critical role in ensuring that ALL students have access to quality education free from discrimination. Inequitable discipline practices and systemic racism have hindered the academic and social/emotional development of Black girls. This workshop will help school counselors learn how to identify discriminatory practices, analyze current national data, and provide resources to implement supports and interventions in their schools.
The last decade has seen major court cases reflecting social changes affecting school counselors' legal and ethical obligations. Learn about principles of practice emerging from recent court rulings involving sexually active students, educational records, transgender youth, child abuse, social media, suicide, and academic advising.
Participant learning outcomes:
After attending this session you should be able to:
1. Identify discriminatory practices common in public schools
2. Analyze current national data on Black girls' experiences in public schools
3. Implement evidence-based interventions to support Black girls

Rachel Walker Bowman

The Hidden Curriculum of Ableism in Teacher Preparation Programs

Ableism, the systemic belief that people with disabilities are inferior to non-disabled people, is mostly unaddressed in teacher preparation programs and remains acceptable in our society.
Much of what universities present to preservice teachers implicitly reinforces ableist ideas and practices, which trickle down to students and ultimately cause unintended harm, particularly to Black, Indigenous, and people of color (BIPOC) with disabilities.
To increase knowledge about this hidden curriculum, I conducted a literature review of studies examining how teacher preparation programs address ableism. Some programs incorporate Disability Studies in Education (DSE), while other programs do not address DSE. Some programs use instructional strategies that disability activists refute as harmful and ableist. In other studies, researchers used interventions to counter ableist ideas directly and produce anti-ableist teachers. This poster will focus on the different ways teacher preparation programs have successfully addressed ableism and will provide recommendations for teacher preparation programs.

Catina Venning

Family Learning Culture Assessment: Development of metrics of the collective epistemic orientations and achievement motivations in diverse families

The family, in educational psychology research, is unidimensional. It is either a covariate, a tool for school agenda or narrowly defined by a single person, usually the mother and her college educational attainment. These diminutions of family hamper efforts to fully understand critical contextual factors that impact student learning, like family. Inspired by Cultural Historical Activity Theory (CHAT) and Family Communication Practices (FCP), Family Learning Culture Theory (FLCT) emerged as the conceptual framework for a exploratory research project, which interviewed three middle-class family representatives, of high school students in two school districts in a Southeastern city in the United States. Aggregate findings, from that preliminary study reveal that family expectations towards learning, school and knowledge, is shaped academic success is a multi-membered, cultural dynamic which extends beyond households and bloodlines. This study also found that over time, family is less directive and more consultative in its support for children's personal fulfillment and goal attainment, which may not include college. The results of this study informed the development of the Family Learning Culture Assessment, which combines interdisciplinary, reliability-tested, metrics along with new dimensions unearthed during the qualitative study, to understand emergent family typologies in school-based settings. This research and the resulting assessment have implications for removing deficit-based binaries, like engaged or disengaged, and replacing them with more nuanced descriptive typologies, reflective of families as complete cultural entities. The possibilities for targeted support or intervention are as varied as the typologies themselves.

School of Medicine

Morgan Driver

Attitudes and Opinions About Direct-to-Consumer Genetic Testing in Undergraduate Science Students

Background: There has been exponential growth in the number of direct-to-consumer genetic testing kits sold in the past decade. Consumers utilize direct-to-consumer genetic tests for a number of reasons which include learning about one's ancestry and potential ways to manage health. Emerging adults tend to be early adopters of new technologies; however, there has been little research regarding the opinions about direct-to-consumer genetic testing in emerging adults.
Methods: Data came from a study conducted in an upper-level biology course focusing on understanding undergraduate science students' overall experiences with receiving personalized genetic testing results from 23andMe. The present study used data collected at the baseline assessment which assessed their opinions and attitudes about direct-to-consumer genetic testing (N=133).
Results: Over 80% of participants would recommend direct-to-consumer genetic testing options including carrier status reports, DNA ancestry reports, wellness reports, and trait reports to others. However, participants were not as confident that others would be able to accurately interpret their test results. Additionally, more than two-thirds of the participants stated that they would ask a healthcare provider to help interpret their personalized genetic test results.
Conclusions: Participants lack confidence in both their ability to interpret their own results and others to interpret their results. It is important for direct-to-consumer genetic testing companies to educate consumers before providing results in order to minimize potential harms due to misinterpretation of results. Further research is needed to assess motivations to participate in direct-to-consumer genetic testing, impact of testing, and understanding of genetic testing results in emerging adults.

Sam Gottlieb
SELECTIVE GSK3B DELETION IN CamkIIa FOREBRAIN NEURONS OR INHIBITION VIA TIDEGLUSIB, DECREASES ETHANOL CONSUMPTION IN C57BL/6J MICE

Purpose: We previously identified glycogen synthase kinase-3 beta (*Gsk3b*) as a central member of a gene network highly regulated by acute ethanol in medial prefrontal cortex (mPFC) and associated with risk for alcohol dependence in humans. Further, we have demonstrated modulation of *Gsk3b* alters ethanol consumption in rodent models. GSK3B could thus represent a potential new therapeutic target for the treatment of alcohol use disorder (AUD). Here, we investigate the mechanisms of *Gsk3b* action in ethanol consumption and report preclinical evidence for the selective GSK3B inhibitor, tideglusib, as a therapeutic agent for AUD.
Methods: (1) Selective Cre-induced *Gsk3b* deletion in Camk2a-neurons within the forebrain using transgenic Camk2a-CreER/Gsk3b floxed mice bred with Gsk3b fl/fl mice to produce Cre/Gsk3b fl/fl mice, which were injected with tamoxifen to induce *Gsk3b* deletion or (2) selective pharmacological antagonism of GSK3B using Tideglusib delivered via gavage in a corn oil vehicle. Actions on drinking behavior were measured using mouse intermittent ethanol, two-bottle choice self-administration models in C57BL/6J mice.
Results: Deletion of *Gsk3b* in Camk2a-neurons decreased ethanol consumption and preference. There was no significant effects of sex or sex*genotype on either consumption or preference, so sexes were pooled. *Gsk3b* deletion did not alter basal locomotor activity, anxiety-like behavior (light-dark box), taste preference for quinine or saccharin, or ethanol pharmacokinetics. Initial administration of tideglusib (100mg/kg twice daily) or corn oil vehicle via gavage decreased total fluid consumption in all groups, regardless of ethanol drinking history or tideglusib treatment. However, following prolonged tideglusib, mice decreased binge (2hr) and daily (24hr) ethanol consumption and preference after three weeks of administration relative to vehicle controls. Tideglusib studies were only performed in male mice. Control studies showed no effect of tideglusib on liver fat accumulation in ethanol consuming animals. Ongoing work is assessing alternative oral tideglusib delivery methods in decreasing ethanol consumption.
Conclusion: These results suggest GSK3B may be a therapeutic target for treatment of AUD. Deletion of *Gsk3b* in forebrain Camk2a-neurons showed a regional and cell-type specificity in GSK3B's modulation of ethanol consumption and preference, providing insight into the mechanisms of *Gsk3b* action in ethanol consumption. Targeting GSK3B using tideglusib, a selective GSK3B inhibitor, also produced a decrease in ethanol consumption and preference over water during the fourth week of treatment. These findings were consistent with previous work in our lab investigating the delivery of tideglusib through intraperitoneal injections, though these studies were limited to a shorter drug-administration period. Here we have used a more therapeutically translatable route of administration via oral gavage and begun to investigate the longer-term effects of tideglusib on ethanol behaviors and toxicity. Tideglusib is a clinically available agent that warrants investigation in the treatment of AUD. *Supported by NIAAA grants P50AA022537 and R01AA027581.*

Alaina Jaster
Influence of 2,5-dimethoxy-4-iodoamphetamine (DOI) on ethanol preference and consumption in C57BL/6 male mice

Substance use disorders (SUD) account for a large number of mental health diagnosis in the United States and around the world. Approximately 13.6 million adults 26 or older and 5.1 million young adults (ages 18-24) battled with a SUD in 2017. Alcohol Use Disorder (AUD) alone effects nearly 6% of the adult population within the United States. This creates a substantial burden on the individual, with alcohol being the third-leading cause of preventable death in the United States. Few treatments for AUD exist, with no new FDA-approved therapeutic treatments within the last 15 years. Additionally, the limited treatments we do have are estimated to produce sustained abstinence in less than 20% of individuals. Psychedelics, such as lysergic acid diethylamide (LSD), psilocybin and 2,5-dimethoxy-4-iodoamphetamine (DOI) affect processes related to cognition, perception and sensory processing.

Recently, it has been demonstrated that serotonin 5-HT_{2A} receptor agonists, such as psilocybin, can be useful in attenuating substance abuse. As an example, clinical findings have demonstrated the ability of psilocybin to decrease heavy drinking days in alcoholic heavy drinkers. Studies utilizing both rats and mice have also suggested the ability of DOI to decrease ethanol preference and consumption in a two bottle choice paradigm of drinking behavior. The present study aimed to assess the ability of two acute doses of DOI (2 mg/kg and 5 mg/kg) on ethanol preference and consumption using the two-bottle choice paradigm. To test this, 15 adult male C57BL/6 mice were kept on a reverse light cycle and trained on the two-bottle choice procedure, in which they were allowed to drink for four weeks to obtain a baseline reading of drinking behavior. Following these four weeks, mice were assigned to either the treatment group or vehicle group based on weight and baseline drinking behavior. On the first day of the fifth and sixth weeks, mice were injected intraperitoneally with a dose of DOI or saline vehicle 30 minutes prior to access to 20% ethanol. The amount consumed of both water and ethanol on drinking days was measured at 2- and 24-hours and analyzed to calculate consumption and preference. Overall, our findings suggest that DOI did not affect ethanol consumption or preference at the 2- or 24-hour measures. The DOI-treated group showed no difference from the vehicle-treated group after receiving an either moderate (2 mg/kg) or high (5 mg/kg) dose of DOI. There was an overall interaction of time and treatment in both 2- and 24-hour fluid consumption in the groups. Further studies are warranted using DOI or other psychedelics and other paradigms for assessing drinking behavior to understand the effects of psychedelics in modulating substance use behavior.

Jessica Kiernan

Racial and ethnic disparities in access to primary care among men who have sex with men (MSM) in the US, a population at high-risk of HIV infection

TITLE: *Racial and ethnic disparities in access to primary care among men who have sex with men (MSM) in the US, a population at high-risk of HIV infection*

BACKGROUND: In 2018, 70% of new HIV diagnoses in the US were among MSM, with disparities by race and ethnicity. Primary care settings increasingly serve as sites for HIV prevention. While racial and ethnic disparities in access to primary care are documented, their persistence among MSM is unknown. We examined racial and ethnic disparities in primary care access among MSM as a potential contributor to disparities in HIV prevention.

METHODS: We used pooled, multi-year data from the National Health Interview Survey (NHIS) (2013-2018) IPUMS database to evaluate differences for non-Hispanic White (NHW) vs. non-Hispanic Black (NHB) and Hispanic self-identifying MSM; controlling for demographic, health-need and time (year) effects. Outcome measures were: insurance status, has usual place of care, usual place is emergency department (ED, an acute care site), ≥1 organization-based barrier (i.e., physician hours), ≥1 socially determinant-based barrier (i.e., food insecurity) and saw a general physician <12 months. We used multivariable logistic regression to assess the association. Having seen any physician <12 months, using an ED or hospital outpatient department as a usual place of care and ≥2 organization or socially determinant-based barriers was evaluated in sensitivity analysis.

RESULTS: The sample included 1,867 MSM, aged 18-64 years. Significantly (p<0.05) fewer NHB and Hispanic MSM had health insurance, a usual place of care or saw a general physician <12 months. A higher percentage reported the ED as their usual place of care and experienced ≥1 socially determinant barrier. NHB and Hispanic MSM were less likely to be insured (adjusted Odds Ratio (aOR)=0.54, p=0.001) or to have seen a general provider <12 months (aOR=0.70, p=0.016). They were more likely to report socially determinant barriers (aOR=2.47, $p<0.000$) and use the ED as their usual place of care (aOR=4.14, $p=0.006$).

CONCLUSIONS: Racial and ethnic disparities exist across multiple measures of access to primary care among MSM. Primary care engagement should be immediately prioritized to promote access and equity of HIV prevention.

Emmanuel Magsino

Influence of Telephone Preoperative Evaluations on Patient Medication Compliance on Day of Surgery

Background

Patient medication compliance is difficult across all medical specialties. In the preoperative time frame leading up to the morning of surgery, medication compliance is a challenging but crucial component of care as failure to comply with preoperative medication instructions may lead to serious perioperative consequences. Therefore, medication compliance is of the utmost importance for patient safety. Prior studies have shown that compliance increases with multimodal interventions including in-person education, telephone reminders, and standardized EMR generated instructions. (2, 3) However, due to the recent COVID-19 pandemic, many patient visits have transitioned from in-person to virtual or telephone which may limit the interventions that patients may receive. (4) Studies from other specialties demonstrate that telehealth interventions are an effective means of improving medication compliance. (1) However, in specialties such as anesthesia which are more known for direct patient contact, the efficacy of telemedicine has not yet been elucidated.

Methods

PACE clinic providers and nurses gave medication instructions over a telephone preoperative anesthetic evaluation a week to several days before the patients' surgery. On the day of surgery (DOS), a survey was conducted by medical students to measure patient adherence to medication instructions. The medical students administered an original questionnaire to interview patients in the presurgical unit (PSU) of the VCU hospital. Eligible participants were 18 or older, spoke English, gave verbal permission, and were evaluated by the PACE Clinic over telephone. To determine medication compliance, we rigorously compared the medication instructions provided by PACE with each patient's own report of which medications they took on their morning of surgery. We also compared the recorded date of their evaluation with each patient's own report of when they recall having their evaluation. Data were compiled using MS Excel and analyzed using conventional inferential biostatistics with a 95% Confidence Interval.

Results

A total of 80 patients were interviewed at the PSU of the VCU hospital on their day of surgery (DOS) in this prospective non-randomized observational study. In total, 70% of all patients interviewed were found to understand instructions and were compliant with medication instructions (n=56). 20% of all patients were found to understand instructions and were non-compliant (n=16). 8.75% of all patients did not understand instructions and were non-compliant (n=7). 1.25% of all patients did not report getting a call (n=1). Within our patient population, 18.75% were age 18-34 (n=15), 17.5% were age 35-49 (n=14), 45% were age 50-64 (n=36), and 18.75% were age 65+ (n=15). Among age groups, 80% of the patients in both the 18-34 and 65+ age groups understood instructions and were compliant. 71% of patients age 35-49 understood instructions and were compliant. 61% of patients age 50-64 understood instructions and were compliant.

Conclusion

Due to the COVID-19 pandemic, the PACE clinic conducted more telephone assessments to minimize patients' and providers' risk of acquiring and disseminating the infection. This change presented an opportunity to assess patients understanding of DOS medication instructions when contacted over the phone. This survey suggests that telephone assessments seems to be an effective means of achieving patient medication compliance on the day of surgery. However, during patient interviews, it was noted that many patients may have been confusing the PACE telephone evaluation calls with the DOS reminder calls. This could influence medication compliance as both can potentially give different sets of patient instructions. Suggestions from the surveys included sending instructions through the patient portals, calling again if the patient missed the call, making patient call backs easier to connect with providers, and clarifying medication nomenclatures. Outcomes will be shared with clinic staff and further data analysis

will be performed to find ways to improve compliance and patient safety. Current evidence suggests that telehealth video encounters may be equal or superior to telephone encounters for patient care compliance but there is paucity of research on the topic and further investigation is necessary.

Jinkal Modi

Formation of Vasculogenic Mimicry: Role of melanoma differentiation associated gene-9/syntenin

Malignant melanoma (MM) is the most aggressive skin cancer and the most frequent skin disorder in Caucasians. MM is associated with aggressive and progressive disease states, leading to major cancer-related morbidity and mortality. Recent investigations identify a new non-angiogenesis-dependent pathway vasculogenic mimicry (VM), which is considered a cancer hallmark that can independently facilitate tumor neovascularization by the formation of fluid-conducting and vascular endothelial cells. MM cells undergoing VM can dedifferentiate into numerous cellular phenotypes and acquire endothelial-like features, resulting in the formation of the *de novo* matrix-rich vascular-like network, such as plasma and red blood cells. The cogeneration of endothelial cells, channels, laminar structures, and heparin sulfate proteoglycans are the main pathophysiological characteristics of VM in human melanoma patients. In highly aggressive melanoma cells downregulation of vascular endothelial cadherin and upregulation of ECM components promote the perfusion of the VM pathway. We investigated whether *mda-9/syntenin, a pro-metastatic gene,* affects VM in MM. The expression of mda-*9/syntenin* was modulated using gain-of-function and loss-of-function strategies to determine its potential role in VM. Downregulation of *mda-9/syntenin* in aggressive melanoma cells decreases VM, while over expressing *mda-9/syntenin* in immortalized melanoma cells increases VM. These findings shed light on a novel role and molecular mechanism of action of *mda-9/syntenin* in VM, which may contribute significantly to the metastatic phenotype of these aggressive cancers.

Deo Mujwara

Cost-effectiveness of Alternative HIV Testing Strategies among Hard-to-Reach Populations in East and Southern Africa.

Background

Uptake of HIV testing services remains substantially low in high-risk and hard-to-reach populations, particularly female sex workers (FSWs) and long-distance truck drivers (truck drivers) in East and Southern Africa, who contribute nearly half of new HIV infections including in the general population. Strategies targeting high-risk and hard-to-reach populations have been shown to improve HIV test uptake in this setting but may require more resources. We examined if these strategies are cost-effective.

Methods

Seven strategies are examined: i) No testing, ii) voluntary testing, iii) provider-initiated and -administered testing, community delivery of: iv) self-testing kits, v) self-testing coupons, and vi) HIV testing referral cards using peer-educators, and vii) offering a choice of self-testing at the health facility. We developed a lifetime Markov model to examine life years saved, disability adjusted life years (DALYs) averted, economic costs, and incremental cost-effectiveness ratios in a cohort of 30-year-old high-risk and hard-to-reach men and women living with HIV. The model health states are defined based on stages of HIV disease progression and engagement in clinical HIV care. Economic costs are estimated from a societal perspective and reported in 2017 USD. The relative performance of strategies was assessed using the incremental cost-effectiveness ratio (ICER), expressed in US$/DALY averted, and the cost-effectiveness determined according to the willingness to pay threshold equivalent to the GDP per capita for Kenya in 2017 ($1,570). Future costs and health benefits are discounted at an annual rate of 3%. Deterministic sensitivity analysis was performed to assess uncertainty in model parameter inputs.

Results
In the base case analysis, delivery of self-testing kits in the community was cost-effective with an ICER of less than $600 per DALY averted and may save up to 16 life years compared to the "No testing" strategy (Table). Life expectancy at 30 years varied based on the disease stage (asymptomatic early to AIDS) at the time of HIV test uptake, with delivery of self-testing kits having the highest life expectancy ranging from 9 to 25 and 13 to 30 among truck drivers and FSWs, respectively. Delivery of self-testing kits in the community was cost-effective among FSW when 75% or more are reached. Findings were robust to uncertainty in parameter inputs.
Conclusion
Using peer-educators to deliver HIV self-testing kits in the community is a cost-effective strategy to improve HIV test uptake in populations that are hard-to-reach and at high-risk of acquiring and transmitting HIV.

Josly Pierre-Louis
Radiation Induces Metabolic Changes in Pulmonary Fibroblasts

Rationale: Exposure of the lung to ionizing radiation, such as during radiotherapy, can result in pulmonary fibrosis (PF), which has few treatment options. PF is characterized by an accumulation of extracellular matrix proteins that form scar tissue, resulting in dyspnea, disruption of gas exchange, and even death. We and others have shown that metabolic reprogramming is a hallmark of idiopathic pulmonary fibrosis (IPF). IPF lung tissue, and lung fibroblasts treated with TGF-b, exhibit increased aerobic glycolysis with increased expression of lactate dehydrogenase A (LDHA) and excess production of lactate, leading to reduced extracellular pH that activates latent TGF-b. **Here, we hypothesized that ionizing radiation would cause aerobic glycolytic metabolic dysregulation in primary human lung fibroblasts.**
Methods: Primary human lung fibroblasts (HLFs) from two non-fibrotic donors were seeded and subjected to either no treatment, TGF-b treatment (500 pg/mL), or radiation (3, 5, and 7 Gy). Cell lysates were harvested 2 and 5 days after irradiation for RNA and protein, respectively. Gene and protein expression of metabolic markers were determined by RT-PCR and western blot. TBP (RT-PCR) and GAPDH (western blots) were used as loading controls. Cell viability was estimated immediately prior to cell lysate harvest using Presto Blue.
Results: Primary non-fibrotic HLFs exposed to irradiation exhibited significant upregulation of Pyruvate Dehydrogenase Kinase (PDK)1 (0.5 – 3-fold, $p<0.05$), LDHA (1.4-fold, $p<0.05$), and LDHB (2-fold, $p<0.05$). The transcription factor FOXO1 exhibited a trend toward increased expression. Cell viability was unaffected by increased radiation dose.
Conclusions: Radiation increased fibroblast expression of genes involved in aerobic glycolysis (PDK1, LDHA, LDHB), in a similar pattern to that seen in IPF fibroblasts. FOXO1, which regulates PDK1 and other genes in the glycolytic pathway, was not significantly upregulated. Radiation may alter its activity rather than mRNA levels. The metabolic changes are closely associated with creating a profibrotic extracellular environment in IPF by promoting an acidic environment. This phenomenon in fibrotic fibroblasts is similar to observations of the Warburg effect in cancer cells, where aerobic glycolysis occurs despite the presence of oxygen, allowing growth advantages. Our evidence suggests this phenomenon can be driven by radiation in lung fibroblasts and affirm that glycolytic reprogramming may also be a hallmark of radiation-induced fibrosis. Further understanding of the common mechanisms that create this metabolic shift could provide novel therapeutics for fibrosis treatment.

Dongjin Suh
Carotid artery dissections from TCAR procedure as reported by the FDA

BACKGROUND:
Transcarotid artery revascularization (TCAR) is hybrid procedure that allows carotid stenting using direct surgical access of the carotid artery to restore blood flow through the carotid artery. It has shown the

lowest perioperative stroke rate when compared with any prospective trial of transfemoral carotid artery stenting. However, intraoperative injuries related to the procedure and its management are not well characterized. We anticipate that this analysis will add qualitative insight in further characterizing adverse outcomes of this novel technology.

METHODS:
The FDA maintains a database called the MAUDE (Manufacturer and User Facility Device Experience) for surveillance of all medical devices approved for use. This database was queried for all cases associated with Silk Road Medical's ENROUTE Transcarotid Neuroprotection System from September 2016 to October 2020.. Case narratives related to patient injuries were individually analyzed to determine type (carotid artery dissection) and time of injury (intraoperative, recovery, post-discharge follow-up). Carotid artery dissection (CD) reporting was further analyzed for associated procedural event at the time of injury, number of access attempts to CD repair, and type of CD repair.
RESUTS:
Of the 115 unique incidents in the database, there were 58 CDs. Most were identified intraoperatively (n=55), while 3 were incidentally identified postoperatively. Overall, sheath placement was the most common procedural event attributed to CD (n=34). There was adequate narrative information about CD repair in 54 patients where 52 of them were performed intraoperatively. There were total of 28 endovascular repair and 24 open surgical repairs of CDs from TCAR procedure. (table1)

Intraoperative CD Repair	**Endovascular Repair N=28**	**Open Surgical Repair N=24**	**p value***
CD repair without additional access attempts	25/50	15/50	0.067
CD repair that required 2 or more access attempts	3/12	9/12	0.039

*Fisher's Exact
There was no significant difference in rate of endovascular and open surgical repair of CDs that did not need additional access attempts. However, rate of open surgical repair was significantly higher in CDs with persistent failure to engage the true lumen in 2 or more additional access attempts.
Total of 4 strokes were associated with CD. Two occurred during recovery from TCAR admission where one was not intervened per physician's discretion despite evidence of dissection during the procedure. The other was associated with a fall from a hypotensive event 7 hours after an endovascular CD repair. One incident of stroke occurred intraoperatively during a conversion to CEA as a result of CD. One incident of stroke occurred 4 days after TCAR procedure in which a CD was identified during the stroke evaluation

Conclusion:
Carotid artery dissection is the most common injury related to TCAR as reported on MAUDE database. Most common procedural event associated CD was sheath placement. Rate of open surgical repair was significantly higher than endovascular repair in dissections with persistent failure to engage true lumen despite additional access attempts. This should add to qualitative insight among vascular surgery community regarding intraoperative management of carotid artery dissections from a TCAR procedure.

Dongjin Suh
Device-Related Adverse Events from Watchman FLX Implants as Reported by the FDA

BACKGROUND:
WATCHMAN FLX is a left atrial appendage closure device that is permanently implanted to prevent intracardiac thrombus that form in patients with non-valvular atrial fibrillation from entering the systemic circulation and potentially causing a stroke. This device was recently approved for use by the U.S. Food and Drug Administration (FDA) since July of 2020. Based on the older generation of this device (WATCHMAN), it has been suggested that the device size may be associated with device-related

thrombus.[i] We set forth to characterize device-related complications based on device size as reported by the FDA.

METHODS:
The FDA maintains a database called the MAUDE (Manufacturer and User Facility Device Experience) for surveillance of all medical devices approved for use. This database was queried (Jan 2020 – Jan 2021) for all adverse events associated with Boston Scientific's WATCHMAN FLX. Case narratives were individually analyzed to determine, device size, and presence of any device-related adverse events (DRAE) including intracardiac thrombosis, device migration, and device embolization. All DRAE's were grouped by device size (<27mm vs. ≥27mm) for comparison.

RESUTS:
Of the 138 unique incidents in the database, 112 cases contained device size information for analysis.

Device-Related Adverse Events N (%)	WATCHMAN FLX < 27mm N=43	WATCHMAN FLX ≥27mm N=69	p value*
Intracardiac Thrombosis	6 (13.0%)	23 (35.2%)	0.0271
Device Migration	5 (10.9%)	8 (11.3%)	1.00
Device Embolization	4 (6.5%)	2 (2.8%)	0.739

*Fisher's Exact
Among the three most common device-related adverse events, rate of intracardiac thrombosis was significantly higher in patients with WATCHMAN FLX devices that were 27mm or greater in size compare to the ones smaller than 27mm. There was no significant difference in rate of device migration and embolization between the two groups.

Conclusion:

WATCHMAN FLX is a newly approved left atrial appendage closure device that aims to prevent thrombus from forming in patients with non-valvular atrial fibrillation. Since its approval by the FDA, DRAE from its use have not been well characterized. Analysis of the MAUDE database showed that the rate of intracardiac thrombus formation was significantly higher in devices ≥27mm. This should add to qualitative insight among the cardiology community regarding management of WATCH FLX patients.

Hope Wolf

Modeling Longitudinal Change in Cervical Length Across Pregnancy

Introduction: A short cervix (cervical length < 25 mm) in the midtrimester (18 to 24 weeks) of pregnancy is a powerful predictor of spontaneous preterm birth (gestational age at delivery < 37 weeks). Although the biological mechanisms of cervical remodeling have been the subject of extensive investigation, very little is known about the rate of change in cervical length over the course of a pregnancy, or the extent to which rapid cervical shortening increases maternal risk for spontaneous preterm delivery.

Methods: A cohort of 5,160 unique women carrying 5,971 singleton pregnancies provided two or more measurements of cervical length during pregnancy. Cervical length was measured in millimeters using a transvaginal 12-3 MHz ultrasound endocavity probe (SuperSonic Imagine). Maternal characteristics, including relevant medical history and birth outcome data, were collected for each participant. Gestational age at delivery was measured from the first day of each woman's last menstrual period and confirmed by ultrasound. Repeated measurements of cervical length during pregnancy were modeled as a longitudinal, multilevel growth curve in MPlus. A three-level variance structure was used to account for non-independence of repeated measurements clustered within pregnancies, which are clustered within participants.

Results: The average number of cervical length measurements per pregnancy is 6. The interclass correlation coefficient (ICC) for cervical length measurements clustered within a pregnancy is 0.146, while the ICC for cervical length measurements clustered within a mother is 0.373. A higher maternal body mass index (BMI) is associated with shorter initial cervical length in early pregnancy ($p < 0.001$), and more rapid linear and quadratic rates of change ($p < 0.001$), while maternal age and parity were not significantly associated with cervical length or its rate of change. Parameters describing cervical length and its rate change during pregnancy explained 59% more variance in gestational age at delivery than a single midtrimester cervical length measurement, the current gold standard in clinical practice. A smaller initial cervical length in early pregnancy ($p < 0.01$) and faster linear and quadratic rates of cervical change across pregnancy ($p < 0.001$) were significantly associated with an earlier gestational age at delivery. However, a significant amount of residual variance in individual estimates of cervical length growth parameters remains, which could be accounted for, in part, by common variation in the population.

Conclusion: We have developed longitudinal models of cervical length that describe individual and group level trajectories of cervical change across pregnancy. Extensions of this model incorporating genomic data, can be used to estimate the heritability of cervical length and its role in mediating the timing of birth.

School of Pharmacy

Mohammed AlAwadh

Development of Peptidomimetic and Non- Peptidomimetic Derivatives as Possible SARS-CoV-2 Main Protease (Mpro) Inhibitors

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the cause of coronavirus disease 2019 (COVID-19), a pandemic that has resulted in nearly 2.4 M deaths, and more than 111.8 M confirmed cases worldwide.[1] There is an urgent need for novel drugs that target SARS-CoV-2 and other pathogenic coronaviruses. The COVID-19 main protease (Mpro) plays a critical role in the viral life cycle by releasing essential polypeptides for viral replication and transcription. [2] Furthermore, Mpro has several distinguishing characteristics that make it an appealing candidate for drug development: 1) common among all members of the Coronavirus family, 2) absent of closely related homologues in humans, and 3) a conserved active site.[3] The main objective of this study is to identify potent, oral small molecule inhibitors of Mpro activity to prevent the devastating sequelae of severe COVID-19. To design novel inhibitors of the SARS-CoV-2 main protease, we investigated the binding mode of the recently reported α-ketoamide inhibitors of this enzyme.[2] Following, we utilized in-silico screening to identify 168 peptidomimetic and non-peptidomimetic compounds that are high probability Mpro binding candidates. The compounds were synthesized in 5 to 10 mg for initial screening for their potential inhibition of Mpro using Fluorescence Resonance Energy Transfer (FRET) assay. The study was conducted using the 3CL Protease, MBP-tagged (SARS-CoV-2) Assay Kit (BPS Bioscience, #79955-2), and the fluorescence due to enzymatic cleavage of substrate measured using BMG LABTECH CLARIOstarTM, a fluorescent microplate reader, with an excited/emission wavelength of 360 nm/460 nm, respectively. The FRET assay showed 29 compounds to exhibit lower fluorescence compared to positive control, indicating inhibitory activity, with three of the compounds exhibiting over 50% enzymatic inhibition. The assay average scores were plotted as dose inhibition curves using variable parameter nonlinear regression to calculate the IC50 values. To design more potent inhibitors, an in-silico molecular docking simulation using the SARS-CoV-2 Mpro crystal structure was conducted to investigate on a molecular level the key binding residues at the active site, as well as the possible binding modes and affinity of the lead inhibitors. Additionally, an in-silico study of the molecular properties and physicochemical profiles of the compounds was performed to predict their pharmacokinetic properties and assess their suitability as potential orally active drug candidates.

Sulaiman Alhudaithi

Pulmonary Delivery of CSF-1R Inhibitors for the Treatment of Osteosarcoma Lung Metastases

Background: The lungs represent a major site of metastases from several types of cancers, including osteosarcoma (OS). For OS patients who develop metastases, nearly 85% are found in the lungs, and the main cause of death in this population is pulmonary disease. Systemic chemotherapy remains the main modality for the treatment of primary and metastatic solid cancers including OS lung metastases (OSLM). However, survival rates of OSLM patients have not improved in the past three decades and continue to be very low. In this work, we investigated the potential of locally administered small molecule colony stimulating factor 1 receptor inhibitors (CSF-1Ris , Pexidartinib and BLZ945) in shifting the balance of tumor associated macrophages (TAMs) away from the tumorigenic (M2-like) phenotype, and evaluated their impact on lymphocyte infiltration. We also studied the efficacy of CSF-1Ris in reducing the tumor burden of an immunocompetent model of OSLM. Local administration of TAM immunotherapy to the lungs may enhance lung biodistribution of such therapies and reduce unwanted off-target toxicity.
Methods: Murine osteosarcoma cells (luc, tdT-K7M2, known to be highly metastasized to the lungs) were injected to female Balb/c mice before being treated with Pexidartinib and BLZ945(intratracheally administered). Western blot was performed using lung tumors to assess the effect of therapeutics on their molecular target (CSF-1R). Immunofluorescence and flowcytometry were utilized to examine the impact of treatment on tumor associated macrophages (TAMs). The effect of Pexidartinib on tumor infiltrating lymphocytes and on the expression of PD-1 and PD-L1 was investigated using flowcytometry. Both bioluminescent imaging (in vivo and ex vivo) and lung weight were used to evaluate tumor burden. Toxicity of lung delivered CSF-1Ris was assessed by body weight recordings and hematoxylin & eosin (H&E) staining of lungs and livers.
Results: Pexidartinib and BLZ945 significantly inhibited the expression of CSF-1R and reduced recruitment of total TAMs, with more profound effect on M2-like TAMs than on the anti-tumorigenic phenotype (M1-like), thereby increasing the M1/M2 ratio. Pexidartinib markedly decreased accumulation of the tumor promoting T regulatory cells in the tumor microenvironment and increased the CD8/CD4 ratio, which has been associated with improved therapeutic outcome. The expression of the co-inhibitory (tumor promoting) molecule, PD-1 on both CD4 and CD8 T cells was downregulated in response to Pexidartinib. CSF-1Ris therapy led to a significant reduction in tumor burden (in vivo, ex vivo, and lung weight) with no obvious overt toxicity as evident by body weight changes and histology.
Conclusion: Tumor burden reduction upon local administration of CSF-1Ris to the lungs correlates with the inhibition of the molecular target and the favored changes in profiles of immune cell infiltration. Pulmonary delivery may allow for the outpatient use of this therapy in the treatment of OSLM as formulations in portable inhalers are developed.

Khalifa Alrajeh

Important Pharmacogenes for Personalized Medicine: A Cross-Sectional Study to Estimate the Prevalence of Genetic Polymorphisms of Very Important Phramacogenes in the Asians/Pacific Islanders

Background

Pharmacogenetic testing, where prescriptions are tailored to the individual patient based on his/her genetic makeup, increases the ability to predict individual drug response. However, little is known about the prevlanece of clinically actionable pharmacogenes in diverse populations. This study seeks to assess the prevalence of select drug-gene alleles that are implicated in the metabolism of commonly prescribed drugs (e.g., antiplatelet), so-called Very Important Pharmacogenes (VIPs). The results of this study will fill in the gaps of knowledge of VIPs in underrepresented population and characterize their potential risk for drug adverse events or due to their underlying genetic polymorphisms, especially in patients of Asian, Hawaiian or Marshallese, or Samoan descent.

Methods

The Ensembl genome browser was used to compare the frequencies of three major single nucleotide polymorhphisms (SNPs) in the cytochrome P450 subfamily 2 class 19 (*CYP2C19)* in EUR with our studied populations . Speciclally, SNPs of interest included rs4244285 G>A, rs4986893 G>A, and rs12248560 C>T, for *CYP2C19*2, *3,* and **17*, respectively. In this cross-sectional study, chi-square or Fisher's exact test was used, when appropriate, with $P < 0.05$ for significance. Our central hypothessis was the genotype/allele frequencies are different between each group of post-partum females from Asian (Filipino/Japanese/ Korean) /Hawaiian/Pacific Islander (Marshallese/Samoan) descent and EUR. Besides, this project describes the clinical impact of VIP genetic variations on widely prescribed drugs metabolized by CYP2C19. This project will ultimately assist in selecting the most appropriate medication for patients from underpresented racial background, using currently available guidelines.

Results

Biobank DNA samples of 1064 participants were used to calculate genotype and allele frequencies for our population groups. This sample was distributed across six self-reported ethnicities; Filipino (21.61%), Japanese (19.73%), Korean (9.77%), Hawaiian (14.84%), Marshallese (15.13%), and Samoan (18.89%). In each ethnicity from our population, the distributions of allele and genotype frequencies of the *CYP2C19* *2 (rs4244285 G>**A**), *3 (rs4986893 G>**A**), and *17 (rs12248560 C>**T**) variants were significantly different from EUR. The overall loss-of-function allele (A) frequencies of *2 (rs4244285 G>A) and *3 (rs4986893 G>A) were significantly higher in our population groups (25%-36% and 2.5%-10%, respectively) than EUR (15%, and 0%, respectively). In contrast, the overall increased function allele (T) frequencies of *17 (rs12248560 C>T) were significantly higher in EUR (22.5%) than in our population (1%-6%). The Asian subpopulations, Hawaiian, and Pacific Islanders were found to have significantly higher loss-of-function genotype (A/A) frequencies of *2 (rs4244285 G>A) and *3 (rs4986893 G>A) (8%-16% and ~1.3%, respectively) than EUR (1.2% and 0%, respectively). Finally, the intermediate metabolizer of CYP2C19 phenotype (G/A) was detected at a signficnatly higher rate in our population groups (rs4244285 G>A and rs4986893 G>A; 34%-45%, and 5%-20%, respectively), compared to EUR (26.6%, and 0%, respectively).

Conclusions

Significant differences in genotype and allele frequencies of *CYP2C19* were found between Asians/Hawaiians/Pacific Islanders and EUR. Further, *CYP2C19*2 (*rs4244285 G>A) and **3* (rs4986893 G>A) variants were detected at higher frequencies in Asians, Hawaiians, and Pacific Islanders than EUR. Our results are consistent with published reports of Asian populations are enriched with the reduced or loss of function alleles of *CYP2C19* compared with EUR. Indeed, knowledge of an individual's *CYP2C19* metabolizer status may be useful before prescribing clopidogrel in our studied populations.

Monther Alsultan

Development of an online warfarin dosing platform using R programming language to facilitate healthcare professional duties and limit medication related errors.

Objective: 1) Gain experience in developing platform agnostic, fully operational and clinically relevant web applications for effective pharmacist led patient care. 2) Create a decision- support tool using open source software to facilitate evidence-based management therapy of warfarin in clinical settings where it is available for everyone to use at anytime and anywhere.
Introduction: Healthcare is continuously growing and modern technologies provide opportunities for the creation of effective tools to manage multiple diseases. Mobile devices such as smartphones enable easy access to a variety of websites remotely and make data and information readily available for use. Additionally, mobile devices can offer healthcare providers with fast and easy access to essential medical information to support patient care. The profession of pharmacy is fast changing from one

primarily focused on dispensing medicinal goods to one intensely focused on the delivery of patient care. This has led pharmacists to be involved in a diverse clinical service such as patient's education, Medication Therapy Management (MTM) and medications dose adjustment. Implementing such services often place additional stress on the daily routine of pharmacists. Therefore, there is a high need to find efficient ways to support healthcare related clinical services. One of the widely used anticoagulant medications is warfarin. Warfarin has been available on the market as effective therapy in management of thrombotic disorders. However, warfarin is frequently associated with medications errors which may lead to serious adverse events. The purpose of this paper is to demonstrate this fact fully via warfarin dosing web application to help support healthcare professionals in clinical settings.
Methods: Open-source programming language R in conjunction with RStudio version 1.2.5033 were used to develop and implement our warfarin dosing platform. Shiny packages for R with other packages were used to create our platform as a web-based app. We based our calculations and function of our platform on the UW health warfarin management- adult- ambulatory clinical practice guidelines.
Results: The platform contains three tools users can use:1) Calculating the warfarin maintenance dose,2) Selecting INR goals and duration of therapy,3) Assessment of Bleeding risk. Additionally, the app has a hyperlink to direct the users to the resource used in this app. On the first page of the app, the user can select their INR target and input a patients INR and weekly dose. Then, the app will immediately display the results. On the second page of the app, there is a feature for users helps to choose the INR target recommended based on patient conditions; There is a drop down menu contains different type of antithrombotic indications. Additionally, on the third page of the app, there is a feature for users helps to calculate the bleeding risk using HAS-BLED score. The users can answer “Yes” or “No” on multiple risk factors to stratify patients’ risk into low, moderate or high.
Conclusion: Our warfarin dosing platform demonstrates the feasibility of creating a free-tool for healthcare professionals to facilitate their daily practice and potential for reducing medication related errors. Additionally, we demonstrate that pharmacists can take advantage of open-sources resources available to develop any health-related application suitable to their needs.

Future Directions: The skills gained in the implementation of this full stack web application development will be further improved upon to develop additional clinical support tools for pharmacists. Further implementations will also incorporate fully or partially trained machine learning models. Our ultimate goal is to allow pharmacists to utilize data driven decision making strategies to implement fast and effective patient care.

Mengchu Li

Targeting the Crossroads of Pain Management and Opioid Use Disorders: Development of Novel Dual Functional KOR-DOR Agonists

Background. In the US, over 2 million people are living with opioid addiction, and 20 million adults are affected by daily pain. To end the staggering opioid crisis of today, the most crucial solutions are to develop addiction treatments and discover safe analgesics. Kappa opioid receptor agonists have been found to possess potent analgesia without significant abuse liability and opioid addiction-reversing effects. Hence, we have carried out a structure-activity relationship (SAR) studies of nalfurafine (NFU) for better addiction treatments and non-addictive analgesics.

Methods. Stereoselective chemical syntheses and “one-pot” methods were explored and established for preparing eight essential intermediates. Eight final compounds were afforded by coupling these intermediates with the desired acyl chloride. Membrane-based competitive radioligand binding assay was performed to determine the affinities of the compounds at kappa opioid receptor (KOR), delta opioid receptor (DOR), and mu opioid receptor (MOR), respectively. Membrane-based [^{35}S]GTPγS binding assay and cell-based calcium flux assay were employed to evaluate agonism and antagonism of these compounds

at all three opioid receptors. Analgesic effects of these compounds were examined in mouse warm water tail-flick assays.

Results. All intermediates and target compounds were successfully synthesized with reasonable yields. Seven out of eight final compounds possessed high binding affinities to the KOR (*Ki* = 0.1-2.9 nM). Based on *in vitro* affinity and functional assays, all compounds were characterized as dual functional KOR-DOR full agonists and low efficacy MOR partial agonists. The 3-hydroxy group in the compound structures was found to be critical for the binding and activation at both the DOR and MOR but not the KOR. *N*-methylation on the amide nitrogen atom seemed to benefit KOR affinity, selectivity and potency. Six compounds demonstrated *in vivo* analgesic effects in the tail-flick assays. Four compounds showed higher potency than morphine, and, particularly, one was 67-fold more potent than morphine (ED_{50} = 0.037 mg/kg).

Conclusions. Some critical SARs have been concluded, which can be applied to future drug design. Moreover, one potent dual KOR-DOR agonist has been identified with potential as a non-addictive analgesic and anti-addiction agent.

Joshua Morriss

Fish Oil supplementation and Aspirin treatment modulates lipid profile in Platelet Rich Plasma

Purpose: Assess the extent to which orally administered ω-3 fatty acid incurs changes to the circulating lipidome of platelet rich plasma (PRP) within an acute time frame of 6 hrs in humans.

Introduction: Autologous PRP is a matrix with an active lipid fraction, containing derivatives of ω-3 and ω-6 polyunsaturated fatty acids (PUFAs), utilized to stimulate the healing of damaged tissues. Oxylipins and other PUFA derivatives serve as time sensitive mediators of inflammation whose dysregulation are associated with pathological tissue repair. Nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin modulate eicosanoids by inhibiting their proinflammatory pathways, triggering aspirin-specialized pro-resolving lipid mediator production pathways. The ratios of proinflammatory and pro-resolving lipids are dependent in part on the availability of their precursor's lipids. We investigated whether the short-term alteration of the ω-3/ω-6 ratio led to the production of PRP with a more pro-resolving lipid profile.

Methods: Whole blood from 45 patients was obtained at baseline and after 6-hours, and processed into PRP. Patients were randomly assigned to either control or those receiving one 1400 mg fish oil tablet, Bayer low-dose aspirin (81mg), or combinational therapy. Lipids were acquired by targeted and untargeted liquid chromatography mass spectrometry. Spearman rank correlation analysis enabled the visual assessment of what effects treatments had on the relative abundance of PUFA derivatives. Lipids selection for analysis on the basis that they were significantly ($p<0.05$) correlated with essential ω-3 and/or ω-6 PUFAs in the control group. Student's unpaired t-test with FDR-adjustment of p-values determined the putative effect therapies had on lipid concentrations. All analyses were conducted in MetaboAnalyst 5.0, JMP Pro 15.1.0, and in-house R scripts (version 4.0.3).

Results: Fish oil ω-3 PUFA supplementation and aspirin had separate and interacting effects on oxylipin and neutral lipid correlations. Strongly correlated ω-6 PUFA metabolites were reversed or reduced in either treatment. A total of 24 lipid species were significantly modulated in the fish oil treatment group, with significant ($p<0.01$) reductions in plasma concentration for ω-6 PUFA derivatives 4-series leukotriene B4 (LTB_4), lipoxin A4 (LXA_4), and epoxide 11,12-EET.

Conclusions: This prospective study demonstrated that short-term dietary PUFA administration can yield exogenous, modulatory effects on PRP's lipid fraction comparable to that of therapeutics.

Wint War (Vivian) Phyo

Pharmacogenomics and SSRI Appropriateness in Older Community Dwelling African Americans

Background:

Depression and anxiety disorders are among the most common illnesses experienced by older adults (age 60 and over). The selective serotonin reuptake inhibitors (SSRIs) are preferred over other classes of antidepressants and have become the mainstay of treatment for these disorders in older adults due to their high efficacy level and favorable safety profiles. However, SSRIs are mainly metabolized by highly polymorphic cytochrome P450 enzymes, particularly CYP2D6 and CYP2C19. Pharmacogenomics is a field of precision medicine, where patients' genotypes are analyzed and matched to appropriate phenotypes. Pharmacogenomic data of CYP enzymes can then be utilized to predict the presence of possible SSRI drug-gene interactions. The aims of the study are to analyze the frequency of CYP2D6 and CYP2C19 polymorphisms in African American older adults who are taking SSRIs and use Clinical Pharmacogenetics Implementation Consortium (CPIC) guideline for dosing of SSRIs to improve SSRIs efficacy and safety for these older adults.

Methods:

Participants (over the age of 60) were enrolled into Translational Approaches to Personalized Health (TAPH) study, which is a pharmacogenomic study of older community dwelling African Americans in Richmond, Virginia. DNA samples were collected via Ora-gene saliva kits and the DNA was analyzed using the PGx Express Chip on the QuantStudio 12K Flex system. After quality control was performed, we analyzed the genotypes for impact on SSRIs in the first 64 participants (Fig. 1), based on the CPIC Guideline for CYP2D6 and CYP2C19 genotypes of SSRIs.

Results:

Eighteen percent of the first 64 participants (i.e. 12 out of 64) were prescribed SSRIs. The enzyme activity levels of both CYP2D6 and CYP2C19 in the participants taking SSRIs are summarized in Figure 2. Overall, only 2 participants had normal activity levels of both CYP2D6 and CYP2C19. The rest of the participants had at least one variant allele that results in decreased or increased activity level of the CYP2D6 and CYP2C19 enzymes. After matching the participants' enzyme activity levels of CYP2D6 and CYP2C19 and the major metabolic pathway of their agent of SSRIs, about ⅔ of the participants are at risk for drug-gene interaction (Fig. 3).

Conclusion:

Among 8 participants who may experience sub- or supra-therapeutic effects of SSRIs based on their pharmacogenomic results, 2 participants, in particular, are at increased risk of serious adverse effect of citalopram-induced prolonged QT interval. Pharmacogenomics can improve patients' health and reduce or prevent these kinds of adverse drug effects by predicting the drug-gene interactions.

School of Social Work

Kaija Craft

"Food is last on my list:" Understanding food insecurity on an urban college campus

Food insecurity among college students has become an increasing concern on campuses nationwide. The average rate of food insecurity among college students is estimated to be 32.9%, with students often experiencing the compounding effects of food, financial, and housing insecurities (Bruening et al., 2017; Leung et al., 2020). Furthermore, college students of traditionally marginalized racial groups, such as Black, Latino/a, and Native American students, are more likely to report experiencing food insecurity (Baker-Smith et al., 2020; El Zein et al.,2019). While there is a growing body of knowledge concerning quantitative data, qualitative research is needed to illuminate the full experience of college students living with food insecurity. This study aims to discover the barriers to food access, the impact of experiencing food insecurity, and coping strategies among college students. As part of a larger mixed-methods study, three focus groups were held at a large, urban university in the Southeastern United States. Findings present that barriers to food access included limited healthy options, limited kitchen access, a lack of transportation, insufficient time, and financial hardship. Students stressed the physical, mental, and emotional toll of living with food insecurity. Finally, various coping strategies were described, such as changes in eating habits, prioritizing other expenses, and participating in research. These findings contribute to the broader research on student basic needs and can help inform universities and policymakers to mitigate food insecurity on campus.

Angela Matijczak

The Moderating Effect of Comfort from Companion Animals and Social Support on the Relationship between Microaggressions and Mental Health in LGBTQ+ Emerging Adults

Introduction: Sexual and/or gender minority (SGM; e.g., lesbian, transgender, nonbinary, LGBTQ+) individuals are frequently exposed to various forms of minority stress that impact their mental health and wellbeing. Microaggressions, a form of minority stress, are defined as unconscious behaviors or statements directed at members of marginalized groups that reflect a hostile or discriminatory message. Microaggressions have been associated with several detrimental outcomes, such as depression and anxiety. Social support has been found to be an important protective factor for SGM emerging adults. Additionally, relationships with companion animals are an underexplored source of support that may be important for SGM individuals. This study aims to explore whether, and to what extent, social support from humans and comfort from companion animals moderates the relationship between SGM-related microaggressions and depressive and anxiety symptoms.
Methods: We partnered with five community organizations to recruit our sample, which consisted of 134 SGM emerging adults between the ages of 18 and 21 (M age = 19.31). Approximately 98.5% of our sample identified with a sexual minority identity, 49.5% identified with a gender minority identity, and 37.3% identified as a racial/ethnic minority. All participants had lived with a companion animal within the past year, with the majority of participants living with a dog and/or a cat. We conducted eight simple moderation analyses to explore whether, and to what extent, comfort from companion animals and human social support individually moderated the relationship between two forms of microaggressions (i.e., interpersonal, environmental) and anxiety and depressive symptoms. Further, we ran four additive moderation analyses to investigate whether comfort from companion animals and social support from humans moderated the relationship between each form of microaggressions and mental health symptoms, when the other moderator was held constant.
Results: The results of our simple moderation analyses indicated that social support moderated the relationship between both forms of microaggressions and depressive symptoms (interpersonal: $\Delta R\ 2 = 0.03$, $F(1, 125) = 4.74$, $\beta = -0.17$, $t(125) = -2.18$, $p = .03$; environmental: $\Delta R\ 2 = 0.02$, $F(1, 124) = 3.93$, $\beta = -0.19$, $t(124) = -1.98$, $p = .05$). Our findings suggest that social support acted as a protective factor, because the relationship between exposure to microaggressions and depressive symptoms was not

significant when participants reported high levels of social support. Comfort from companion animals also moderated the relationship

between interpersonal microaggressions and depressive symptoms (ΔR 2 = 0.03, F(1, 125) = 4.78, β = 0.18, t(125) = 2.19, p = .03). However, comfort from companion animals seemed to exacerbate the association between interpersonal microaggressions and depressive symptoms, as there was a positive and significant relationship between these two variables when participants reported medium or high levels of comfort from companion animals. The results of the additive moderation analyses found that the relationship between exposure to microaggressions and depressive symptoms was positive and significant when social support was low or medium and comfort from companion animals was high or medium. However, when social support was high, the relationship was no longer significant, regardless of the level of comfort from companion animals.
Discussion: Our results suggest that social support from humans may be a key protective factor that buffers the relationship between microaggressions and depressive symptoms. Further, these findings also highlight the need to continue investigating the complex role of relationships with companion animals on mental health outcomes for SGM emerging adults. In particular, longitudinal studies are needed to clarify the direction of these relationships, as we are unable to make causal inferences with this cross-sectional study. The results from this study have important implications for future research in this area and practice with SGM populations.

Jennifer Murphy

Victimization and psychological wellbeing among sexual and gender minority emerging adults: Testing the moderating role of emotional comfort from companion animals

Introduction: Human-animal interaction science is a growing field, largely due to the potential psychosocial benefits companion animals provide to humans. One way companion animals may influence psychosocial outcomes is through their ability to provide emotional comfort, though few studies have examined relationships between sexual and gender minority stressors (i.e. discrimination, victimization, rejection), human-animal interaction, and psychological wellbeing. To address this gap in the literature, the current study evaluates whether, and to what extent, the association between gender-based victimization and psychological wellbeing (i.e., anxiety, depression, self-esteem) varies as a function of emotional comfort from companion animals among emerging adults.
Methods: Data were collected from young people between the ages of 18 and 21 years who self-identified as a sexual and/or gender minority (N = 134; 37.3% ethnic/racial minority; 49.2% gender minority; 98.5% sexual minority). We conducted three simple moderation analyses that examined whether, and to what extent, gender-based victimization was associated with mental health (i.e., anxiety, depression, self-esteem) as a function of comfort from companion animals. Additive multiple moderation models were also conducted to examine comfort from companion animals and social support as moderators between victimization and each psychological wellbeing indicator.
Results: Results of the simple moderation models suggest that the effect of gender-based victimization on self-esteem was moderated by comfort from companion animals (ΔR 2 = .03, F(1, 125) = 4.66, β = .22, t(125) = 2.16, p = .03) and that the relationship is statistically significant only at low levels of comfort from companion animals (β = -0.38, t = -2.41, p = .02). Further, our additive multiple moderation model with both comfort from companion animals and social support as moderators of the relation between victimization and self-esteem found that victimization was significantly moderated by comfort from animals (ΔR 2 = .03, F(1, 123) = 5.38, β = .24, t(123) = 2.32, p = .02), but not social support. The relation between victimization and self-esteem was significant and negative at low levels of comfort from companion animals, but only for those with high levels of social support (β = -0.43, t = -2.65, p < .01). In contrast, when high levels of comfort from companion animals were reported, the effect of victimization on self-esteem was no longer statistically significant, regardless of whether social support was low or high. We did not find evidence of moderation in models with either anxiety or depression as the dependent variable.
Conclusion: These results suggest that high levels of comfort from companion animals may be a

protective factor against the harmful effects of victimization on self-esteem. However, our results suggest that comfort from companion animals may not provide the same benefits for anxiety and depression. Further research is needed to replicate our results and to elucidate whether other aspects of HAI, such as attachment to pets or caretaking for pets, may play a role in associations between victimization and anxiety and depression. Given the harmful effects of gender-based victimization and other stressful circumstances that LGBTQ+ youth are disproportionately at risk of experiencing (i.e., employment issues, housing insecurity), this study highlights the importance of exploring how, and for whom, comfort from companion animals and other aspects of HAI may provide protective benefits.

Camie Tomlinson

Examining the indirect effects of sexual and gender minority stressors on self-efficacy and psychological stress via human-animal interaction during emerging adulthood

Introduction: Human-animal interaction science is a growing field, largely due to the potential psychosocial benefits companion animals provide to humans. One way companion animals may influence psychosocial outcomes is through their ability to provide emotional comfort, though few studies have examined relationships between sexual and gender minority stressors (i.e. discrimination, victimization, rejection), human-animal interaction, and psychological wellbeing. To address this gap in the literature, the current study evaluates whether, and to what extent, the association between gender-based victimization and psychological wellbeing (i.e., anxiety, depression, self-esteem) varies as a function of emotional comfort from companion animals among emerging adults.
Methods: Data were collected from young people between the ages of 18 and 21 years who self-identified as a sexual and/or gender minority (N = 134; 37.3% ethnic/racial minority; 49.2% gender minority; 98.5% sexual minority). We conducted three simple moderation analyses that examined whether, and to what extent, gender-based victimization was associated with mental health (i.e., anxiety, depression, self-esteem) as a function of comfort from companion animals. Additive multiple moderation models were also conducted to examine comfort from companion animals and social support as moderators between victimization and each psychological wellbeing indicator.
Results: Results of the simple moderation models suggest that the effect of gender-based victimization on self-esteem was moderated by comfort from companion animals (ΔR 2 = .03, $F(1, 125) = 4.66$, $\beta = .22$, $t(125) = 2.16$, $p = .03$) and that the relationship is statistically significant only at low levels of comfort from companion animals ($\beta = -0.38$, $t = -2.41$, $p = .02$). Further, our additive multiple moderation model with both comfort from companion animals and social support as moderators of the relation between victimization and self-esteem found that victimization was significantly moderated by comfort from animals (ΔR 2 = .03, $F(1, 123) = 5.38$, $\beta = .24$, $t(123) = 2.32$, $p = .02$), but not social support. The relation between victimization and self-esteem was significant and negative at low levels of comfort from companion animals, but only for those with high levels of social support ($\beta = -0.43$, $t = -2.65$, p < .01). In contrast, when high levels of comfort from companion animals were reported, the effect of victimization on self-esteem was no longer statistically significant, regardless of whether social support was low or high. We did not find evidence of moderation in models with either anxiety or depression as the dependent variable.
Conclusion: These results suggest that high levels of comfort from companion animals may be a protective factor against the harmful effects of victimization on self-esteem. However, our results suggest that comfort from companion animals may not provide the same benefits for anxiety and depression. Further research is needed to replicate our results and to elucidate whether other aspects of HAI, such as attachment to pets or caretaking for pets, may play a role in associations between victimization and anxiety and depression. Given the harmful effects of gender-based victimization and other stressful circumstances that LGBTQ+ youth are disproportionately at risk of experiencing (i.e., employment issues, housing insecurity), this study highlights the importance of exploring how, and for whom, comfort from companion animals and other aspects of HAI may provide protective benefits.

School of the Arts

Ruth Deibler
COVID-19, Healthcare Interior Design + Provider Experience - How does your space work for you?

The lack of research on healthcare staff experience and interior design of the spaces they work in is evident. A focus on staff perspective is needed, particularly staff who navigated the COVID-19 pandemic. This research seeks to capture those stories to develop further research in order to improve staff experience.

Hypothetically, by placing providers at the center of qualitative research related to healthcare interior design, we can better understand existing healthcare spaces. Ideally, we can develop additional evidence-based, human-centered solutions to transform interior environments in healthcare.

The 20-year Women's' Health Study generated significant data on women's health, but most importantly, the initial research has snowballed into 600+ research reports and continues to feed research that has made an indelible impact on women's health (About the Women's Health Study, n.d.).

In the same vein as the Women's Health Study, this research documents provider experience with interior space and may lead to new research in healthcare design. In the long term, the qualitative, grounded-theory approach may lead to remediation of our healthcare spaces by applying transdisciplinary design solutions developed through the research.

Grounded theory research "sets out to discover or construct theory from data" (Chun et al., 2008). This grounded-theory survey is entitled, **"COVID-19, Healthcare Interior Design + Provider Experience – How does your space work for you?"** Participants are providers working in any level of healthcare with any level of experience. The survey questions allow the provider to identify specific components of their space. Additionally, they were offered the opportunity to share a story about their relationship with their interior work environment during the COVID-19 pandemic. The ability for healthcare staff to write about their experiences with their interior environment will offer additional clues about healthcare space and future research.

VCU Life Sciences

Heather King
Mapping the VCU Campus Food Environment

Preliminary research from a related VCU faculty team indicated that roughly 1⁄3 of all VCU students experience some level of food insecurity. Inventions to remedy this dire situation will require a more complete picture of the campus food environment. This project documented aspects of that environment. Our research team surveyed vending machines within Monroe Park buildings and facilities, along with nearby corner stores that were easily accessible to the university. Our team employed two instruments from the nationally recognized Nutritional Environment Measure Survey (NEMS), a toolkit created by Penn State University, to determine the nutritional quality of the campus food environment through direct observation. In addition to the NEMS data collection, our research team administered virtual student questionnaires to gauge general usage and attitudes towards food options on campus. VCU students were surveyed between Fall 2020 and Spring 2021 during the COVID-19 pandemic; and our data collection pivoted to incorporate the effects of the pandemic on campus. Findings are compiled in a geospatial map of the Monroe Park campus and surrounding areas. Within the interactive map, vending and corner store options were identified by the NEMS award systems along with their observation notes. Our findings concluded all snack and some beverage machines on campus received no NEMS award due to the lack of healthy options. Our hope in representing the data in a visually informed layout will incite action by the university administration to implement new opportunities to ensure a healthy and balanced food environment for the VCU community.

Marie Vergamini

Colobinae evolution: Using GIS to map the distribution of leaf monkeys across Southeast Asia over time

The Colobinae, or leaf monkeys, are distributed geographically across Africa and Asia. Colobinae are specialized arborealists and leaf eaters with sacculated stomachs, sheering teeth, reduced thumbs, and very mobile shoulders. Colobinae diverged ~10.9 million year ago (Ma) from the Cercopithecidae in Africa, and Asian colobines appear in the fossil record in the late Miocene ~8.5 Ma. However, an incomplete fossil record means little is known about the evolutionary pressures that led to Asian colobine migration and diversification. Here, we use recent fossil discoveries and geospatial information to develop hypotheses about how geographic barriers played direct roles in Asian colobine evolution. Using ArcGIS, we plotted Miocene-epoch to Pleistocene-epoch fossil Colobinae collection sites with overlapping geospatial information including geographic barriers that may have influenced species distribution like the Himalayas and the Hengduan Mountains. We also included extant species' presence, distributions, and species diversity to assess patterns of distribution over time. Data from each epoch were compared to track species distribution over time.

Results suggest that combining fossil data, extant species' distributions, and biogeographically relevant geospatial elements provides some parameters for where and when Colobine adaptions were selected for. For example, cold climate adaptions in certain Asian Colobines, especially *Rhinopithecus*, are not recent and have shaped how that genus is distributed today. These parameters can support powerful hypothesis building about the evolutionary histories of extant species adapting behaviorally and anatomically to densely forested South East Asia.

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[i] Kubo S, Mizutani Y, Meemook K, Nakajima Y, Hussaini A, Kar S. Incidence, Characteristics, and Clinical Course of Device-Related Thrombus After Watchman Left Atrial Appendage Occlusion Device Implantation in Atrial Fibrillation Patients. JACC Clin Electrophysiol. 2017 Dec 11;3(12):1380-1386