Devendra K. Agrawal, PhD (Biochem), PhD (Med Sciences), MBA, MS (ITM), FAAAAI, FAHA, FAPS, FIACS
Senior Vice-President for Research & Biotechnology
Professor, Department of Translational Research

Message from the Senior Vice President for Research & Biotechnology

The annual Student Technology and Research (STAR) Symposium at WesternU is held each year to recognize and encourage our health science students who performed research and scholarly activities during the summer and beyond on an array of different pre-clinical and clinical research topics in their field of education and interest. Indeed, the diverse research topics are fascinating, interesting and educating and show the depth and breadth of Health Science Research conducted by our students and the faculty at WesternU.

This year, more than 100 students, working independently or jointly with another student, were selected and awarded the summer research stipend, trained and mentored by our faculty in various Colleges at WesternU.

On behalf of the University and the Office of Senior Vice President for Research & Biotechnology, I congratulate all our summer research scholars on their research, hard work and collaboration with their mentors/advisors, as reflected in the abstracts and final reports submitted by many awardees. I am aware of the research articles published/under publication by several students. In this unprecedented crisis, the research activity of some of the students will continue until January/February 2021. However, we will have an opportunity to hear the findings from several awardees on Saturday November 7, 2020. We look forward to hearing about their learning experience and discovery!

In spite of significant challenges and constraints this year, the hard work of our students shows their curiosity, initiative, genuine motivation, and engagement in the academic enquiry and contribution to science. Indeed, the hard work and vision represented in the abstracts and the reports reflect the advancement in our quality and standard of health science research, which is critical to the overall mission of WesternU.

I take this opportunity to thank Dr. Hendrik Szurmant, who led the team of faculty to review the summer research projects and recommended for the summer research award. I also thank the faculty members who supported STAR scholars in the role of mentors/advisors. This program would not be possible without the support and participation of our faculty! Also, I thank Ms. Susan Dominguez for her organization and support in the management of the summer research program and the preparation of this abstract booklet.

Devendra K. Agrawal

909.469.7040 • 909-469-5577 fax • dagrawal@westernu.edu
309 East Second Street • Pomona, CA 91766-1854 USA • www.westernu.edu

Hendrik Szurmant, PhD
Associate Professor, Department of Basic Medical Sciences
College of Osteopathic Medicine of the Pacific

Message from the Chair of the WesternU Research Committee

What a year it has been! The pandemic has put a tremendous burden on our talented WesternU students that decided to enhance their education by pursuing original research. Significant time commitment is required to identify a suitable mentor among WesternU faculty or affiliated institutes and to develop an ambitious yet manageable research project.

This year, when the pandemic hit, the reality of a mostly virtual environment meant that many research projects fell through or needed to be adjusted so that work could be performed remotely. Nevertheless, our students persisted and identified new or adjusted projects to move forward with summer research plans. The success of our students' efforts will be on full display at the Student Technology and Research Symposium. Beyond the presentations and the abstracts collected in this book, numerous students are planning to present their work at national and international conferences and are publishing their work in peer reviewed journals.

Health care is never at a standstill and new knowledge derives from the research conducted at universities and companies across the country. Those students that embrace research as part of their education will become leaders in their respective fields, as they are not only consumers of this new knowledge but also creators.

Students, we are proud of your accomplishments and hope you will continue to pursue your love of research into your clinical years and beyond!

Hendrik Szurmant, Ph.D.

909.706.3938 • 909-469-5535 fax • hszurmant@westernu.edu
309 East Second Street • Pomona, CA 91766-1854 USA • www.westernu.edu

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9:35 - 9:50 AM	3	Bauer, C.	COMP	Michener, L.	Are Males and Females alike? The Role of Central Sensitization in Patients with Chronic Rotator Cuff Tears
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PRESENTERS ABSTRACTS (arranged alphabetically, by last name of the submitting student)

A

Arasheben, Audelia, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Matthew Budoff, University of California Los Angeles Harbor
Project Title: Progression of Coronary Calcium and Incident CV Outcomes in Persons with ESRD
Authors: Audelia Arasheben, Dr. Matthew Budoff and April Kinninger

Project Abstract: Studies have discovered a strong correlation between CAC build-up and incidence of CV outcomes amongst patients with coronary artery disease (CAD). Fast progressing Calcium build-up is also a common characteristic of Chronic kidney disease (CKD) as a consequence of medications, hemodialysis, and metabolism [1-3]. Few studies have examined longitudinal changes in vascular calcification among patients on dialysis [4]. Most studies evaluating CAC score effects on mortality rates in ESRD patients use baseline CAC scores for predictive values [5]; however, we propose to analyze the impact of CAC progression over multiple clinical visits and the predictive value in patient mortality rates and outcomes. Through the use of electron beam tomography and analysis of 146 ESRD patients with 2 clinically indicated CAC scans, we conclude that patients with a progression of 131 HU or greater within a year are twice as likely to die of all causes.

Goals of the Study/Hypothesis: The purpose of this study was to evaluate the predictive value of progression in coronary artery calcification (CAC) measured with electron beam tomography and all-cause mortality rates amongst patients with end stage renal disease (ESRD).

Materials & Methods: We evaluated 146 ESRD subjects who had underwent 2 clinically indicated CAC scans to measure CAC progression, CAC was then annualized for analysis. Subjects were followed until death, or last confirmed provider visit as censoring date. Time to death/censoring were evaluated by Kaplan Meier analysis stratified by CAC progression. Multivariate Cox proportional hazard regression models were used to compute hazard ratios (HRs) for the association between CAC progression and death.

Results: Overall, 95 individuals died (66%) during a mean follow-up of 7.9+-5.4 years. (51% men, 63% diabetic) Just over 86% (126) ESRD subjects had CAC at baseline. Subjects who died from any cause had significantly higher CAC and CAC progression. ESRD subjects with an annualized CAC progression

Arbogast, Andrew, College of Osteopathic Medicine of the Pacific
Advisor: Peter Chang, University of California Irvine
Project Title: Detection of Coronary Artery Calcium Deposits on Non-contrast CT Using Artificial Intelligence
Authors: Andrew Arbogast, B.S. B.A., Monish Ramadoss, B.S., Peter Chang, MD

Project Abstract: According to the CDC, coronary artery disease (CAD) is one of the leading causes of death in the US, with an average of 1 in every 4 deaths being due to CAD. For some, close monitoring due to familial history allows for its early diagnosis, thus leading to early interventions and significantly reduce or delay development of pathologies. But for others, the first sign of CAD may be a myocardial infarction. This makes early detection of this disease

crucial to prevent deaths. Here, we postulate a noninvasive, “zero additional cost” methodology that may be used as a potential add on screening test for calcified CAD plaques that is performed on non-contrast, non-gated chest CT’s. Since evaluating for lumen obstruction is not feasible on non-gated scans, we hypothesize that there may be a plausible relationship between coronary plaque volume and onset of symptoms. To identify these plaques before symptom development, an artificial intelligence software using image segmentation techniques [Dense U-net structured] is being built. Once finalized, a retrospective study will be performed at UC Irvine Health on past CT scans to determine if there is a correlation between coronary plaque size and health outcomes. If successful, we hope this tool will be included and ran on all chest CT scans (performed for other indications) to evaluate for cardiac health outcomes, as well as a possible tracker for coronary plaque volumes on patients where at coronary angiogram may not be possible or indicated.

Goals of the Study/Hypothesis: Detection and diagnosis of CAD is normally done using angiography. But due to its invasiveness, angiography is usually not indicated until symptom development. This makes screening for CAD by other means if of the utmost importance for early management. While CT Coronary Angiography is a great tool to evaluate the coronary system, its use in clinic is limited because direct invasive angiography in the cath lab allows for a more immediate treatment of identified occlusions. This leaves any new image (non-stress test) screening tool for CAD to be an “add on” to existing images; not a specific, orderable test. A great point of entry to CAD screening is the non-contrast, non-gated CT Chest scans, which happen often in the inpatient and outpatient setting for a variety of different reasons. In the past, there have been difficulties to evaluate the heart on these scans due to “fuzziness” that is created due heart movement. This is especially important in CAD, where trying to evaluate lumen obstruction as diameter measurements are increasingly difficult due to movement. Thus, the goal of this screening tool is to use AI to detect and quantify coronary lesions via volume measurements through the background movement of the heart.

Materials & Methods: AI Construction: The artificial intelligence in this project is being built using Tensorflow (v2.2) with Python. The neural network is built using a combination Dense Net and U-Net like architecture, which are specific types of convolutional neural networks used in image segmentation. In order to train the neural network, you need to feed the algorithm images of CT scans that have plaques to train it to identify these lesions. Permission from OrCAScore and StructSeg 2019 datasets (grand-challenge.org) were obtained for this study.
Should the AI be successful in detecting coronary artery plaques with a high accuracy (Sorensen-Dice Coefficient), a retrospective study will be developed at UC Irvine Health to evaluate cardiac health outcomes based on plaque volumes (instead of lumen occlusion) that are calculated by this AI.

Results: N/A at this time; hoping to have preliminary results soon.

Conclusions: N/A at this time, hoping to have preliminary results son.

References: N/A

B

Bauer, Chase, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Lori Michener, University of Southern California
Project Title: Are Males and Females alike? The Role of Central Sensitization in Patients with Chronic Rotator Cuff Tears
Authors: Chase Bauer, Amy K. Hagerty, Federico Pozzi, Malcolm Tsay, Bernard Y. Liebeskind, Lori A. Michener

Goals of the Study/Hypothesis: Women have a higher prevalence of chronic pain conditions, partially explained by the presence of central sensitization (CS). In CS, pain sensitivity increases across the body. Evidence suggests CS may play a role in persistent musculoskeletal pain; and up to 30% of individuals with shoulder pain demonstrated CS. In this study, we determine if outcomes of a physical therapy exercise program were influenced by CS or sex in patients with shoulder pain.

Materials & Methods: In a longitudinal study, 11 patients with full-thickness rotator cuff (RC) tears (5 male, 66±7 years of age) were examined before and after 12 sessions of strength and aerobic exercise over 8 weeks. We measured pressure pain threshold (PPT) over the tibialis anterior. This site is distal from the injury and is a marker of CS. A group of sex-matched healthy control (HC, 64±6 years of age) was recruited. CS was assessed as the difference between RC and HC groups via the mean difference (MD) with 95% confidence interval (CI95). Recovery in the RC group was assessed via the Penn shoulder score (function subscore), reporting change over the intervention as MD and CI95. These analyses were stratified by sex.

Results: Males demonstrated a lower PPT compared to control at baseline, whereas females did not
(Table 1). Post-intervention, females demonstrated larger clinically meaningful improvements in shoulder function compared to males (Table 2).

Table 1.

Variable	Sex	Mean Difference (HC-RC group)	95% Confidence interval
PPT at the tibialis anterior, Kg	Males	2.5	[-0.97,10]
	Females	0.6	[-2.5, 3.7]

Table 2.

Variable		Mean Difference over time (post-pre)	95% Confidence interval
Penn Function (0-60, 60 full function)	Males	2.8	[-2.7, 8.4]
	Females	11	[1.6, 2.1]

Conclusions: At baseline males with RC tears had lower PPT indicating CS. Following intervention, males exhibited less treatment benefit compared to females. These results are in line with prior data demonstrating lower PPT with poorer outcomes, although our study uniquely identifies males as centrally sensitized in contrast to classic understanding of pain. Despite small sample size, these data suggest classic assumptions of CS in female patients may not hold for patients with chronic RC related shoulder pain.

References: N/A

Bui, Alexandra and Jogin, Roshni, Graduate College of Biomedical Sciences
Advisor: Dr. Miou Zhou, Graduate College of Biomedical Sciences
Project Title: The Molecular and Cellular Mechanisms of CCR5 Regulation of Cognitive Deficits in Mouse Stress Models
Authors: Alexandra Bui and Roshni Jogin

Project Abstract: C-C chemokine receptor 5 (CCR5) serves as a binding site for inflammatory C-C cytokines. With stress, cytokine associated inflammation amplifies, and in turn, exacerbates an immune response potentially leading to cognitive defects. We believe CCR5 to be a strong candidate for modulating the neuroinflammatory responses to stress, which can induce memory deficits [1].

Goals of the Study/Hypothesis: We hypothesize that stress leads to changes in CCR5/CCL5 expression and that learning and memory deficits can be rescued with the FDA-approved *CCR5* antagonist, Maraviroc. We plan to: demonstrate this effect through behavioral paradigms including object placement recognition (OPR), novel object recognition (NOR), and contextual fear conditioning (CFC); determine whether stress enhances anxiety behavior in the elevated plus maze (EPM) and open field (OF) task; measure expression of *Ccr5* and its ligand, *Ccl5,* in the hippocampus after stress; and test whether Maraviroc ameliorates behavioral deficits induced by stress.

Materials & Methods: Groups of C57BL/6NTac mice were subjected to no stress (group 1), repeated restraint stress (RRS) for 7 days (group 2) or 14 days (group 3), or single prolonged stress (SPS) (group 4). Afterwards, hippocampal tissue from some mice were collected to

measure *Ccr5* and *Ccl5* expression with quantitative PCR (qPCR), and remaining mice were tested in behavioral paradigms in the following order: EPM, OF, OPR, NOR, and CFC.

Results: Our preliminary results show that while there was no change in CCR5 expression, there was an increase in CCL5 expression in the dorsal hippocampus 24 hours after SPS. Thus, CCR5 activation may cause increased ligand expression after acute stress.

Conclusions: Examining the effects of CCR5 on learning and memory after exposure to stress will further the understanding of the relationship between CCR5 activation and cognitive deficits, and potentially develop a treatment with Maraviroc.

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C

Cao, Jessica, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Moses Chow, College of Pharmacy
Project Title: Cell Culture and Drug sensitivity Testing Model for Potential Individualized Prostate Cancer Therapy
Authors: Jessica Cao

Project Abstract: Prostate cancer is one of the most common cancers in men worldwide. Due to the wide array of cancer types, there is a great need for a method of efficient drug screening for effective therapy for a patient's specific prostate cancer, especially one with existing drug resistant cancer. Cell culture and sensitivity testing similar to antimicrobial agents for infectious disease would be an ideal approach for individualized prostate cancer therapy. However, due to the difficulty in establishing an individualized model similar to a specific patient's tumor and microenvironment, an ideal approach is not yet possible. Nevertheless, progress made in the last few decades may soon provide this possibility.

Goals of the Review: To compare current available models and propose improvements for efficient, effective therapeutic screening for prostate cancer.

How data was collected and what items were critically reviewed: Articles relating to 3 models: conditional reprogramming of cells, patient derived xenografts (PDX), and organoids for culture of cancer cells were found on Google Scholar. If no recent articles were found, articles before 2016 were considered. Models were reviewed critically based on their ability to mimic the microenvironment and heterogeneity of *in vivo* tumors. Then, a recommendation was made on the future application of the model for individualized therapy.

Conclusion and Outstanding questions: Of the current three models, the PDX and 3D organoid model are better suited for culture and drug sensitivity testing and can be further improved. Despite existing shortcomings, their combination and development of a biobank with cryopreserved organoids can be important steps for the future. Once the organoid is matched and selected to a patient's cancer, high throughput screening can be performed to identify the best therapeutic candidate. Afterwards, further verification of in vivo efficacy can be confirmed with the PDX model.

Cooperman, Hannah, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Michelle Steinauer, College of Osteopathic Medicine of the Pacific
Project Title: How Does Leishmania Vector Distribution Vary Over a Gradient of Land Use: A Review of Available Evidence
Authors: Hannah Cooperman, Thomas Tripolone, Astrid Reyes, Dr. Michelle Steinauer, Dr. Brianna Beechler and Dr. Rhea Hanselmann

Project Abstract: Goals of the Study: Rapid anthropogenic change engenders the spread of infectious pathogens as well as their vectors and carriers. The parasite Leishmania causes debilitating and often deadly disease that
disproportionately affects the poorest populations worldwide. Many environmental factors influence the distribution of sandfly vectors including human-driven habitat modifications and climate change. Our research group has collected vectors in agricultural and wilderness areas in Costa Rica in an effort to understand vector ecology and the influence on Leishmaniasis distribution; however, pandemic restrictions have prevented analysis of the data and further collections. Our aim is to assess the available body of sandfly trapping studies in Central America for a relationship between vector distribution and a land use gradient.

Materials & Methods: Existing sandfly trapping studies were compiled to evaluate for a relationship between vector
distribution and land use type. PubMed, Google Scholar, and Web of Science searches combined categories of disease, vector, and location. Relevant studies were screened according to explicit descriptive qualifiers. Only studies with well-defined trap ecotopes were included, then catalogued into domestic, peridomestic, and sylvatic groups.

Results: The preliminary results found a total of 14 full-text articles that met the inclusion criteria. Following a comprehensive categorization of relevant studies, we will complete a statistical analysis of compiled data to describe land use patterns of increased risk for Leishmania transmission.

Conclusions: Evaluation of available studies led to the conclusion that there is an inadequate body of data
identifying ecological drivers of Leishmaniasis in Central America. Most studies lacked adequately reproducible site descriptions as well as isolation and identification of Leishmania spp. within trapped vectors. These oversights impede characterization of how parasite distribution varies over geography and time. This knowledge is vital to determine the relationship between disease ecology and human infections. Our findings will inform future experimental design to address these questions on site in Costa Rica.

D

Dang, Alex and Nguyen, Brandon, College of Podiatric Medicine
Advisor: Dr. Kazuto Augustus, College of Podiatric Medicine

Project Title: Preliminary Internet Usage Trends of Podiatric Patients with New-Onset Conditions

Project Abstract: Technology is a constantly evolving field that has provided convenience to both patients and doctors. Compared to years past, we expect to see vastly different responses due to the increased ease of use and increasing technological literacy of people who have been exposed to readily available devices. Our research also specifically focuses on podiatry patients, who by nature of their conditions and comorbidities, are generally older than those seen at other specialties. Many studies in the past tracked internet usage and search trends, especially in medical contexts. However, technology is always changing and we want to see how internet usage is like for podiatry patients today. Up until now, podiatry patients have not been polled like this. Our goal is to find out the usefulness of technology, especially in the hands of podiatry patients, who demographically are usually on the older end of the spectrum. We want to see if podiatry patients offer different responses from the traditional responses seen in the past for other specialties and if there are any similarities or differences.
Whenever a new patient comes in, we have them fill out their HPI and other medical history as normal. When they come in, we will take their vital signs and proceed with a normal history-taking prior to the doctor's entrance and consultation. If there is time, we will provide the patient with a brief questionnaire asking about internet usage prior to their visit at the doctor's office. This questionnaire will only be provided to patients that are older than 18 years old. After the questionnaire is done, we will ask them to wait for the doctor and then their consultation by the physician will proceed as normal. The researcher will input the patient's answers into a database, which will later be analyzed for regressions.

Goals of the Study/Hypothesis: Our goal was to find out the usefulness of technology, especially in the hands of podiatry patients, who demographically are usually on the older end of the spectrum. We wanted to see if podiatry patients offer different responses from the traditional responses seen in the past for other specialties and if there were any similarities or differences.

Materials & Methods: This survey sought to assess podiatric patients' internet usage to look up symptoms prior to their initial consultation. Over three months, new patients at a local podiatry practice were provided with a three-page questionnaire to fill out along with patient information during their initial consultation. In the survey, the main branching question was whether or not the patient has used the internet to look up their condition. If they had not, then subjects needed to explain why not. If they had, they could move on with the questionnaire. The rest of the questionnaire assessed for the website(s) used, the time spent looking up the information, and how helpful or easy the website was to navigate and understand. Then, based on the information gathered, what ailment did they think their symptom(s) most aligned with as well as what remedies or treatments they tried. Once the questionnaire is completed and collected from the patient, the physician proceeded with their normal in-office consultation and the diagnosis would be compared with our survey data.

Results: In three months, a total of eighty-six patients consented and responded to the in-person survey interviews. Out of the total, fifty-one were females, and thirty-five were males.

Demographically, twenty-four patients came from Newport Beach, eighteen from Costa Mesa, twelve from Huntington Beach, seven from Corona Del Mar, five from Laguna Beach, four from Irvine, two from Santa Ana, two from Laguna Woods, two from Orange, two from Anaheim, one from Laguna Niguel, one from Laguna Hills, one from Lakewood, one from Foothill Ranch, one from Seattle, one from San Clemente, one from Long Beach, one from Westminster.

When asked how they found podiatry, fifty-nine responses were referrals from either primary care or other specialties, ten through family, eight through friends, five through occupation, five through the internet, two through a magazine, and one through a public event. A few patients had multiple responses in different categories.

The youngest patient that visited the office was eighteen, and the oldest was ninety-three—most patients who visited the office were forty-eight years old or older. The most common age group is from seventy-eight to ninety-three, and the least common age group ranges from eighteen to thirty-three years old.

Conclusions: Demographically, patients travel locally, approximately a ten-fifteen-mile radius to see the doctor. Most patients resided in Newport Beach, where the office is located, or in neighboring cities like Costa Mesa or Huntington Beach.

Most patients who visited the office held at least a Bachelor's degree or higher. The trend correlates with the fact that most patients traveled from the three wealthier cities listed above that are closer to the coast. However, there is no correlation, correlation coefficient of 0, between education level and age of the patient.

These age groups' trends show that the older the patient, the more likely they are to have foot and ankle ailments.

Most patients did not use the internet to look up their symptoms before their initial consultation. That mainly corresponds to the fact that they recently visited their primary care doctor and were referred to podiatry. Some patients admitted that they still looked up their symptoms on the internet even after visiting their primary care doctor. They stated that the doctor did not know the diagnosis and looking up online offered them a peace of mind. Others acknowledged that they looked up their symptoms prior to visiting their primary care doctor.

Several limitations exist within the study. Patients answered the survey questions through an in-person interview with the investigators. The delivery of how a survey was asked may have affected the responses received. Bias was potentially introduced because several questions, such as those that used the Likert Scale, are subjective and can vary depending on opinions, moods, or understanding. Furthermore, patients tend to respond differently when asked directly through verbal means versus answering individually on their own.

Other patients are either too old or have disabilities that require caretakers to answer the survey questions, which allowed for another bias opportunity since they responded based on their perspective of the patient.

Some patients looked up their symptoms and went to their primary care doctors before coming in to see our podiatrist. Their correct diagnosis most likely came from the primary care doctor rather than an internet search. Some patients did further research from Google search engine and couldn’t remember the exact website, resulting in recall bias.

Not all of the patients were given the same amount of time to answer the survey questions; sometimes the doctor would interrupt the survey to begin consulting. Some patients answered the survey questions: before their consultation, after their consultation, or a combination of both. This may have affected the response that the patient had to some of the survey questions. If, for

example, a patient answered the survey questions after their consultation, he/she may feel more inclined to strongly agree on the reliability of internet usage if their self-diagnosis was correct.

References: 1. Aboueid S, Liu RH, Desta BN, Chaurasia A, and Ebrahim S. The Use of Artificially Intelligent Self-Diagnosing Digital Platforms by the General Public: Scoping Review. *JMIR medical informatics*. 2019; *7*(2), 13445.

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G

Gutierrez, Katherine & Nguyen, Sean, College of Podiatric Medicine
Advisors: Dr. Saba Sadra and Dr. David Shofler, College of Podiatric Medicine
Project Title: Preliminary Internet Usage Trends of Podiatric Patients with New-Onset Conditions

Project Abstract: With diverse communities come prejudices, stereotypes, and discrimination. One particular community that faces these hardships is the Lesbian, Gay, Bisexual, Transgender, Queer, gender non-conforming (LGBTQ+) community. The goals of medical school are to train and educate future medical providers to care for patients of all backgrounds, and to learn to recognize and address their own biases. However, current literature has shown that health care disparities are more prevalent in Lesbian, Gay, Bisexual, Transgender/Transsexual, Two spirited, Intersex, Questioning/Queer (LGBTQ+) (1, 2). While there is research regarding MD/DO medical students' perception towards the LGBTQ+ community (3), there's currently no research regarding the LGBTQ+ attitudes and experiences among podiatric medical students. Students who were enrolled in the Western University of Health Sciences College of Podiatric Medicine program were surveyed with questions regarding the LGBTQ+ community using Qualtrics, and data was analyzed using a Microsoft Office Excel program. This study aims to investigate the perception that podiatric medical students at

Western University of Health Science have about the LGBTQ+ community, and the level of knowledge students have to provide quality care for LGBTQ+ patients. Students' attitudes towards the community were overwhelmingly positive, however, many stated that they experience and/or witnessed discrimination from faculty and peers. In order to best prepare students for the profession they are entering, universities must increase cultural and social education for LGBTQ+ patients to feel that they are welcomed in a safe environment.
Goals of the Study/Hypothesis: This study aims to investigate the perception that podiatric medical students at Western University of Health Science have about the LGBTQ+ community, and the level of knowledge students have to provide quality care for LGBTQ+ patients.

Materials & Methods: Students who were enrolled in the Western University of Health Sciences College of Podiatric Medicine program were surveyed with questions regarding the LGBTQ+ community using Qualtrics, and data was analyzed using a Microsoft Office Excel program.

Results: Students' attitudes towards the community were overwhelmingly positive, however, many stated that they experience and/or have witnessed discrimination from faculty and peers.

Conclusions: In order to best prepare students for the profession they are entering, universities must increase cultural and social education for LGBTQ+ patients to feel that they are welcomed in a safe environment.

References: N/A

H

Hadiprodjo, Hana, College of Podiatric Medicine
Advisor: Dr. Albert Hsiao, University of California San Diego
Project Title: Deep-Learning Multi-Organ Segmentation of CT Chest Examinations
Authors: Hana Hadiprodjo, Evan Masutani, Kyle Hasenstab, Albert Hsiao

Project Abstract:
Goals of the Study/Hypothesis: As of October 2020, there have been over 29 million confirmed COVID-19 cases[1]. Clinicians in the USA often order chest radiographs to assess and manage patients with suspected COVID-19-induced pneumonia.[2] However, it can be helpful to correlate radiographic findings with now well-characterized computed tomography (CT) features.[3] Given that a chest CT comprises hundreds of slices, correlating and particularly co-registering regions of interest between modalities is time-consuming and tedious. Convolutional neural networks (CNNs), a recently developed form of machine learning[4], has the potential to expedite this co-registration task. As a first step, our goal is to use CNNs to automatically identify and segment multiple organs in chest CTs to provide landmarks for downstream co-localization with radiographic findings.

Materials & Methods: 58 axial image series from chest CT examinations were retrospectively collected. A medical student, supervised by a board-certified radiologist, manually annotated the defining borders of the lungs, airway, clavicle, spine, and mediastinum using in-house software. We randomly assigned 70% of chest CTs for training (40), 20% for validation (11), and 10% for testing (7). Of the 40-training data, we further augmented the sample size to be 120 CTs by

changing the field of view plus and minus 10%. We employed a pre-trained 3D UNet architecture for our CNN.[5] Overall performance of our CNN was assessed using the 3D Sorenson-Dice coefficient; we report the mean and standard deviation.

Results: The Dice score for the right lung, left lung, mediastinum, right clavicle, left clavicle, spine, and airway were 0.971±0.014, 0.947±0.048, 0.895± 0.034, 0.771±0.078, 0.780±0.088, 0.877±0.009, and 0.931±0.011, respectively (Figure 1). We show an example pair of predictions and ground truth in Figure 2.

Conclusions: CNNs can accurately segment multiple organs within the thoracic cavity. Future work will be to co-localize these segmentations to radiographic findings.

Figure 1: Swarm plot depicting 3D Dice coefficient for each segmented anatomical landmark for each test series (n=7).

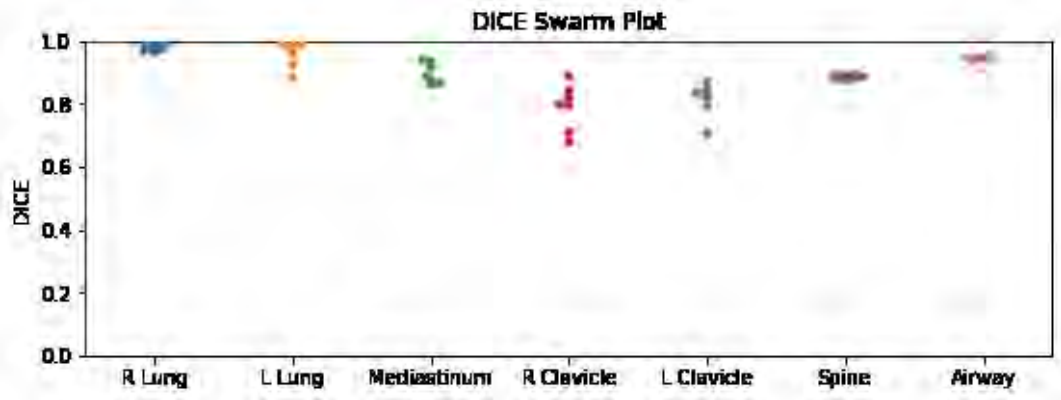
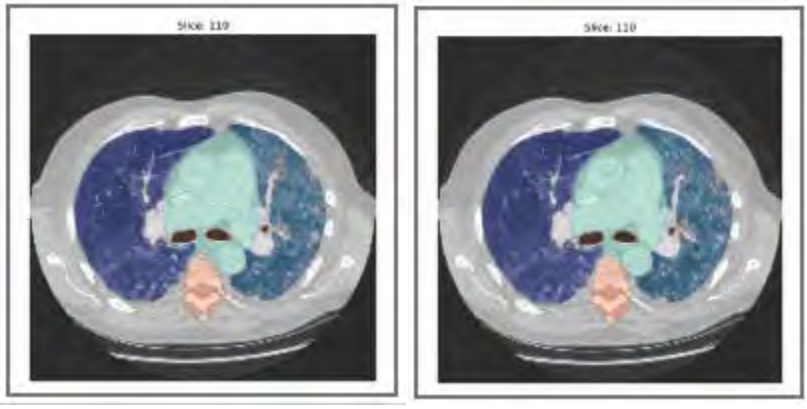


Figure 2: Example ground truth (left) and predicted (right) segmentations of the spine, lungs, mediastinum, and airway.



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Humphrey, Bridget & Martin, Aleksa, College of Podiatric Medicine
Advisor: Dr. Saba Sadra, College of Podiatric Medicine
Project Title: Gendered Experiences of Women Podiatrists
Authors: Bridget Humphrey and Aleksa Martin

Project Abstract: Goals of the Study/Hypothesis: An online survey was conducted on women podiatrists to assess their career experience.

Materials & Methods: An online survey was conducted on members of the Podiatric Physician Mom Group [PPMG] and American Association for Women Podiatrists [AAWP] on Facebook. Each question on the survey was optional. Responses were anonymous, and IP addresses were not recorded. The opening questions in the survey asked about demographic data, such as gender identity, race, and ethnicity. The questions thereafter focused on topics such as work-life balance, discrimination based on race and/or ethnicity, discrimination based on gender identity, financial satisfaction, and career satisfaction. Many of the questions were on a 5-point Likert scale.

Results: Nearly half of the participants, or 48.9%, reported that they had been sexually harassed by a colleague, peer, or member of staff, and 71.1% reported that they had been sexually harassed by a patient. The majority of participants considered themselves the main financial provider for their household, primarily responsible for monthly bill payments, childcare, meal-planning, vacation planning, and financial planning. When asked what their most desired change for the field of podiatry was, the first most popular choice was financial and legal parity with osteopathic and allopathic physicians, the second most popular was higher salary, the third most popular was more flexible weekday schedule, and the fourth was longer paid maternity leave. The female podiatrists in the study reported similar weekly hours of work to the average podiatrist reported in American Podiatric Medical Associations' (2018) Podiatric Physician Findings Survey Report, however, the amount of compensation reported in this study was less.

Conclusions: More research needs to done to examine gendered experiences in podiatric medicine.

References: We have not yet submitted our work for publication. Our references are listed below

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K

Khwaja, Bisma, College of Osteopathic Medicine of the Pacific
Advisors: Dr. Devendra K. Agrawal, Research & Biotechnology and Dr. Finosh Thankam, College of Osteopathic Medicine of the Pacific
Project Title: Mitochondrial DAMPs and altered mitochondrial dynamics in oxLDL-burden in atherosclerosis
Authors of the submitted publication: Khwaja B, Thankam FG, Agrawal DK

Project Abstract: Atherosclerosis results in life-threatening cardiovascular pathologies, including ischemic heart disease, stroke, myocardial infarctions, and peripheral arterial disease. The role of increased serum LDL and resultant accumulation of oxidized-LDL (oxLDL) in atheroma formation is well established. Recent findings elucidate the significance of mitochondrial damage-associated molecular patterns (mtDAMPs) in triggering sterile inflammation in concert with oxLDL. The mtDAMPs including mtDNA, cytochrome C, cardiolipin, HSP60, mitochondrial transcription factor A (TFAM), and N-formyl peptides are expected to possess pro-atherogenic roles, but limited data is available in the literature. The mtDAMPs initiate sterile inflammation in atherosclerotic lesions via numerous signaling pathways, most of which converge to the NLRP3 inflammasome. Priming the activation of NLRP3 inflammasome, mtDAMPs promote secretion of proinflammatory cytokines, including IL-1β, implicated in atherosclerotic lesions through vascular smooth muscle and fibroblast proliferation, arterial wall thickening, and plaque formation. In this article we critically reviewed and discussed the central role of the NLRP3 inflammasome in mtDAMP-induced sterile inflammation in atherosclerosis with specific components including caspase-1, pregnane X receptor (PXR), and downstream cytokines such as IL-1β and L-18 as potential mediators of atherosclerosis. Better understanding of the proinflammatory effects of mtDAMPs and its pathological association with oxLDL possess immense translational significance for novel therapeutic intervention.

Reference: Khwaja B, Thankam FG, Agrawal DK: Mitochondrial DAMPs and altered mitochondrial dynamics in oxLDL-burden in atherosclerosis. *Mol Cell Biochem*. – submitted for publication – September 2020.

L

Landeros, Jessica & Ramnani, Anushka, College of Podiatric Medicine
Advisor: Mathew Wedel, College of Podiatric Medicine
Project Title: Supernumerary Muscles in the Leg and Foot: A Review of Their Types, Frequency, and Clinical Implications
Authors: Anushka Ramnani, Jessica Landeros, and Mathew Wedel Ph.D.

Project Abstract: Variations of the ankle are infrequent and exist as supernumerary muscles and tendons. Often understudied and overlooked, they can cause many complications of the

lower extremity. The PQ, PDQ, and the low- lying peroneus brevis muscle belly are classified as accessory muscles of the lateral ankle. Other muscle variants like the accessory soleus, the flexor digitorum accessorius longus (FDAL), peroneocalaneus internus (PCI), and the tibiocalcaneus internus (TCI) of the posterior compartment will also be explored. While often asymptomatic, these muscles have the ability to cause great pain and issues such as tenosynovitis and tarsal tunnel syndrome when they impinge upon the normal anatomy of the patient. Although conservative treatments such as orthoses and NSAIDs may help alleviate some pain, surgical treatment yields higher success rates. The goals of this study are to examine the prevalence of PQ, PDQ, accessory soleus, FDAL, PCI, and TCI as well to understand the morphological and clinical significance of these accessory muscles and their interactions with surrounding muscles. Due to the wide implications of these supernumerary muscles, we attempt to create a reference guide for physicians to use in aiding their diagnoses and therapeutic plans.

Goals of the Study/Hypothesis: What are the supernumerary muscles that are present in the leg and foot and is there a way to create a manual for physicians to help guide their treatment plan when encountering patients who may present with these symptoms which may be due to supernumerary muscles?

Materials & Methods: Using PubMed to gather articles, we analyzed and evaluated various anatomical & clinical research papers and texts. We also used Sarrafian's Anatomy of the Foot and Ankle as the basis of our anatomical research.

Results: Supernumerary muscles vary in prevalence and frequency in the lower extremity. They are often overlooked as causes of clinical symptoms such as pain and tenosynovitis. Although conservative treatments such as orthoses and NSAIDs may help alleviate some pain, surgical treatment yields higher success rates.

Conclusions: Supernumerary muscles are widely overlooked as causes of pain, ankle instability, and tarsal tunnel syndrome. The presence of these muscles is useful to anatomists, radiologists, clinicians, and surgeons in guiding their diagnoses and treatment plan.

References: Final edits to the paper are still being made. We hope to submit to the Journal of Southern California Clinicians.

We had presented to the Podiatric Research Club for their Podiatric Research Conference via a PowerPoint Presentation on August 18th, 2020.

Lunardhi, College of Osteopathic Medicine of the Pacific
Advisor: Anita Nelson, **College of Osteopathic Medicine of the Pacific**
Project Title: Predictive Ability of Ultrasound on Neonatal Diagnoses and Consequences on Prenatal Care Utilization
Authors: Alicia Lunardhi, BS, Fanglong Dong, PhD, Kristina Galyon, DO, Kimberly Jamie Ko, MD, Hindi E. Stohl, MD, JD

Abstract project: Goals of the Study/Hypothesis: Fetal anomalies suspected on prenatal ultrasound may cause patients significant stress. Some findings resolve or have minimal clinical

significance for the neonate. Assessing the ability of ultrasound to accurately predict neonatal diagnoses allows individualized maternal counseling.

Materials & Methods: IRB approval was obtained. A retrospective review of electronic medical records for women receiving prenatal care at Harbor-UCLA Medical Center who had abnormal findings on prenatal ultrasounds from January 2015 through December 2018 was performed. Corresponding neonatal medical records were reviewed for the suspected condition(s). Ultrasound findings and medical conditions were categorized. Chi-square and Fisher's exact tests were conducted to assess associations between prenatal ultrasounds and neonatal outcomes.

Results: 208 maternal-fetal dyads were included. Prenatal ultrasounds were significantly associated with postnatal findings for the following conditions (sensitivity, specificity, p value): anatomical disorder of extremities (0.72, 0.97, $p<0.0001$), anatomical disorder of face/skull/brain (0.67, 0.91, $p=0.0002$), congenital anomaly of GI tract (0.75, 0.98, $p<0.0001$), congenital heart disease (0.75, 0.91, $p<0.0001$), fetal demise (0.11, 1.00, $p=0.0433$), genetic disorder (0.72, 1.00, $p<0.0001$), growth restriction (1.00, 0.85, $p<0.0001$), kidney disorder (0.55, 0.98, $p=0.0018$), and large for gestational age (0.80. 0.98, $p<0.0001$). The highest false positive rates occurred in congenital heart disease (65.4%), anatomical disorder of face/skull/brain (64.3%), and small for gestational age (54%).

Conclusions: Prenatal ultrasound highly correlates with neonatal findings for many congenital conditions however can also be associated with a high false positive rate for certain diagnoses.

References: If you have published or submitted this work for publication, please provide the citation below.

We plan to submit for publication to ACOG. Currently submitted for oral/poster presentation for the ACOG conference in 2021.

M

Mohindra, Rohit, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Finosh Thankam, College of Osteopathic Medicine of the Pacific
Project Title: Altered Vascular Extracellular Matrix in the Pathogenesis of Atherosclerosis
Authors: Rohit Mohindra, Dr. Devendra K Agrawal, Dr. Finosh Thankam

Project Abstract: Cardiovascular disease continues to grow as a massive global health burden, with coronary artery disease being one of its most lethal varieties. The pathogenesis of atherosclerosis induces changes in the blood vessel and its extracellular matrix (ECM) in each vascular layer. The alteration of the ECM homeostasis has significant modulatory effects on the inflammatory response, the proliferation and migration of vascular smooth muscle cells, neointimal formation, and vascular fibrosis seen in atherosclerosis. In this literature review, the role of the ECM, the multitude of components, and alterations to these components in the pathogenesis of atherosclerosis is discussed with a focus on versatile cellular phenotypes in the

structure of blood vessel. An understanding of the various effects of ECM alterations opens up a plethora of therapeutic options that would mitigate the substantial health toll of atherosclerosis on the global population.

Goals of the Study/Hypothesis: N/A

Materials & Methods: N/A

Results: N/A

Conclusions: N/A

References: N/A

N

Nguyen, Jacqueline, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Miklos Peterfy, College of Osteopathic Medicine of the Pacific
Project Title: Identification of CEP68 as a Candidate Gene for Insulin Clearance and Type 2 Diabetes
Authors: Jacqueline Nguyen and Miklós Péterfy

Project Abstract:
Goals of the Study/Hypothesis: Insulin clearance (IC) is a major determinant of plasma insulin levels and has been implicated in the development of type 2 diabetes (T2D). However, the molecular mechanisms regulating insulin clearance remain poorly understood. Through a genome wide association study (GWAS) in mice, we previously identified chromosomal loci regulating insulin clearance, 9 of which overlapped with established T2D human loci suggesting a causative relationship between the two. The aim of this study was to identify candidate genes for insulin clearance based on these loci for future experimental studies.

Materials & Methods: We used publicly available databases and bioinformatic approaches to analyze genes and genetic variants at each of the chromosomal loci. Candidate genes were identified by expression quantitative trait locus (eQTL) analysis as implemented at the GTEx Portal. The functionality of coding variants was predicted by PolyPhen and SIFT, whereas non-coding variants were analyzed through HaploReg and RegulomeDB.

Results: Our initial analysis identified candidate genes at 3 chromosomal loci. ZNF771 harbored a missense variant associated with T2D, whereas CEP68 and JAZF1 showed significant cis-eQTLs in the liver. JAZF1 and ZNF771 were not pursued further, as JAZF1 has previously been characterized in insulin secretion and the ZNF711 coding variant was predicted to be benign. Further analysis of T2D-associated noncoding variants within the CEP68 gene identified a single nucleotide polymorphism (rs2242867) predicted to affect chromatin binding of the PRDM10 transcription factor.

Conclusions:

Through bioinformatic analyses, we identified CEP68 as a novel genetic determinant of insulin clearance and T2D. Our results suggest a model, where genetic variation at rs2242867 affects

CEP68 expression through altered chromatin-binding and transcription factor activity of PRDM10. Endosomal trafficking, a process mediated by microtubules, which are organized in centrosomes, is integral to insulin clearance. Based on our results, we hypothesize that, as a centrosomal protein, CEP68 may have a role in the endosomal process of insulin clearance and T2D susceptibility. The role of CEP68 and PRDM10 in IC and T2D will be tested in future functional studies.

References: N/A

S

Sharma, Brijesh, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Victor Valcour, University of California San Francisco
Project Title: Mindfulness-Based Stress Reduction Intervention for Symptom Management in Older Individuals with HIV-associated cognitive disorder
Authors: Brijesh Sharma, Shireen Javandel, Victor Valcour, Benedetta Milanini

Project Abstract: **Goals of the Study/Hypothesis:** As the number of elders living with HIV-1 continues to grow, we are faced with a group that is susceptible to the symptom burden of HIV-associated neurocognitive disorder (HAND), despite being virally suppressed. Mindfulness-Based Stress Reduction (MBSR) has been shown to help patients manage the common symptoms of HAND in other population but has not been studied in this population.

Materials & Methods: We randomly assigned participants (N=180) 55 years or older with HIV and symptoms of HAND to either an 8-week MBSR arm or a waitlist control arm. We then utilized numerous instruments to examine the impact of MBSR on some common symptoms of HAND including attention, stress, anxiety and depression and examined their impact on everyday function, executive functioning and quality of life at baseline, weeks 8 and 16.

Results: Participants were matched for all measures (*p□ _0.05).* The median [range] age in the MBSR group was 64 [55-78] and 62 [55-74] in the Control group. 95% (n=139) of participants were virally suppressed (VL < 20 copies/mL) and 100% (n=146) had <100 copies/mL). Immediately after the MBSR treatment, participants reported a significant decrease in depressive symptoms (*Δ=-1.57, p=0.016*), an immediate (Δ=*0.62, p=0.008)* and sustained (*Δ=0.76, p=0.011)* increase in psychological quality of life as compared to the control group.

Conclusions: MBSR improves depressive and quality of life symptoms in elders who are dealing with symptoms of HAND. As this population continues to age, it is crucial that clinicians turn to programs like MBSR to help address symptom burden of HAND.

References: Pending:Sharma, B., Moskowitz, J., Javandel S., Paul, R., Gruttola, D.G.V, Tomov, D., Haleem A., Valcour V., & Milanini B. (2020). Mindfulness-based Stress Reduction for Symptom Management in Older Individuals with Viral Suppression and HIV-associated Neurocognitive Disorder.

Steevens Madelaine, College of Veterinary Medicine
Advisor: Dr. Rhea Hanselmann, Dr. Curtis Eng, College of Veterinary Medicine
Project Title: Wild parrots in the City: A case study of Parrots and Parakeets in Point Loma, San Diego
Authors: Madelaine Towbin, Emerald Chiang, Katherine Ghobrial, Shira Razi

Project Abstract: Worldwide, many parrot and parakeet populations are declining in their natural ranges. Several species of parrots and parakeets that are vulnerable, threatened, or endangered in their native habitats have established breeding populations in Southern California. However, due to their non-native status, these parrots and parakeets are not monitored. Beyond a few reports documenting species presence and population size estimates at particular roosting sites, little is known about the ecology of these birds. Specifically, no recent studies exist describing how parrots and parakeets interact with the highly urbanized environment they inhabit or the threats that this environment might pose to their health. The purpose of this study was to take a first step in filling this void by systematically documenting wild parrots and parakeets in their non-native environments in a Southern California urban coastal community. Wild parrots and parakeets were observed daily for seven weeks at a single location and along transects in Point Loma, San Diego. Parrot and parakeet species, numbers, behaviors, perching sites, and food sources were documented, and potential threats associated with their behaviors and locations were noted. A survey of local residents will collect data to complement these observations, identify additional health threats, and gauge residents' attitudes and opinions towards the wild parrots and parakeets in their neighborhood. Threatened and endangered species breeding and apparently thriving in a highly urban environment far from their native ranges presents a unique conservation dilemma and an opportunity to study the role that these birds play in their new ecosystem.

Goals of the Study/Hypothesis: No recent studies exist describing how parrots and parakeets interact with the highly urbanized environment they inhabit or the threats that this environment might pose to their health. The purpose of this study was to take a first step in filling this void by systematically documenting wild parrots and parakeets in their non-native environments in a Southern California urban coastal community.

Materials & Methods: Observational Methods: Wild parrots and parakeets were observed once a day in one location in Point Loma, San Diego, for three consecutive weeks in order to establish their most active times and locations. Transects and a time schedule were created in order to improve and structure observations of parrots and parakeets in their urban environment. Parrots and parakeets were observed multiple times per day for four consecutive weeks along the transects in Point Loma, San Diego. Observations of parrots and parakeets were done by the naked eye, binoculars, and photographs. Parrot and parakeet numbers, species type, behaviors, perching sites, and food sources were documented. Potential threats associated with their behaviors and locations were also noted.

Survey Methods: A survey was also created in order to compliment the observations that were done in Point Loma, San Diego. The survey of local residents will collect data on observations, identify additional health threats, and gauge residents' attitudes and opinions towards the parrots and parakeets in their neighborhood.

Results: (Results with photos is too large to attach – see poster)

Interactions with local wildlife:

- Parrots and parakeets exhibited antagonistic behaviors with American crows.
- No interactions between other wildlife was observed.

Possible threats in the environment:

- American crows have been observed flying around and landing at roosting sites.
- Tree trimming was occurring at roosting sites during the last few days of observations.

- Feral cats have been observed in lower shrub bushes and trees that the parrots and parakeets have been observed perching in.

Conclusions: Observations seem to indicate that the parrots and parakeets do not have a negative effect on the native environment. The only native plant that parakeets consumed during the observations was the Torrey Pine nut from the Torrey Pine tree. Torrey Pines are endangered species; however, the parakeets do not seem to have an impact on the physical appearance or growth of the tree**.** It is possible that the parakeets could contribute to seed dispersion. Observations strongly suggest that there are various potential threats to the parrots and parakeets in their urban environment such as; human interactions such as tree trimming, American crows and Feral cats. More information from the survey will help further our understanding of potential threats in the Point Loma, San Diego neighborhood. Threatened and endangered species are breeding and apparently thriving in a highly urban environment far from their native ranges. This presents a unique conservation dilemma and an opportunity to study the role that these birds play in their new ecosystem. Parrots and parakeets have never been documented eating native plants in San Diego, further research is needed in order to establish the relationship between parrots, parakeets, and the native environment, such as the Torrey Pine tree.

References: Not published but here is the link to my poster:

https://nvss2020-aavmc.ipostersessions.com/default.aspx?s=33-26-9E-76-C0-FD-95-70-A4-BB-33-0D-E6-60-E8-26

T

Tam, Jonathan, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Mohamed Radwan Ahmed, College of Osteopathic Medicine of the Pacific
Project Title: LOX-1-PCSK9 Axis in Atheroma Formation
Authors: Jonathan Tam, Dr. Devendra Agrawal, Dr. Finosh Thankam and Dr. Mohamed Radwan Ahmed

Project Abstract: Cardiovascular Disease (CVD) is a major contributor to annual deaths globally. Atherosclerosis is a prominent risk factor for CVD. Although significant developments have been recently made in the prevention and treatment, the molecular pathology of atherosclerosis remains unknown. Interestingly, the recent discovery of Proprotein Convertase Subtilisin/Kexin Type 9 (PCSK9) introduced a new avenue to explore the molecular pathogenesis and novel management strategies for atherosclerosis. However, understanding regarding PCSK9 and the downstream signaling warrants further investigation. In this literature review, we provide insight into the reciprocal relationship between PCSK9 and Lectin-like Oxidized Low-Density Lipoprotein Receptor-1 (LOX-1) in the pathogenesis of atherosclerosis. Further understanding of the LOX-1-PCSK9 axis possesses tremendous translational potential to design novel management approaches for atherosclerosis.

Towbin, Madelaine, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Anita Nelson, College of Osteopathic Medicine of the Pacific

Project Title: Social Media Perspectives and Questions of Living with PCOS
Authors: Madelaine Towbin, Emerald Chiang, Katherine Ghobrial, Shira Razi

Project Abstract: This study sought to analyze how women with the hormonal disorder Polycystic Ovarian Syndrome (PCOS) utilize social media, the themes they discuss online, the medical accuracy of the advice they encounter, and if they are aware of their increased risk of anxiety and depression.

Materials & Methods: A team of investigators searched for the most viewed social media posts using the keyword "PCOS" between July and December 2019. The criteria for popular posts varied by site: posts in public Facebook PCOS groups, Reddit r/PCOS with ≥175 upvotes, YouTube videos with ≥1000 views, Instagram photos with ≥5 likes and Tweets with ≥1 interaction were analyzed for mentions of advice, conflicts of interest, and any of the following themes: weight loss, experience with doctors, medication, fertility, acne, abnormal hair growth, anxiety, depression, and/or menstrual irregularity. Advice was classified into categories of "completely accurate" if it was supported by a medical association, "insufficient evidence" if it only was found in peer-reviewed studies, and "inaccurate" if any part was against clinical guidelines or was unsupported. Conflict of interest was noted when it mentioned products from which the poster gained profits.

Results: 376 posts were analyzed with 655 total mentions of the selected themes. Fertility (n=106), weight loss (n=101), and medication (n=100) were the most frequently mentioned, while anxiety (n=28) and depression (n=35) were the least. 100% of Instagram posts contained conflicts of interest (n=47) and 98 were recorded overall.

182 total pieces of advice were recorded: Facebook (54%) and Reddit (49%) had the highest accuracy, while Instagram (20%) had the lowest.

Conclusions: Physicians can create stronger supportive relationships with patients with PCOS by educating more on the themes women most frequently discuss online, such as fertility and weight loss, and by screening for anxiety and depression, as women seem to be largely unaware of those risks.

Trinh, Kevin & Natarajan, Rahul, College of Podiatric Medicine
Advisor: Dr. Rebecca Moellmer, College of Podiatric Medicine
Project Title: Motivations for Pursuing a Career in Podiatric Medicine
Authors: Kevin Trinh and Rahul Natarajan

Project Abstract: This project aims to identify various motivations of podiatric medical students at Western University of Health Sciences for pursuing a career in podiatry. It also aims to gather data that could be used to enhance recruitment efforts, especially to undergraduate and pre-medical students interested in pursuing a career in health and medicine. Using Qualtrics, a survey was created that included informed consent, demographic information, and questions regarding the first exposure to podiatric medicine, shadowing experiences, and a variety of motivational factors. The survey concluded with questions on the consideration of other post-collegiate options, comments on the field, and likelihood of participants making the same choice again. The survey was then administered to all students of a single podiatric medical school. The study showed that the best way to publicize the field of podiatry is to advertise through undergraduate advisors and various internet forms of communication. Shadowing is also a very

important method of exposure as it allows students to make informed decisions prior to committing to the field. Out of all of the provided motives, a stable and secure future, good work-life balance, and intellectual satisfaction were among the highest-rated factors of those surveyed. In terms of practicing podiatry, surgery appears to be the most important clinical aspect that draws people into the field, with practice in outpatient clinics trailing shortly after. A majority of the participants would choose to pursue podiatric medicine again if they had to start over showing that they are content and satisfied with the field. The study garnered responses from over half of the student population at WesternU CPM. Although the amount of responses was sufficient for this study, future studies should include a larger sample size for a better representation of the total population pursuing a career in podiatric medicine.

Goals of the Study/Hypothesis: This project aims to identify various motivations of podiatric medical students at Western University of Health Sciences for pursuing a career in podiatry. It also aims to gather data that could be used to enhance recruitment efforts, especially to undergraduate and pre-medical students interested in pursuing a career in health and medicine.

Materials & Methods: Using Qualtrics, a survey was created that included informed consent, demographic information, and questions regarding the first exposure to podiatric medicine, shadowing experiences, and a variety of motivational factors. The survey concluded with questions on the consideration of other post-collegiate options, comments on the field, and likelihood of participants making the same choice again. The survey was then administered to all students of a single podiatric medical school.

Results: The study showed that the best way to publicize the field of podiatry is to advertise through undergraduate advisors and various internet forms of communication. Shadowing is also a very important method of exposure as it allows students to make informed decisions prior to committing to the field. Out of all of the provided motives, a stable and secure future, good work-life balance, and intellectual satisfaction were among the highest-rated factors of those surveyed. In terms of practicing podiatry, surgery appears to be the most important clinical aspect that draws people into the field, with practice in outpatient clinics trailing shortly after. A majority of the participants would choose to pursue podiatric medicine again if they had to start over showing that they are content and satisfied with the field.

Conclusions:

The study garnered responses from over half of the student population at WesternU CPM. Although the amount of responses was sufficient for this study, future studies should include a larger sample size for a better representation of the total population pursuing a career in podiatric medicine.

References: Pending publication

Truong, Roland, College of Osteopathic Medicine of the Pacific
Advisors: Dr. Devendra K. Agrawal, Research & Biotechnology and Dr. Finosh Thankam, College of Osteopathic
Project Title: Immunological Mechanisms Underlying Sterile Inflammation in the Pathogenesis
Authors: Roland Truong, Dr. Finosh G. Thankam and Dr. Devendra K Agrawal

Project Abstract: Innate and adaptive immunity play a critical role in the underlying pathological mechanisms of atherosclerosis and the findings regarding sterile inflammation open opportunities to develop novel therapeutics. In response to LDL uptake and its oxidation to ox-LDL in the intimal layer, T cell subsets are recruited and activated at the site of atheroma to upregulate pro-atherogenic cytokines which exacerbate plaque formation and plaque instability. The present article critically discussed the interconnection between DAMPs and the receptor complex of CD36-TLR4-TLR6 that primes and activates inflammasomes in the pathophysiology of atherosclerosis. Furthermore, potential mediators of sterile inflammation are identified to target and develop novel therapeutic strategies in the management of atherosclerosis. Sterile inflammation via NLRP3 inflammasome is perpetuated by the activation of IL-1β and IL-18 and induction of pyroptosis resulting in the release of additional inflammatory cytokines and DAMPs. Challenges with current inhibitors of the NLRP3 inflammasome lie in the specificity, stability, and efficacy in targeting the NLRP3 inflammasome constituents or the inflammasome itself without ameliorating upstream or downstream responses necessary for survival.

Reference: Expert Review of Clinical Immunology – Submitted after minor revision.

PROJECT ABSTRACTS Submitted (Students not presenting)

Abato-Earwood, Tamara, College of Veterinary Medicine
Advisor: Dr. Kristopher Irizarry, College of Veterinary Medicine
Project Title: Assessing Gibbon Interaction With Auditory Enrichment: Gibbon Interaction with Computer-Interface
Authors: Tamara Abato-Earwood, Shant Balci, Elizabeth Strain, George Nababan, Kregg Maruyama, Wesley A. Johnson, and Carlos Castro Candelas, Curtis Eng, Kristopher Irizarry

Project Abstract: As members of the apes (Hominoidea), gibbons (family Hylobatidae) are not studied as habitually as their counterparts, the chimpanzees (family Hominidae). TEAM Gibbon's goal is to create a fortifying program while monitoring the development of enrichment through increased gibbon interaction with the MPEG Audio Layer-3 (MP3) player. This project focused on auditory enrichment, that investigated what factors contribute to voluntary MP3 use by captive gibbons. As part of the study design, the MP3 player was exposed to multiple gibbons, enclosures, species, genders, and ages. Upon a gibbon pushing any of the four colored buttons a specific audio file will play. Overall our study investigated four aspects of voluntary auditory enrichment: 1. Investigated gibbon contact with MP3 player and assessed tactile efficiency of gibbon presses. 2. Determined if certain times within the observational period were associated with increased/decreased interaction with the MP3 enrichment. 3. Compared differences between gibbons (gender/age), enclosures, and the presence of food. 4. Observed over 100 interactions with the MP3 player (classified into two categories, those producing MP3 activation, and those that did not). All of our results were assessed for significance. Within the course of our study, multiple gibbons not only touched the MP3 player but also activated audio sounds. Preliminary data suggests that food presence may decrease MP3 interaction, and sufficient novelty may be attained by changing the MP3 players location, height, and consecutive days within an enclosure. Future work on this project should focus on investigating the role of MP3 height on gibbon interaction and choice of MP3 file in maintaining gibbon interest.

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Materials & Methods: As part of the study design, the MP3 player was exposed to multiple gibbons, enclosures, species, genders, and ages. Upon a gibbon pushing any of the four colored buttons a specific audio file will play. Overall our study investigated four aspects of voluntary auditory enrichment: 1. Investigated gibbon contact with MP3 player and assessed tactile efficiency of gibbon presses. 2. Determined if certain times within the observational period were associated with increased/decreased interaction with the MP3 enrichment. 3. Compared differences between gibbons (gender/age), enclosures, and the presence of food. 4.

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Results: Within the course of our study, multiple gibbons not only touched the MP3 player but also activated audio sounds. Preliminary data suggests that food presence may decrease MP3 interaction, and sufficient novelty may be attained by changing the MP3 players location, height, and consecutive days within an enclosure.

Conclusions: Future work on this project should focus on investigating the role of MP3 height on gibbon interaction and choice of MP3 file in maintaining gibbon interest.

References: N/A

Akcam, Annaelle, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Marcel Fraix, College of Osteopathic Medicine of the Pacific
Project Title: A Study of the Barriers to Accessing Reproductive Care in the Female Homeless Population
Author: Annaelle Akcam

Project Abstract: The goal of this project is to perform a descriptive analysis of the barriers to accessing reproductive care in the female homeless population in San Diego County, from the perspective of those serving homeless women. The survey aims to answer the following questions: Are there barriers preventing homeless women from accessing care? How are homeless women handling menses? Are there barriers preventing homeless women from adequately utilizing menstrual products? Do women have access to contraceptive care? Are there barriers preventing homeless women from utilizing contraceptive care?
Design: A survey will be sent to professionals who work closely with the female homeless population in San Diego County.
Participants: I have contacted twenty-five organizations in San Diego County that serve the homeless population in various capacities. The managers, or alternate point-of-contact, are receiving a survey to forward to their staff. These organizations include federally qualified health-centers, clinics, shelters, and non-profit organizations that serve the San Diego homeless population.
Survey: Each participant is invited to complete the 10-15 minute survey, in general terms, about their position, the population they serve, and their views on the barriers to accessing healthcare, utilizing menstrual products, and utilizing contraceptive products for the female homeless population of reproductive age.
Data analysis: Descriptive statistics will be performed using measures of frequency to ascertain which barriers are most important when it comes to accessing healthcare, menstrual products, and contraceptive products.

Goals of the Study/Hypothesis: The goal of this project is to perform a descriptive analysis of the barriers to accessing reproductive care in the female homeless population in San Diego County, from the perspective of those serving homeless women. The survey aims to answer the following questions: Are there barriers preventing homeless women from accessing care? How are homeless women handling menses? Are there barriers preventing homeless women from adequately utilizing menstrual products? Do women have access to contraceptive care? Are there barriers preventing homeless women from utilizing contraceptive care?

Materials & Methods: Design: A survey will be sent to professionals who work closely with the female homeless population in San Diego County.
Participants: I have contacted twenty-five organizations in San Diego County that serve the homeless population in various capacities. The managers, or alternate point-of-contact, are receiving a survey to forward to their staff. These organizations include federally qualified health-centers, clinics, shelters, and non-profit organizations that serve the San Diego homeless population.
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Data analysis: Descriptive statistics will be performed using measures of frequency to ascertain which barriers are most important when it comes to accessing healthcare, menstrual products, and contraceptive products.

Results: Due to delay in IRB approval (7/31/20), as well as length of time it has taken to hear back from various organizations, insufficient data has been collected from which to draw results (only three responses have been received at this time (10/21/20)).
Conclusions:
Insufficient data has been collected from which to draw conclusions at this time.

References: N/A

Alla, Sravani and Boussi, Tal
Advisor: Dr. Jacqueline Truong, College of Podiatric Medicine
Project Title: Evidence of Spin in Podiatric Medical Journals
Authors: Sravani Alla and Tal Boussi

Project Abstract: **Goals of the Study/Hypothesis:**
Spin is defined as using specific reporting strategies, regardless of the rationale or intention, to promote the intervention or treatment as favorable despite the presence of non-significant results. This gives rise to inaccurately extrapolated results and guides readers towards unwarranted conclusions. In this study, we will be evaluating the presence and prevalence of spin in the abstracts of RTCs throughout podiatric medicine-related studies with nonsignificant primary endpoints as well as the association between industry funding and spin in abstracts.

Materials & Methods: This study used podiatric medicine specific randomized control trials (RCTs), observational studies, meta-analyses, and systematic reviews from January 2019 to December 2019 in 5 journals. The data was then added to a Google Sheet, consisting of the title, journal, funding source, comparator arm, and the primary endpoint. We focused on the presence of spin in the title, abstract results, abstract conclusions, and the selection of the reported endpoints.

Results: 222 articles were included in this study. 65 of the articles evaluated presented with spin. 29% of all articles evaluated presented with spin. Funded articles had a 24% rate of spin. Articles that were not funded had a 31% rate of spin.

Conclusions: In conclusion, it was determined that there is a need for more research to be conducted to evaluate spin within other specialties and study its effect on clinical decision making.

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Amin, Neda, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Hendrik Szurmant, College of Osteopathic Medicine of the Pacific

Project Title: Signal transduction pathways involved in antimicrobial resistance mechanisms of Gram-positive bacteria

Authors: Neda Amin and Dr. Hendrik Szurmant

Project Abstract: **Goals of the Study/Hypothesis:** Gram-positive pathogens include some of the most formidable human pathogens. Many of these bacteria have evolved resistances to our

most important antimicrobials. Bacterial signal transduction systems are heavily involved in mediating these resistances and have been proposed as new drug targets. We conducted a systematic literature review in order to highlight the importance and the diversity of signal transduction systems in antimicrobial resistance of clinical isolates of Gram-positive pathogens.

Materials & Methods: We conducted a systematic literature review by analyzing publications of the past 10 years with a focus on antimicrobial resistance in the Gram-positive pathogens *Staphylococcus aureus*, *Enterococcus faecalis*, *Streptococcus pyogenes* and related species.

Results: Our literature review highlights the diverse mechanisms and the importance of signal transduction in bacterial drug resistance. One prime mechanism involved in these processes is the bacterial two-component system, which has no orthologs in the animal kingdom. Other important mechanisms involved in signal transduction include inducible proteolysis of repressors of transcription of resistance genes. In some instances, mutations in specific native signal transduction systems directly contribute to antimicrobial resistance and this commonly involves the two-component system as well.

Conclusions: Our literature review highlights the importance of various signal transduction systems in antimicrobial resistance and thus supports current drug development efforts aimed at targeting these systems

References: To be submitted.

Balci, Shant, College of Veterinary Medicine
Advisor: Dr. Kristopher Irizarry, College of Veterinary Medicine
Project Title: Assessing gibbon interaction with auditory and environmental enrichment
Authors: Shant Balci and Kristopher Irizarry

Project Abstract: Gibbons are considered apes, specifically belonging to “smaller/lesser” apes, and are extremely vocal and communicate via song. The mp3 player elicits auditory and mental stimulation, while requiring tactile interaction, offering a cognitively engaging experience. This was done by the gibbons pressing the four different colored buttons on the device, initiating the different categories of sound. In addition to the auditory enrichment, environmental enrichment, which was categorized into stationary perches and moving swings/ropes, was observed in order to compare the efficacy of each.
Goals of the Study/Hypothesis: Items located in the top half of the enclosure received more use/interactions than items located in the lower half. We also hypothesized that the mp3 player was interacted with more readily and frequently when placed near a branch so that they may sit while exploring the device.

Materials & Methods: The enclosures studied, as well as the sounds played on the device, alternated each week. We also compared enrichment interactions between times when food was present and when food was not present in order to observe any differences in their interest in interacting with enrichment. The data was analyzed via video and audio footage, which determined if the artificial enrichment is appropriate in encouraging species-specific behaviors. The project was designed to span 11 weeks with six weeks of on-site work, which began June 22, at the Gibbon Conservation Center in Santa Clarita, California.

Results: It is expected that the auditory stimulation will be a positive influence to the gibbons, however, they will be more inclined to interact with branches they can swing from due to their arboreal nature.

Conclusions: N/A

References: N/A

Bodapati, Sandhya, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Kathryn T. Chen, University of California Los Angeles
Project Title: Recent approaches and clinical trials targeting pancreatic adenocarcinoma invasiveness and the tumor microenvironment
Authors: Sandhya Bodapati, Isabel Mejia, Kathryn T. Chen, Begoña Diaz

Project Abstract: (maximum 300 words single-spaced text- Font Arial 11 or similar)
"Pancreatic adenocarcinoma (PDAC) originates in the glandular compartment of the exocrine pancreas. Histologically, PDAC tumors are characterized by a parenchyma that is embedded in a particularly prominent stromal component or desmoplastic stroma. The unique characteristics of the desmoplastic stroma shape the microenvironment of PDAC and modulate the reciprocal interactions between cancer and stromal cells in ways that have profound effects in the pathophysiology and treatment of this disease. Here, we review some of the most recent findings regarding the regulation of PDAC cell invasion by the unique microenvironment of this tumor, and how new knowledge is being translated into novel therapeutic approaches."

Goals of the Study/Hypothesis: The current management of pancreatic ductal adenocarcinoma (PDAC) with chemotherapy and complete surgical resection has limited efficacy, and the overall 5-year survival of patients diagnosed with PDAC has had limited improvements over the past two decades. This study summarized the current understanding of the PDAC tumor microenvironment (TME) and reviewed novel targeted approaches and clinical trials that address these components in order to improve treatment.

Materials & Methods: Published papers addressing pancreatic cancer and its TME or components of the desmoplastic stroma within the past ten years were identified using PubMed. All clinical trials reviewed were found through clinicaltrials.gov. The review period included clinical trials conducted from 2003-2020.

Results: Experimental therapies targeting the desmoplastic stroma include FAK inhibition and recombinant hyaluronidase, and are currently being evaluated in clinical trials. There are currently several cancer vaccine trials underway. For example, GVAX, which modifies cancer cells to release granulocyte-macrophage colony stimulating factor (GM-CSF), has shown promising, but mixed, results in some patients. Further clinical trials combining GVAX with chemotherapies and immunotherapies are necessary to assess its relevance in the scope of PDAC treatment. Other cancer vaccines targeting proteins such as mutant Ras, mucins, and kinesins, also remain to be promising targets, and are pending completion of clinical trials. Several other targeted therapies, such as chemokine ligand 12 (CXCL12) inhibitors which mitigate the prominent effects of cancer associated fibroblasts in the PDAC TME serve as promising targets for immunotherapy.

Conclusions: Although there have been many robust in-vitro and small animal studies evaluating the components of PDAC TME as targets for treatment, translation to humans remains challenging. New clinical trials targeting molecules of the desmoplastic stroma and TME offer hopeful promise for the field.

References: Mejia, I.; Bodapati, S.; Chen, K.T.; Díaz, B. Pancreatic Adenocarcinoma Invasiveness and the Tumor Microenvironment: From Biology to Clinical Trials. Biomedicines 2020, 8, 401.

Burger, Kristina and Southard, Rachel, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Beatrice Saviola, College of Osteopathic Medicine of the Pacific
Project Title: Perceived Stress and Perceptions of Vaginal Health Amongst Female Medical Students During COVID-19
Authors: Rachel Southard, Kristina Burger

Project Abstract : In the midst of a global pandemic, medical students have been presented with the traditional stressors of medical school along with isolation due to quarantine, loss of opportunities, and fears of themselves and others contracting COVID-19. These persistent stressors activate the hypothalamic-pituitary-adrenal axis, which causes an increase in glucocorticoid and catecholamine production. Cortisol has many systemic effects impacting energy metabolism, immune function, and blood pressure. 1 The prolonged stress on cis-female medical students from medical school and COVID-19 increases their risk of developing vaginal health issues. Per year, between 5 and 10 million visits to a physician are from the chief complaint of vaginitis. 2 Vaginitis is a broad term used to define the spectrum of conditions that cause vulvovaginal symptoms. 3 This research aims to examine the relationship between stress in medical school and the effects of perceived vaginal health. Results of this study have not yet been concluded; however, we expect to find a negative correlation between levels of perceived stress and quality of vaginal health.

Goals of the Study/Hypothesis: The goal of this study is to examine the relationship between stress perceived by cis-female medical students and reported problems with vaginal health.

Materials & Methods: An anonymous, voluntary, online questionnaire was published using Qualtrics. Cis-female medical students (Osteopathic and Allopathic) across the United States were recruited through email invitation and Rachel Southard's YouTube platform to participate. Questions inquired about age, reported quality of vaginal health, perceived stress levels, and stress management methods. Confounding factors such as contraceptive use, sexual activity, and antibiotic use were controlled for. For incentive, participants had the option to enter a raffle for the opportunity to win an Amazon gift card with a value of $20.00.

Results: Results from this survey have not been concluded.

Conclusions: We hypothesize that there will be a negative correlation between levels of perceived stress and quality of vaginal health.

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prospective database of affected women. Obstet Gynecol. 2006;108(5):1185-1191. doi:10.1097/01.AOG.0000239103.67452.1a

Chang, Josh, College of Veterinary Medicine
Advisor: Dr.Linda Kidd, College of Veterinary Medicine
Project Title: Post hoc analysis of extracellular vesicle procoagulant activity in cats measured with ZYMUPHEN-MP Activity Assay
Authors: Josh Chang, Amber Pentoney, Linda Kidd

Project Abstract: **Goals of the study & Hypothesis:** Thromboembolism is a common and deadly complication of hypertrophic cardiomyopathy in cats. Studies in people suggest phosphatidylserine-exposing extracellular vesicles(PS+EV) play a pathophysiologic role in thrombosis and may serve as biomarkers for thrombotic risk. We recently tested a human assay that measures procoagulant activity (PCA) of PS+EVs for use in cats. PS+ EV's were generated by incubating whole blood with LPS. Platelet free plasma was obtained using a centrifugation protocol optimized for use in people. The intra- and inter- assay coefficients of variation were high (28.64 and 54.25%, respectively). Samples with low PS+EV PCA (<1nM) showed the greatest variability. Residual platelet levels in plasma were higher than in people. Platelets can increase EV formation during freeze-thaw cycles of plasma. We hypothesized that platelet contamination may contribute to assay variability. The aim of the study was to determine the effect of samples with physiologically insignificant PS+EV PCA on assay precision, determine whether a correlation exists between platelet contamination and PS+EV PCA, and further characterize EV production in cats by examining variability of LPS-induced EVs in individual cats.

Materials & Methods: Analyses performed using Graphpad Prism v8. The Mann Whitney U-test was used to compare continuous variables. The Spearman Rho test was used to test correlations.

Results: The intra- and inter-assay CV when samples with PS+EV PCA<1nM were omitted was 12.12% and 22.60% respectively. The correlation coefficient between residual platelets and PS+EV PCA was r=0.7(p=0.23). Similar to people, LPS-induced variable amounts of EV formation in individual cats. Further optimizing platelet clearance from cat plasma may improve precision.
Conclusion: The assay shows promise in measuring cat PS+EV procoagulant activity. Next step is to determine if platelet clearance will eliminate assay variations.

Doshier, Jessi, College of Veterinary Medicine
Advisor: Dr. Linda Kidd, College of Veterinary Medicine
Project Title: Prevalence of Thromboembolic Disease in Dogs with IMHA
Authors: Doshier J., Allahverdi V., Schulman R., Kidd L.

Project Abstract: **Goals of the Study/Hypothesis:**

We hypothesized the prevalence of pulmonary thromboembolism (PTE) and thromboembolism in other organs is lower in dogs with IMHA than reported prior to recent recommendations for routine thromboprophylaxis.

Materials & Methods: Observational retrospective study. Cases were identified by searching electronic medical records of a large specialty practice for patients presenting between January 2017 and December 2019. Cases that met inclusion criteria for IMHA were evaluated for robustness of the diagnosis of IMHA, and whether PTE or thromboembolism of other organs were present using previously established criteria. Post hoc analysis asking whether dyspnea was associated with survival to discharge was performed using Fishers exact test.

Preliminary Results: 105 records met initial inclusion criteria. To date, 37/105 records have been evaluated for the presence or absence of dyspnea during hospitalization as part of the criteria for diagnosis of PTE. Dyspnea occurred in 16/37 (43%) of dogs. Six dogs with dyspnea had radiographs taken at the time of dyspnea. 3/6 had supportive (intermediate) evidence of PTE, while 2/6 had lower level evidence (suspicious) for PTE. 11/18 dogs without dyspnea and 8/16 dogs with dyspnea received clopidogrel. One dog received aspirin and data was not available for 2/37 dogs. Two dogs with intermediate and one with low level evidence for PTE did not receive thromboprophylaxis. Survival to discharge was recorded for 35/37. Six dogs with, and 19 dogs without dyspnea survived to discharge, while 10 dogs with, and no dogs without dyspnea died or were euthanized during hospitalization. A lack of dyspnea was associated with survival to discharge (p=0.0001).

Preliminary Conclusions: Dyspnea occurs commonly in dogs with IMHA during hospitalization. PTE likely contributes to dyspnea and death. Conclusions regarding the overall prevalence of PTE and thrombosis compared to historical controls are pending further data extraction and analysis.

Feng, Shanyi, Lee, Kyoyi and Le, Tien, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Anita Nelson, College of Osteopathic Medicine of the Pacific
Project Title: The Effect of Social Media on Pregnant Women's Perception of Tdap Vaccination
Authors: Shanyi Feng, Kyoyi Lee, Tien Le

Project Abstract: **Goals of the Study/Hypothesis:** To determine the quality of information regarding Tdap vaccination for the mother and those around the newborn ("cocooning") available online in media platforms such as Reddit, Instagram and Facebook and to assess the completeness and accuracy of professional websites, using CDC guidelines as a standard.

Materials & Methods: In the IRB exempt project, we identified Tdap-focused posts using keyword search engine for Facebook, Reddits and hashtag for Instagram. We filtered popular posts published between 2012 to Feb. 2020 and excluded posts with < 10 comments and/or <10 likes/shares, those published outside of the US. Posts with > 50 comments were analyzed until the 50th comment or until 4 sub themes were identified.

For expert websites, we used auto-generated Google search from page 1-15 for 100 sites, excluding websites with subscriptions, foreign standards, research paper, videos.

Results: From 95 Instagram posts with 485 comments, 88% favored Tdap. Only 3 of 16 health professional posts and 9/52 of Tdap-related comments mentioned vaccinations of others to provide newborn “cocooning”.

In 100 Facebook posts with 2877 comments, 12% of private users and 3% organization posts mentioned cocooning. Additionally, 1.3% of 307 qualifying-comments mentioned cocooning.

In 100 Reddit posts with 2872 comments, 14% posts asked “who needs Tdap?” and 19% asked “how to approach those around the newborn who refuse Tdap?”; 31% of the comments that mentioned cocooning, again the most popular subtheme was how to handle Tdap refusal.

Out of 100 “expert websites”, 33% were correct and complete.

Conclusions: Clinicians need to provide coherent advice on the importance of cocooning to counteract the misinformation and lack critical details in online sources.

References: American College of Obstetricians and Gynecologist (ACOOG) Poster- Cocooning the Newborn from Pertussis: What Social Media Say About Tdap)

Fenske, Natalie and Williams, Hanah, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Lisa Warren, College of Osteopathic Medicine of the Pacific
Project Title: Physician Recommendation of Cannabidiol (CBD) as a Treatment Modality for Anxiety in Adolescent Patients
Authors: Hanah Williams, Natalie Fenske, Jessica Houghton, and Karina Munoz

Project Abstract: **Goals of the study/Hypothesis: The main goal of this research** project is the exploration of physician outlook on the use of CBD in adolescent anxiety. Applications of CBD products have expanded over the last decade, and beneficial effects have been found in cases of anxiety disorders. However, clinical research on CBD products, especially in adolescent cases, has remained limited despite increasing popularity of these products and their seemingly benign nature. Given the challenges faced by physicians who treat adolescents in managing anxiety in their patients, further treatment options are a valuable avenue of examination, especially given the unique nature of the condition and the limitations of current treatment protocols. Our specific aim by assessing physician outlook towards CBD is to determine if this is a possible alternative treatment worth pursuit. It is ultimately the responsibility of physicians to decide a safe and effective treatment plan for their patients, which could be increasingly effective given more safe and viable options. Therefore, currently practicing physicians are an excellent resource to provide this information. Questions outlined in our survey attempt to measure bias towards CBD products, willingness to recommend CBD products for an adolescent population, and current practices as related to CBD. Our research goal is to determine the likelihood of physician recommendation of CBD products, specifically for adolescent anxiety cases. We hypothesize that an increased willingness to recommend CBD for adolescent populations will correlate with less years practiced following residency completion by the physician. Further questioning seeks to explore what other factors affect this willingness, with the end goal of assessing viability of CBD for further research as an alternative treatment for adolescent anxiety.]

Goals of the Study/Hypothesis: N/A

Materials & Methods: N/A

Results: Due to Covid-19, we experienced setbacks in the distribution of our survey. At this time, we do not have results and are opting out of presenting at the STAR Symposium. Our project is still in progress and distribution methods are currently being finalized. All of our progress has been updated with the IRB and we are staying on course to complete this project with our PI, Dr. Lisa Warren, DO and our student research group. We hope you understand our commitment to our project and our request to keep this out of public eye until we can present our project in its completed form.

Conclusions: N/A

References: N/A

Guzzardo, Michael, College of Podiatric Medicine
Advisor: David Shofler, College of Podiatric Medicine
Project Title: Access to Podiatric Healthcare in Los Angeles County and Health Disparities
Authors: Michael Guzzardo

Project Abstract: This study examined the geographic distribution of podiatry practices in Los Angeles County as a representation of the negative contribution which limited access to healthcare has on the health inequalities experienced by racial, ethnic, socioeconomic and other disparaged groups.

Goals of the Study/Hypothesis: It will be hypothesized here that there is a deficit in podiatric healthcare in neighborhoods where racial and ethnic minorities reside, and the specific research found here will be used to support the argument that lack of healthcare access is in-part causing health disparities between whites and other racial/ethnic minority groups.

Materials & Methods: The scope of this study was specifically limited to podiatrists in Los Angeles County. Locations of podiatrists was determined using online public information like Google Maps and Yelp to recreate the patient experience of finding access to podiatry services. This data was further expanded and confirmed with each corresponding practice's website or, if no website existed, other ancillary websites.

Population data including the distribution of age, racial/ethnic and socioeconomic groups were obtained from public information available on various government or non-government sponsored organizations. This information was used to determine where there was a high concentration of demographic groups which suffer most from health disparities.

Areas determined to be lacking in podiatric healthcare were selected based on comparative analytics of the entire county. Distribution and density of podiatrists relative to the population was used as a metric of whether or not an area had limited healthcare access. These metrics were then overlaid with geographic areas where there are statistically disparaged populations living. Neighborhoods with a higher percentage of racial/ethnic minorities and low average income were considered to be disparaged groups.

Those over the age of 60 were included in this study because there is overlap between the poor health elderly and their higher reliance on podiatry services. This was included to further detail where podiatric healthcare services are needed.

Duplicate listings and locations with no website or phone number were mostly excluded from this analysis. Areas of the county which are largely unoccupied for geological reasons, such as mountainous terrain, were excluded.

Results: File too long

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Huang, Hou Yuan, Salinas, Shelbi, Graduate College of Biomedical Sciences
Advisor: Dr. Miou Zhou, Graduate College of Biomedical Sciences

Project Title: Molecular and Cellular Mechanism of CCR5 Regulation of Cognitive Deficits in a Mouse Model of Alzheimer's Disease

Authors: Hou Yuan Huang, Shelbi Salinas

Project Abstract: Alzheimer's Disease (AD), currently the 6th leading cause of death in the United States, is the most common cause of dementia and is characterized by the presence of amyloid beta and tau. The increased levels of inflammation in AD further deteriorates the brain's cognitive function. The progress of developing treatment in decreasing the accumulation of amyloid beta and tau has been challenging. Alternative treatment to decrease inflammation in AD may be crucial to delay cognitive deficits in AD patients. Previous studies have shown an increased expression of CCR5 in the brains of both AD patients and AD mouse models, which initiates inflammation in the brain and leads to cognitive impairment [1, 2]. Genetic ablation of CCR5 has been shown to reduce astrocytosis and microgliosis, and, as a result, ameliorate the cognitive deficits of the AD mouse model.

Goals of the Study/Hypothesis: We hypothesize that CCR5 has a significant role in AD as its expression and activation has been shown to increase in AD. The inhibition of CCR5 with its antagonist Maraviroc may be a potential treatment for cognitive deficit in AD.
The first goal of our study is to examine the effect of CCR5 knockdown and overexpression in hippocampal CA1 region on the cognitive function of an AD mouse model with hippocampal Aβ(1-42) injection. Our second goal is to examine the rescue effect of the FDA-approved CCR5 antagonist Maraviroc on cognitive deficits in mice with hippocampal Aβ(1-42) injection.

Materials and Methods: Quantitative PCR (qPCR) will be performed to measure the expression level of *Ccr5* mRNA expression level in the dorsal hippocampal CA1 region of control mice and mice with Aβ(1-42) injection. Mice learning and memory will be assessed using a contextual fear conditioning (CFC) test and an object-place recognition (OPR) test in combination with the Maraviroc treatment. Immunostaining for Aβ deposit and microgliosis will be performed to study the effect of Aβ-induced inflammation and CCR5 antagonist in AD.

Results: Our project has been greatly delayed due to the COVID-19 pandemic. As a result, we do not yet have results.

Conclusions: N/A

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5 signaling pathway in the neuroinflammatory response and cognitive deficits induced by beta-amyloid peptide. Am.J.Pathol., 2009. **175**(4): p. 1586-1597
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their ligands in normal and Alzheimer's disease brains. The American journal of pathology, 1998.
153(1): p. 31-37. Huang, HouYuan and Salinas, Shelby

Kim, Cindy, College of Osteopathic Medicine
Advisor: Dr. Claudia Borzutzky, Children's Hospital Los Angeles

Project Title: Improving Access to Etonogestrel Implant at Children's Hospital Los Angeles
Authors: Cindy Kim OMS-II, Arek Hidirsah MD, Anita Nelson MD, Claudia Borzutzky MD

Project Abstract: **Goals of the Study/Hypothesis:** Although Etonogestrel implants are considered first-line contraception for adolescents, they may not be accessible to providers at CHLA-affiliated AltaMed clinic, nor is learning to place them a requirement for pediatric trainees per American College of Graduate Medical Education (ACGME) guidelines. This study identifies number of providers trained, provider comfort level counseling benefits and side effects of implants, potential barriers that prevent providers from getting trained, and provider-perceived likelihood of placing implants if trained.

Materials & Methods: An IRB-exempt, anonymous 11-question survey was distributed three times via RedCap to ~270 clinic pediatricians and CHLA pediatric residents. Responses were compared by provider status (Attending vs. Resident) and adolescent patient volume (4+/month vs. 1-2/month). Chi-square analysis was done to compare responses between groups.

Results: The response rate was 21% (n=56) with no statistically significant results achieved. 89% of total respondents were not trained (97% of residents and 87% of those who saw 4+ teenagers per month). 64% and 38% of those respondents, respectively, felt comfortable counseling about benefits and side effects of implants. Top reported barriers to training were: training not offered (24%), lack of access to training (20%), insufficient time for training (19%), and insufficient patient volume (14%). More residents reported lack of access to training, while more attendings reported time constraints preventing training. Residents are more likely to seek training and report fewer time constraints. Greater than two-thirds of providers predicted they would place 1-5 implants/month if trained.

Conclusion: To improve future access to contraceptive implants, training of pediatric residents should be required by ACGME. However, lack of trained attendings and need for coordination of the entire medical team may limit current use in clinics. Impacts of formal training on short- and long-term provider behaviors and patient access to implants should be studied in future projects.

Reference: Kim C, Hidirsah A, Nelson A, Borzutzky C. Improving Access to Etonogestrel Implant at Children's Hospital Los Angeles (CHLA). Poster presented at: 2020 Advances in Women's Health Conference of the American College of Osteopathic Obstetricians and Gynecologists; 2020 Oct 16-18; Virtual.

Krantz, Adam, College of Veterinary Medicine
Advisor: Dr. Tonatiuh Melgarejo
Project Title: 'Chimpanzee Mystery Illness' in Sierra Leone: Systematic Review of Collaborative Research
Authors: Adam Krantz, Tonatiuh Melgarejo

Project Abstract: Great ape species, including the chimpanzee (Pan troglodytes), are increasingly threatened with extinction due to human activities in the age of the Anthropocene. Veterinarians play a key role in the protection of both captive and free-ranging populations through the Species Survival Plans and Taxon Advisory Groups as members of Veterinary Advisory Groups, which are sub-committees of the Association of Zoos and Aquariums Animal Health Committees. A proper understanding of causes of mortality from naturally occurring disease is vital to the preservation of these populations and can be established through systemic reviews of the existing literature.

Goals of the Study/Hypothesis: The aim of this project was to develop a protocol for a systemic review of the literature to answer the research question: "What are the documented causes of chimpanzee mortality from naturally occurring diseases in zoological and free-living populations?"

Materials & Methods: N/A

Results: Research Ongoing.

Conclusions: Through synthesis of all the existing published literature an up-to-date framework can be developed, which can be used by veterinarians to implement evidence-based methods in the captive or free-ranging populations, and at all levels of conservation intervention.

References: N/A

Lucero, Mariana, College of Osteopathic Medicine
Advisor: Dr. Raj Kandpal, College of Osteopathic Medicine
Project Title: Stem-like Cells from Invasive Breast Carcinoma Cell Line MDA-MB-231 Express a Distinct Set of Eph Receptors and Ephrin Ligands
Authors: Mariana Lucero, Jaspreet Thind, Jacqueline Sandoval, Shayan Senaati, Belinda Jimenez And Raj P. Kandpal

Project Abstract: Breast cancer cell lines consist of bulk tumor cells and a small proportion of stem-like cells. While the bulk cells are known to express a distinct combination of Eph receptors and ephrin ligands, the transcript profiles of stem-like cells in these cell lines have not been adequately characterized.

Goals of the Study/Hypothesis: The aim of this study was to determine Eph receptor/ephrin ligand profiles of cancer stem cells specific to a triple negative breast carcinoma cell line.

Materials & Methods: The normal breast cell line MCF10A and the invasive breast carcinoma cell line MDA- MB-231 were used to isolate $CD24^{+}/CD24^{-}$ cell populations. The profiles of Eph receptors and ephrin ligands were determined by real-time PCR and the relative abundance in bulk and stem cells were compared

Results: Based on the mean ΔCT values, the descending order of abundance was as follows. EphrinA5 > EPHA2 > (EPHA8, EPHB2) > ephrin-B2 > (EPHA7, EPHB4, ephrin-A4) > ephrin-A3 > ephrin-A1 > (EPHB3, ephrin-B1) > EPHA4 > EPHA1 > EPHA10. EPHA6 and ephrin-A2 transcripts were not detectable in stem cells from either cell line. The expression of EPHA4, EPHA7, EPHA8, and ephrin-A5 in MDA-MB-231 stem cells was up-regulated by 12, 20, ~500, and 6.5-fold respectively.

Conclusions: The up-regulation of transcripts for EPHA8 and its cognate ligand, ephrin-A5, in the stem cells isolated from MDA-MB-231, suggest their involvement in the invasiveness of this cell line. Based on literature reports, we propose the role of EPHA8 and ephrin-A5 in MDA-MB-231 stem cells via the PI3K-AKT-mTOR pathway.

References: Lucero M, Thind J, Sandoval J, Senaati S, Jimenez B, Kandpal RP. Stem-like Cells from Invasive Breast Carcinoma Cell Line MDA-MB-231 Express a Distinct Set of Eph Receptors and Ephrin Ligands. Cancer Genomics Proteomics. 2020 Nov-Dec;17(6):729-738.

Lum, Trenton, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Anup Katheria, Neonatal Research Institute at Sharp Mary-Birch Hospital
Project Title: Blood Transfusion In Preterm Infants And The Subsequent Development Of Bronchopulmonary Dysplasia
Authors: Trenton Lum, Jenna Sugar, Rachel Yim, Sophie Fertel, Ana Morales, Anup Katheria

Project Abstract: **Goals of the Study/Hypothesis**: Preterm infants are frequently transfused with red blood cells (RBC) in the NICU. Previous studies in neonates have found a need to escalate mean airway pressure or FiO2 in the hours immediately following RBC transfusion suggesting that there may be negative effects on lung function leading to bronchopulmonary dysplasia (BPD). The purpose of this study was to investigate the relationship between RBC transfusions and the subsequent development of BPD among preterm infants born at <32 weeks gestational age.

Materials & Methods : This study utilizes a retrospective cohort design to evaluate preterm infants born <32 weeks between May 2007 to August 2020. BPD was defined as supplemental oxygen dependency at 36 weeks postmenstrual age. Bivariable and multivariable regression were used to evaluate the association between RBC transfusion and the subsequent development of BPD.

Results: 622 infants were evaluated. Three hundred ten (50%) infants received a total of 1397 RBC transfusion exposures. 50% received their first and/or only RBC transfusion after 72 hours of life. Bivariable regression revealed a significant association between RBC transfusion and the successive development of BPD (OR, 13.2 [95%CI, 7.7-22.7], P<0.0001). After adjusting for maternal age, placental transfusion, gestational age, birth weight, gender, surfactant administration, 5-minute APGAR score, and sepsis, receipt of RBC transfusion was associated with a 4.5-fold increased likelihood to later develop BPD (adjusted-OR, 4.5 [95%CI, 2.3-8.8], P<0.0001). This relationship was also retained in sub-cohort analysis of extremely preterm infants born <28 weeks (adjusted-OR, 2.6 [95%CI, 1.0-6.5], P=0.046).

Conclusions: Red blood cell transfusion was an independent predictor of the subsequent development of bronchopulmonary dysplasia in preterm infants after adjusting for prematurity and severity of illness at birth. Prospective studies employing therapies to reduce the need for

blood transfusion, such as erythropoietin administration or ensuring placental transfusion at birth, are needed to confirm this association.

Marans, Jesse, College of Veterinary Medicine
Advisor: Dr. Dominique Griffon, College of Veterinary Medicine
Project Title: Validation of a Novel Technique to Measure Rotational Instability of the Canine Stifle

Authors: Jesse Marans, Jin Yu, Ayman Mostafa, Gary Wisser, Dominique Griffon

Project Abstract: Cranial cruciate ligament disease (CCLD) is the most common cause of stifle lameness in large breed dogs. Loss of function of the CCL causes translational and internal rotational instability (RIS). While translational motion between the tibia and femur is relatively easy to measure, RIS has proven more difficult and can be confused with tibial torsion (TT). The most common surgical procedure, tibial plateau leveling osteotomy, addresses translational instability, but is not designed to address RIS. Stress compression radiographs do not directly measure rotational instability in CCL injuries. The purpose of this study is to develop and validate a dynamic radiologic technique that quantitates the degree of rotational instability in the stifle joint. We produced a positioning device by importing 3-D CT scans of a Labrador Retriever's hind limbs into Computer Aided Design (CAD) software and then building the device around those images. This radiolucent device is 3-D printed with Formlabs Tough Resin consisting of adjustable rails and clips, a graduated ring over the stifle and a carbon rod connected to a digital torque meter. It maintains the position of the thigh while applying a standardized torque on the tibia. We will then test our method on 4 hind limbs, obtained from 2 large dog cadavers. We will assess RIS and tibial torsion (TT) in normal limbs and those surgically altered to create RIS, TT or both. All limbs will have standard radiographs and CT scans performed in neutral position and with internal tibial torque applied in a standardized fashion using a novel positioning device.

Goals of the Study/Hypothesis: Cranial cruciate ligament disease (CCLD) is the leading cause of stifle lameness in dogs (1,2). CCLD causes both cranial and internal rotational instability of the stifle. While the translational motion between the tibia and femur is routinely detected, clinicians are currently unable to assess the internal rotational instability (RIS)(3). In addition, differentiating RIS from tibial torsion currently requires computed tomography.

The overall goal of this research is to develop and validate a simple, non-invasive and cost-effective technique to assess RIS and differentiate it from tibial torsion. We hypothesize that this goal can be achieved with a dynamic radiographic method. The objective of this summer project was to create the positioning device required for this radiographic technique.

Materials & Methods: The positioning device was designed to meet the following needs:

- Maintain the thigh in position while applying a predetermined torque on the tibia
- Measure the degree of rotation of the stifle
- Be as radiolucent as possible
- Adjustable to different sizes of large dogs

Production of the first prototype:

- 3-D CT scans of a Labrador Retriever's hind limbs were imported into Computer Aided Design (CAD) software
- Medial and lateral adjustable rails and blades, and a graduated ring over the stifle were 3-D printed with radiolucent Formlabs Tough Resin in a Formlabs 2 printer
- A rod connected the distal portion of the positioning device to a digital torque meter
- An internal torque of 6.5 N-cm was applied

Validation:

Four hindlimbs of two dogs euthanized for reasons unrelated to the study were used to test the prototype.

Caudocranial radiographs of the tibia were obtained with the limb in the positioning device. The distance between the calcaneus and sulcus of the talus was measured neutrally and under stress. We also measured tibial width and the shortest distance between the center of the femoral head and the PFA.

We validated that the limbs had normal bony anatomy by measuring the femoral anteversion angle, tibial plateau angle, mechanical tibiofemoral angle and metatarsotibial angle, mechanical axis deviation of the stifle and tarsal, as well as, the distance between the center of the body of the talus and the proximocaudal edge of the calcaneal tuber.

Radiographs were repeated after transection of the CCL, as an experimental model of CCLD

Results: Transection of the CCLD led to cranial drawer and increased internal rotation on palpation of the stifle.

Several issues were identified:

- The friction within the circular rings exceeded 6.5Ncm prompting the evaluation of stifle at 13 N-cm instead. However, friction varied between trials, preventing accurate assessment of the torque directly on the stifle joint.
- Plastic screws linking parts of the positioning device were not strong enough and allowed motion within the side rails.
- The bottom of the positioning device interfered with the radiographic table during torque.
- The tibia needed to be elevated to be parallel to the table and needed more stabilization to ensure transmission of torque
- Adjusting the horizontal level of the side rails and the angle of flexion of the stifle created too much variability

Alterations were subsequently made:

- The width of the tibial frame was decreased
- Addition of a pair of blades to give two points of contact to the tibia
- Fusion of the tibial and femoral rails to eliminate motion
- Fixed the angle of flexion between the tibial and femoral frames to 130 degrees
- Bottom rollers were added to the tibial frame to allow up to 45-50 degrees of rotation without interference with the table.
- Decreased width of circular rings to decrease friction
- Fused the circular rings to their respective frames

These changes improved the stability of the frame but did not palliate the friction occurring between the inner and outer sections of the circular rings and between the bottom rollers and table.

Conclusions: In an attempt to validate this radiographic technique for measuring RIS and differentiate it from TT, a positioning device was created. This device must be able to apply 6.5 N-cm of torque reproducibly to the tibia with a fixed femur. There were friction problems with the original design, as well as with the modifications performed to date. The texture of the resin would not allow the rings to move without friction, so we plan on replacing these rings with a metal bearing. In addition, we feel that removing the bottom rollers will also improve the device. We are hopeful that these modifications including all of the prior changes, will solve the friction problem and allow the validation study to move forward.

With these alterations we will be able to obtain the necessary radiographic measurements to validate this important technique. The key measurement from the standard radiographs is the angle of medial rotation (ρ). This is calculated by using the formula shown in the last image. To ensure the accuracy of these radiographs, CT scan comparisons will be utilized. Once this device is validated, it will have the immediate impact in aiding with the diagnosis of CCLD and assisting with pre-operative planning. Finally, it will aid in assessing and possibly developing more effective surgical procedures for this condition.

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Morgan, Nicole, College of Veterinary Medicine
Advisor: Dr. Wael Khamas, College of Veterinary Medicine
Project Title: Histological study on the small intestine of an Argentine black and white tegu (*Salvator merianae)* invasive to Florida
Authors: Nicole Morgan, Dr. Wael Khamas

Project Abstract: **Goals of the Study/Hypothesis:** This study intends to provide anatomical descriptions and characterizations of the histology of the small intestine of the Argentine black and white tegu, *Salvator merianae.*

Materials & Methods: Two specimens of *S. merianae* were collected and euthanized. Sections were taken and stained Hematoxylin and Eosin (H&E), Periodic Acid Schiff (PAS) stain, Elastic

stain (Modified Verhoef's), Modified Masson's Trichrome, and Alcian blue (pH 1.0, pH 2.5). Photographs were obtained using Olympus BX41 microscope and measurements and descriptions of the mucosa, submucosa, and muscular layers were obtained and analyzed using ImageJ software.

Results: Organ contains the basic four layers: mucosa, submucosa, muscular layer, and serosal layer. The mucosa is organized into primary villi with secondary and sometimes tertiary

villus extensions. Epithelium is simple columnar with microvilli and ovoid nuclei that contain a visible nucleolus. Goblet cells are numerous and may be present more in the distal intestine. Scattered intraepithelial lymphocytes were noted. Eosinophils are also present; it is speculated that amount may be increased due to parasites that were also found in the section. Clusters of lymphoid tissue (GALT) are visible within the lamina propria. No glands were observed. The lamina muscularis was thin and scattered within the primary villus. The submucosa contained dense connective tissue with vascular, nervous, and lymphatic structures present. The muscular layer contained a smaller inner circular layer with a larger outer longitudinal layer. Serosal layer was thick and covered with mesothelium.

Conclusions: The histology of the small intestine has some differences and similarities to that of mammals and other reptiles. More research is needed to differentiate proximal versus distal intestine and draw comparisons with other known reptiles.

References: N/A

Noh, Sangkyu (Steven), College of Osteopathic Medicine of the Pacific
Advisor: Mohamed M Radwan, College of Osteopathic Medicine of the Pacific
Project Title: Emerging Cholesterol Modulators for Atherosclerotic Cardiovascular Disease
Authors: Sangkyu Noh, Kevin Mai, Madeleine Shaver, Stanley Yong, Mirko Mostaghimi, Grace Oh, Mohamed M Radwan MD

Project Abstract: Studies have demonstrated that reducing elevated low-density lipoprotein cholesterol (LDL-C) results in fewer cardiovascular disease-related events. Statins have become the gold standard lipid-lowering therapy for preventing atherosclerotic diseases. However, with increasing evidence in support of combination therapies providing greater benefits to certain patient populations, such as those intolerant to statins, there is an urgent need to identify novel lipid-lowering approaches to treating atherosclerotic diseases.

We discuss the safety and efficacy of current alternative and adjuvant cholesterol targeting agents as well as their implications for practice use. These drugs target LDL-C, high-density lipoprotein cholesterol (HDL-C), or lipoprotein(a) (Lp(a)). In trials, the addition of PCSK9 antibodies, such as evolocumab, to statins yielded a greater reduction in LDL-C, coronary atherosclerosis progression, and risk of cardiovascular events with no major safety concerns. However, expensive cost and administrative burden are impediments to practical use. PCSK9 siRNA, inclisiran is an appealing alternative because of the marked reduction of LDL-C without significant adverse events as well as its lower cost and administrative burden. Bempedoic Acid (BemA) is another promising LDL-C lowering agent highlighted for its efficacy as both monotherapy and add-on to statins. Activated in the liver, BemA lends a favorable tolerability that possess potential as an alternative for patients with statin-related myopathies. As an HDL-C targeting agent, cholesteryl ester transfer protein inhibitors have shown to elevate HDL-C but fail to safely provide evidence for improving cardiovascular outcomes. In addition, antisense oligonucleotide therapies IONIS-APO(a)rx, IONIS-APO(a)Lrx, and AKCEA-APO(a)-Lrx demonstrated safety and efficacy in lowering Lp(a) levels but warrant further development in phase 3 trials. For all the novel approaches, further investigation is needed to better appreciate the long-term efficacy, safety, and effects on cardiovascular outcomes. Nevertheless, these therapies provide a promising outlook as alternatives for a subset of atherosclerotic patients for whom statins have been ineffective or intolerable.

Goals of the Study/Hypothesis: N/A: Review Article

Materials & Methods: N/A: Review Article

Results: N/A: Review Article

Conclusions: N/A: Review Article

References: None.

Oosterbaan, Claire, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Maryam Othman, College of Osteopathic Medicine of the Pacific
Project Title: Barriers to OB/Gyn Care for Sexual Minority Women, from the Perspective of Experts Who Have Been Serving These Women Well
Authors: Claire Oosterbaan & Maryam Othman, MD

Project Abstract: Sexual Minority Women (SMW) is a broad term for women identifying as lesbian, bisexual, queer, questioning or non-heterosexual in general. SMW present with several disparities, including increased substance abuse, mental illness and poor physical health[6]. In the realm of gynecologic health, SMW were found to have lower rates of receiving Pap smears and a 37% prevalence of high-risk cervicovaginal HPV[1] as compared to 20.4% in women sampled from the general population[4]. Research has repeatedly shown that HPV infection is highly correlated to the development of cervical cancer, along with data showing that 93% of cervical cancers could be prevented by screening and HPV vaccination[2]. More research needs to be conducted to determine the root cause in this discrepancy in prevalence and screening for HPV and cervical cancer in SMW. SMW have also been found to have a greater likelihood of delaying care due to negative healthcare experiences like provider discrimination when compared to heterosexual women[7]. A study that explored SMW experiences in sexual identity disclosure reports that factors encouraging disclosure include physicians avoiding assumptions, openly asking about sexual identity and behaviors, signaling inclusivity, and catering to SMW-specific needs regarding contraceptive care[3]. While we know SMW seek this behavior, we seek to determine this from the lens of the provider. Finally, it is yet to be determined how implicit bias of medical staff may affect SMW from obtaining women's healthcare, which this survey aims to explore.

Goals of the Study/Hypothesis: The purpose of this pilot study is to determine the barriers that SMW have in accessing obstetric and gynecologic care and assess these barriers through the lens of the healthcare team. In particular, the role that homelessness and identifying as a minority may play into the quality and quantity of SMW's healthcare will also be explored. By collecting information from experienced providers and team members, this survey will key into their experiences and perceptions of SMW. These survey results will remain entirely anonymous and will solely serve the purpose of identifying gaps to obtaining reproductive healthcare that SMW face from those who are most welcoming and familiar with serving this group.

Materials & Methods: Study design: An anonymous, voluntary web-based survey on Qualtrics sent out to organizations that have clinics serving LGBTQIA+ populations around the United States. The purpose of this survey is to assess and better understand barriers to obtaining

OB/GYN healthcare for SMW. In addition, the role of medical provider mistrust and implicit bias will be explored within the survey.

Participants: The participants of this study are any healthcare provider or staff member that works with LGBTQIA+ populations. Sites contacted to distribute the survey represent diverse areas of the United States with clinics serving LGBTQIA+ communities and having distinguished women's healthcare services.

Survey: The survey that providers and staff will complete takes approximately 5-7 minutes and has an optional link that can be explored at the participant's own leisure. The optional link is not associated with explicit data collection, but it is rather a tool that respondents can use to explore their own implicit biases. No personal identifying information will be collected. The survey itself asks about their role in the clinic, how long they have worked there, which United States region they care for women (according to the United States Census Bureau)[8], what group of women they believe experiences the largest barrier to receiving reproductive health care, what they perceive the largest barriers that SMW face to receiving reproductive health care, and their perception on mistrust and implicit bias in the healthcare field. The questions range from multiple choice to using the Likert scale and ending with some fill-in-the-blank questions. Responses will be collected for one month after the survey is sent out to potential participants.

Data Analysis: Using the data collected from the survey responses, descriptive statistics will be collected and analyzed to determine demographics of SMW, what barriers are most significant, and how providers perceive the SMW experience in receiving reproductive health care. Means, medians, ranges, and percentages will be reported. Possible associations will be tested using Chi-square and t-test for statistical significance. The questions that are fill-in-the-blank will be used qualitatively to explore ideas that can be more quantitatively researched in future studies.

Results: Due to delayed IRB approval (9/29/2020), as well as barriers to collecting data due to the COVID-19 pandemic, insufficient data has been collected. This abstract will be updated once sufficient results have been collected.

Conclusions: Due to delayed IRB approval (9/29/2020), as well as barriers to collecting data due to the COVID-19 pandemic, insufficient data has been collected to draw conclusions.

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Panfilov, David, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Yijia Xiong, College of Osteopathic Medicine of the Pacific
Project Title: Pathogen detection with morpholino microarray
Authors: David Panfilov, Yijia Xiong

Project Abstract: For this project, we will be using morpholinos to target pathogen’s signature RNA and optimizing this procedure in hopes of incorporating It into future screening practices. We will be focusing on extracting the genetic components from various microorganisms and tagging them with a fluorescent dye. Once the total RNA are tagged with the fluorescent dye, it will be hybridized to the morpholinos on the glass slide. These glass slides contain different morpholinos designed to bind to different RNA targets. For example, some slides have morpholinos that will bind to the 23S, 16S, 16S, 5S, and other bacterial rRNAs. Afterwards, the array cells will be photographed to qualitatively and quantitatively determine what RNA components have been bound to morpholinos. Experimental conditions will be optimized for better detection.

Goals of the Study/Hypothesis: To use morpholinos to detect the presence of pathogens and to optimize conditions for future screenings.

Materials & Methods: RNA from various microorganisms, i.e. E coli., will be extracted with different methods. The RNA extraction will be confirmed by using UV-vis spectrometry by looking at the absorption peaks. Peaks intensities and ration at 230nm/260nm/280nm will be used to check for the presence and quality of RNA material. The next step would be the fluorescence labeling of the RNA sampling. The labeled RNA will be separated from excess dye by running it through a size exclusion column. Finally, the RNA sample will be hybridized to the morpholinos that have been functionalized on a glass slide and a microarray photo will be taken to analyze the different components of RNA. We will screen an array of different RNA extraction, labeling and hybridization conditions to optimize the detection limit.

Results: N/A

Conclusions: N/A

References: N/A

Parker, Dana, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Michelle Steinauer and Dr. Johannie Spaan: College of Osteopathic Medicine of the Pacific

Project Title: **Effect of *Schistosoma mansoni* infection status and worm burden on cytokine expression**
Authors: Dana Parker OMS II, Emily Lawrence OMS III, Nathan Leavitt OMS III, Jennifer L. Johns DVM, PhD, Brian Dolan PhD, Kathy Magnusson DVM, PhD, Johannie M. Spaan PhD, Michelle Steinauer PhD

Project Abstract: **Goals of the Study/Hypothesis:** It is increasingly recognized that gut inflammation and microbiome changes influence behavior and cognition through a "gut-brain axis". Billions of people have chronic gut inflammation due to helminths yet impacts of parasitism on the gut-brain axis remain largely unexplored. *Schistosoma mansoni* is a blood fluke that causes local inflammation in the large intestine and liver due to egg trapping. We hypothesize that this inflammation impacts microbiome composition, behavior, and cognition. Using a mouse model, our first step was to characterize systemic inflammation due to infection.

Materials & Methods:

A multiplex immunoassay to quantify seven serum cytokine measurements from 27 infected and 20 control mice, and a non-metric multidimensional scaling (NMDS) analysis were used to characterize immune profiles. Distance matrixes with a good quality fit (stress = 0.05) revealed infected mice had significantly different inflammatory profiles than controls. Six of the seven cytokines (IFN-γ, IL-1β, TNF-α, IL-4, IL-17A, IL-23) were strongly correlated and grouped on a single axis. IL-23, which is strongly associated with severe immunopathology in schistosome infections was negatively associated with the remaining cytokines. IL-10, an anti-inflammatory cytokine, defined the second axis and evidence suggests that schistosome parasites can drive IL-10 production to suppress the immune response and immunopathology.

Results: Considering worm burden, IL-10, IL-23, and IFN-γ concentrations had positive associations with worm burden (Wilcoxon rank sum test, $P = 0.0290$, $P = <0.0001$, and $P = 0.0031$ respectively), which perhaps suggests a complex relationship between developing immunopathology and counter immune suppression.

Conclusions: This study demonstrates that infected mice have distinct inflammatory profiles than control mice. Our future research will examine the links between inflammation, gut microbiome, behavior, and cognition. Furthermore, we will investigate how gut inflammation and microbiome changes affect brain derived neurotropic factor and inflammatory cytokines in brain regions to explore effects of inflammation secondary to *S. mansoni* on the gut-brain axis.

Shafer, Christian, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Edie Sperling, College of Osteopathic Medicine of the Pacific
Project Title: Arterial Latex Injection for Medical Student Learning
Authors: Christian Shafer, OMS-II; William Merbs; Edie Sperling, PT, DPT, OCS

Project Abstract: Anatomy lab with patient donors has always been a hallmark of pre-clinical medical school education. While some medical schools choose to explore the option of virtual labs, others continue to look for ways to enhance the learning experience for students within the patient donor anatomy lab1,2,3. The purpose of this study is to explore the value of adding latex injection of human vasculature as another tool to enhance learning and perspective. Latex injection has been used by specialists and surgeons to study details of arterial trees, and this same model could add to medical student education4,5,6,7. As many of these smaller arteries are often discarded and unnoticed as students dissect larger structures, this study is of specific

interest in the medical education setting. Red, laboratory grade latex was obtained and injected into the femoral, radial, and ulnar arteries. The latex was allowed three days to set and solidify. Dissection of the structures of interest was then performed and documented photographically. We found clearer visualization of larger arteries in addition to the smaller arteries, specifically those intimate with subcutaneous fat, fascia, and periosteum. Our findings suggest value in utilizing at least one donor patient injected with latex to help students appreciate the smaller and variable arteries that may not typically appear in anatomy textbooks or atlases.

Goals of the Study/Hypothesis: The purpose of this study is to explore the value of observing latex-injected human vasculature as another tool in the dissection lab to enhance learning and perspective in medical education. Latex injection has been used by specialists and surgeons to study details of arterial trees, and this same model could enhance medical students' understanding of the dense concentration and variability of vascular structures. As many of these smaller arteries are often discarded and unnoticed as students dissect larger structures, this study is of particular interest in the health education setting.

Materials & Methods: Red, laboratory grade latex was obtained and injected into radial, and ulnar arteries. The latex was allowed three days to set and solidify. Dissection of the femoral, structures of interest was then performed and documented pnhotograpically.

Results: We found clearer visualization of larger arteries, in addition to many previous non-visualized smaller arteries, specifically those intimate with subcutaneous fat, fascia, and periosteum.

Conclusions: Our findings suggest value in utilizing at least one donor patient injected with latex to help students appreciate the smaller and variable arteries that may not typically appear in anatomy textbooks or atlases.

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Strain, Elizabeth, College of Veterinary Medicine
Advisor: Dr. Kristopher Irizarry, WesternU DVM
Project Title: Identifying and characterizing behavioral phenotypes in captive gibbons.
Authors: Elizabeth Strain*, Tamara Abato-Earwood, Shant Balci, Kalee Farberow, Avak Zakarian, Connor Ellis, George Nababan, Kregg Maruyama, Wesley A. Johnson, Carlos Castro Candelas, Gabbi Skollar, Curtis Eng, and Kristopher Irizarry

Project Abstract: Novel enrichment is the main staple of maintaining the overall mental and physical health of captive apes, including gibbons. Finding devices that can be categorized as successful forms of enrichment is especially difficult as gibbons exhibit preference for certain types of enrichment over other types. The main goal of this study is to classify several categories of behavioral phenotypes within the normal captive gibbon environment. Following the documentation of this functioning library, classified behavioral phenotypes can be more easily identified and quantified in captive settings. Three different species of Hylobatidae (Eastern Hoolock, Javan, and Pileated) are currently being observed for distinct behavioral phenotypes ranging from feeding and grooming behaviors to interaction with a variety of enrichment devices. From this data, we hope to better understand and identify behavioral phenotypes seen in these gibbons and ultimately relate certain behavioral phenotypes in these primates to something equivalent to human emotion that can serve to provide insight into successful enrichment devices.

Goals of the Study/Hypothesis: From this study, we intend to develop a functioning library as a prominent backbone resource for future study reference regarding captive gibbon behavioral phenotypes.

Materials & Methods: For this study, two groups of Eastern Hoolock (n =4, n =2), two groups of Pileated (n =2, n =3), two groups of Northern WhiteCheeked (n =3, n =2), and two groups of Javan (n =3, n =1) gibbons were observed over a six week period (N=20). Female (n=10) and male (n=10) gibbons were assessed across a varying age range, the youngest at 13 months and the eldest at 27 years of age. Video, audio, and photographic recordings were taken during periods of potential behavioral phenotypic display and catalogued within five main categories of brachiating, eating, drinking, social and enrichment interactions. Subcategories for brachiating include fast, slow, head-forward, and head-rotating movements. Eating includes carrying of the food, stationary positions while masticating, and isolation and social eating. The subcategories within drinking are indirect and direct sources to mouth, while the enrichment category contains both novel (trampoline, mp3, and puzzle feeders) and pre-existing devices (natural environment, non-natural enclosure objects, toys) along with investigation and observation during these events. Finally, social interaction is subcategorized into allogrooming, lounging, and play specified by proximity.

Results: From this observation study, all species of Hylobatidae demonstrated the five main categories of brachiating, eating, drinking, social and enrichment interactions. Please see the attached presentation for picture results.

Conclusions: From this observation study, all species of Hylobatidae demonstrated the five main categories of brachiating, eating, drinking, social and enrichment interactions (Image 1-23). However, certain behavioral phenotypes were distinguishable based on gender, such as the head-swinging brachiation pattern only seen in males (Image 4). This pattern was only noted in enclosure with mated pairs and we theorize that the head-swinging behavioral phenotype may be a brachiation tic due to the presence of the more dominant female or a sign of an unsuccessful mating pair (Fuentes, 2000). While this brachiation pattern has been noted in other studies across species, further research should be done to assertain why this behavior occurs (Turnquist et al., 1999). Behavioral phenotypes regarding dynamic enrichment use were similar across all species, with each observed family or mated pair of gibbons frequently using swinging toys that allowed for faster brachiation (Graph 1). Isolated males appeared to interact with enrichment provided more so than those in group settings, however the analysis to verify this observation is past the scope of this study (Graph 1). While the preference for enrichment in primates is for the arboreal over the terrestrial types, specific fondness between isolated versus group dynamics in gibbons has not been analyzed in current literature (Veitia, 2017). The benefits of this future study could provide valuable insight towards captive gibbon keeping and overall health. Other observations made, like the frequency of drinking compared to eating, could provide better intuition regarding placement of water sources (i.e. arboreal versus terrestrial) (Graph 3). Social interactions between younger family members towards other relatives within the same enclosure exhibited more social play initiation behavioral phenotypes, where mated pairs appeared to show a balance of said initiation (Graph 2). More in-depth studies involving analyses should be used to determine this observation as current studies regarding human children demonstrate higher cognitive function (Whitebread et al. 2017). Finding a potential link between social play behavioral phenotypes in gibbons with higher cognitive function may provide insight into the human condition as a result.

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Subramanyam, Chaitra, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Raja Sivamani, California Northstate University, College of Medicine
Project Title: A Review of Evidence Behind Antiviral and Immune Supporting Herbs and Supplements and Pharmaceuticals for SARS-CoV-2
Authors: Hera Wu, Chaitra Subramanyam, Jessica Maloh, Heather Zwickey , and Raja Sivamani

Project Abstract: **Goals of the Study/Hypothesis:** The pandemic with the novel coronavirus COVID-19 (SARS-CoV-2) has created great interest in the use of immune supporting and antiviral therapies that span pharmaceuticals, herbs, and supplements that include Ayurvedic herbs as well. However, a summary of the evidence for immune supporting and antiviral activities are missing. We provide an evidence-based overview of the current state of knowledge and evidence for antiviral effects and review the evidence that specifically relates to SARS-CoV-2.

Materials & Methods: MEDLINE searches and pre-print databased were conducted for conventional therapies and reviewed for clinical trials, herbs, and supplements that could be translated into English. Inclusion of herbs was limited to those that have been studied for their antiviral effects and we subanalyzed the literature for Ayurvedic herbs. Inclusion of nutraceuticals and supplements was limited to those that have been studied for their antiviral effects and immune modulating properties.

Results: Conventional repurposed antivirals and agents currently with preliminary results from clinical trials include chloroquine, hydroxychloroquine, remdesivir, favipiravir, and umifenovir, a combination of lopinavir and ritonavir, and intravenous immunoglobulin therapy, corticosteroids, tocilizumab, and convalescent plasma. The nutraceuticals vitamin D, vitamin C, Nacetylcysteine (NAC), zinc, and larch arabinogalactan have all demonstrated antiviral and immune symptoms associated with SARS-CoV-2, but the results are not yet available. Furthermore, the some of the Ayurvedic herbal agents have demonstrated antiviral properties in in vitro studies, while modulating properties and associations. Studies suggest an association between zinc deficiency and vitamin D deficiency with risk for infections. Further, NAC and zinc have demonstrated reductions in pro-inflammatory markers associated with infection, while larch arabinogalactan may increase these markers. None of these nutraceuticals have been studied in the context of SARS-CoV-2. Based on in vitro studies, the herbal agents Artemisia annua, Lycoris radiata, Pyrrosia lingua, and Lindera aggregata have been found to inhibit cytopathic effects of a strain of SARS-CoV-1, and Houttuynia cordata has also demonstrated anti -viral properties against SARS-CoV-1 strain.

Additionally, through varying mechanisms of action, the herbs echinacea, elderberry, berberine, and astragalus have demonstrated antiviral activities. Next, current trials are investigating the use of Ayurvedic remedies in the management of flu-like Picrohiza kurroa has demonstrated a protective effect on humoral immunity. However, the herbal agents included in this article have not been studied in the prevention or treatment of SARS-CoV-2.

Conclusions: Conventional therapies being studied for use for SARS-CoV-2 infection may have specific antiviral properties against SARS -CoV-2 in vitro and need more and larger randomized controlled studies in order to confirm efficacy and safety. Studies on nutraceutical and herbal agents demonstrating their anti-viral or immune-supporting properties are exclusively in vitro and therefore cannot be generalized as medical recommendations in patients without clinical evidence. There are currently a few studies on managing flu-like symptoms using ayurvedic protocols during the COVID-19 pandemic, but the participants in these studies have not tested positive for SARS-CoV-2 and the results of the studies have not been published yet.
References: If you have published or submitted this work for publication, please provide the citation below.
Wu H, Subramanyam C, Maloh J Zwickey H, Sivamani R. (2020) A Review of Evidence Behind Antiviral and Immune Supporting Herbs and Supplements and Pharmaceuticals for SARS-CoV-2. *Ayurveda Journal of Health, 18(2),* 16-37

Syriani, Lara Aboud, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Sonia Michail, Children's Hospital Los Angeles
Project Title: Fecal Bile Acids in Pediatric Ulcerative Colitis Patients with Clostridium Difficile Infection
Authors: Lara Aboud Syriani & Sonia Michail, MD

Project Abstract: Goals of the Study/Hypothesis: The goal of this study is to determine how the levels of primary and secondary bile acids change in children diagnosed with ulcerative colitis when they get infected with Clostridium difficile.

Materials & Methods: All subjects in this study were recruited from the department of Gastroenterology, Hepatology, and Nutrition at the Children's Hospital Los Angeles. All the patients included in this study are under the age of 21 and they are either healthy subjects or patients diagnosed with Clostridium Difficile infection, Ulcerative Colitis, or both.

Informed consent was obtained from patients or their parents/legal guardians and subjects were asked to provide one stool sample during their clinic visits. Stool samples were sent to the lab to undergo a bile acid extraction process followed by analysis by LC/MS on Thermo Vanquish UPLC/AB Sciex Qtrap with targeted MRM method.

All the obtained bile acids data was analyzed using GraphPad Prism version 8.4.3 for Windows (GraphPad Software, La Jolla, California). One-Way Analysis of Variance test was performed followed by Tukey's Multiple Comparison test to compare the difference between our four groups: healthy subject, CDI patients, UC patients, CDI and UC patients. Statistical Significance was calculated with the P value set to < 0.05.

Results: The complete results of this study are not finalized yet. However, the initial results of this study show that the secondary bile acid, ursodeoxycholic acid, is significantly lower in patients with Clostridium difficile infection whether they are diagnosed with ulcerative colitis or not.

Conclusions: No conclusions can be reached at this time as this study is still in progress.

References: If you have published or submitted this work for publication, please provide the citation below. N/A

Vu, Michael, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Yadi Fernandez-Sweeny, College of Osteopathic Medicine of the Pacific
Dr. Anita Nelson, College of Osteopathic Medicine of the Pacific
Project Title: Depression And Anxiety Screenings For Women With Pcos Within Veterans Affairs
Authors: M. Vu, A. L. Nelson, Y. Fernandez-Sweeny

Project Abstract: Goals of the Study/Hypothesis: The prevalence of depression and anxiety amongst women with PCOS are higher than in thegeneral population. It is recognized that Veterans Affairs (VA) hospitals provide care forpotentially higher stressed populations versus their civilian counterparts. Women seeking care in VA clinics may have greater levels of stress. We surveyed primary care residents to see what screening was performed.

Materials & Methods: IRB approval was obtained on an exempt basis from the Human Subjects Committee of Western University of Health Sciences . VA residency directors were sent an email that
described the study and provided a survey link that they could share with their residents. Residents were directed to our voluntary, anonymous Qualtrics survey, that included multiple choice and Likert scale questions covering quantitative and qualitative aspects of resident perception. Pregnant women were asked to self-exclude.

Results: Forty residency directors were contacted; 2 had no further VA relations. Twenty-five residentscompleted the survey. Forty-six percent of respondents were Caucasian, 42% female, 76% specialized in family or internal medicine, and 27% served in the armed forces. Over 88% of respondents knew the associations between PCOS and endometrial cancer, cardiovascular disease, or fertility challenges. Routine screening for depression and anxiety was reported by 31% of residents for women with PCOS and 25% for postpartum. Another 35-40% of residents reported screening only symptomatic women. Approximately 40% of residents tend to use the abbreviated Patient Health Questionnaire when screening. While 87% of residents were comfortable or somewhat comfortable with discussing depression and anxiety, 90% reported that it was strongly or somewhat difficult to find time and appropriate referrals.

Conclusions: As PCOS itself undergoes rapid changes in its diagnosis and management, studying a
potentially higher stressed population such as the VA, highlights the need to implement more widespread routine screening for depression and anxiety in women with PCOS.

References: Submitted for Consideration:
● Poster (American College of Osteopathic Obstetricians and Gynecologists, Annual Conference)
● Oral (Western Medical Research Conference, Carmel)
● Poster (American College of Obstetricians and Gynecologists, Annual Clinical and Scientific Meeting)

Wong, Shelby, College of Osteopathic Medicine of the Pacific
Advisor: Dr. Anup Katheria, Neonatal Research Institute, Sharp Mary Birch Hospital for Women & Newborns, San Diego, CA
Project Title: Association Between Umbilical Cord Management And 5 Minute Peripheral Oxygenation In Preterm Infants
Authors: S. Wong , R. Yim , D. Poeltler , W. Rich , S. Sanjay , A. Katheria[2, 1]

Project Abstract: Goals of the Study/Hypothesis: Delay Cord Clamping (DCC) is recommended for all preterm newborns. However, effects of delaying resuscitation and oxygen administration in resuscitated preterm newborns are largely unknown. A recent post hoc exploratory ana lysis of the major TO2RPIDO trial done by Kei Lui et. al. found that infants with 80% or less 5-minute mean peripheral arterial oxygenation (SpO2) were more likely to die or have neurodevelopmental impairment. This study investigated if resuscitated preterm infants that received DCC had lower 5-minute SpO2 compared to those with umbilical cord milking (UCM) or early cord clamping (ECC). We hypothesized there would be significant differences between the three groups.

Materials & Methods: This was a retrospective review of resuscitated premature infants born between 2014-present at 23-31 weeks gestation receiving either ECC (N=20), DCC (N=178), or UCM (N=130) before resuscitation. Data gathered was SpO2 (measured by pulse oximetry), and various physiologic data including administered inspired fraction of oxygen (FiO2). Mean 5-minute SpO2 and FiO2 levels of each treatment group were compared with statistical analyses.

Results: There were no statistically significant differences in maternal or neonatal demographics between the three groups using ANOVA and Chi square analyses. Mean SpO2 and FiO2 at 5 minutes were compared. FiO2 at 5 min was higher in ECC compared to UCM (p=0.031) and DCC (p=0.025), with no difference found between UCM and DCC. The 5- minute SpO2 was higher in UCM compared to DCC (79.4% vs 74.8%, p= 0.028). There was no difference between mean 5-minute SpO2 of ECC and UCM (P= 0.72) or DCC (p=0.16)

Conclusions: Despite receiving similar amounts of supplemental oxygen, infants receiving DCC had lower 5- min SpO2 compared to UCM. Providing higher supplemental oxygen during DCC or immediately following clamping and cutting of the umbilical cord may improve 5-minute SpO2 and neonatal outcomes.

Yang, Howard (Shan Chao), College of Pharmacy
Advisor: Dr. Chow, College of Pharmacy
Project Title: Potential Panaxadiol-Anticancer Drug Combination for Treatment of Resistant Prostate Cancer
Authors: Howard (ShanChao) Yang

Project Abstract: Prostate cancer is one of the leading causes of death in men. Although the efficacy of initial treatment of newly diagnosed prostate cancer is excellent, mortality increases as the disease progresses to metastatic castrate-resistant prostate cancer (m-CRPC). Over the years, the development of new treatment approaches such as herb-drug combination has shown enhanced anticancer activities and may improve m-CRPC. Panaxadiol, an herbal compound derived from the ginseng root has been found to exert significant anticancer effect

and thus may further enhance such effect when combined with cabazitaxel, an FDA approved drug for m-CRPC

Objectives of the Study 1) To review anticancer effect of panaxadiol-cabazitaxel combination for prostate cancer. 2) To review chemical-physical properties of panaxadiol for further drug development.

Collection of Data and Items Reviewed: NCCN guideline for prostate cancer and the past research have been critical sources of data in this study. The articles on panaxadiol's anticancer effects and future development of panaxadiol-cabazitaxel combination were search using Google Scholar and PubMed. Articles were reviewed based on the quality of the study design and how relevant are the information pertaining to panaxadiol and anticancer drug combination. The years of article searched were between 2010 to 2020

Conclusion: Panaxadiol, a compound from ginseng root, has excellent potential as a chemotherapy adjuvant with potential additive/synergic effects when combined with cabazitaxel. Further studies on panaxadiol solubility, pharmacokinetic and pharmacodynamic are needed to develop a suitable drug formulation when combined with cabazitaxel.

Zakarian, Avak, College of Veterinary Medicine
Advisors: Kristopher Irizarry and Curtis Eng, College of College of Veterinary Medicine
Project Title: Baseline cognitive screening using a puzzle feeder across four species of Hylobatidae
Authors: Avak Zakarian, Kalee Farberow, Kristopher Irizarry, and Curtis Eng

Project Abstract:
Hylobatidae, also referred to as lesser apes or gibbons, are divided into four extant genera and further specified into 20 species. Gibbon cognition has yet to be studied thoroughly likely due to the small number of captive gibbons and their species-specific statuses ranging from vulnerable to critically endangered. Current knowledge supports that gibbons are highly intelligent with a generally strong interest in novel objects. The Gibbon Conservation Center located in Santa Clarita, California has housed various research studies and provides the ideal environment for enrichment-based projects. This research focuses on male-female pairs spanning four species: the *Hoolock leuconedys* (Eastern Hoolock), *Hylobates pileatus* (Pileated), *Nomascus leucogenys* (Northern White-Cheeked), and *Hylobates moloch* (Javan) and their interactions with a novel puzzle feeder. This study uses an adjustable puzzle feeder to allow for the formatting of nine different levels of difficulty. Our intention is to introduce the puzzle feeder as a tool for baseline cognitive screening for a food reward. Measurements include frequency, duration, solving capacity and behavioral observations relating to the introduction of the puzzle feeder. We hypothesize that providing the puzzle feeder as a problem-solving based enrichment tool will help to create a baseline understanding of gibbon cognition highlighting differences in species. The ability to better understand the problem-solving capacity and how it varies between species will be a step in creating a library to understand gibbon cognition. Preliminary data suggests a difference in solving ability and time taken to solve between those in our study.

Project Abstract: Goals of the Study/Hypothesis: The goal of this study was to evaluate the efficacy of a novel puzzle feeder across four species of gibbons (*Hoolock leuconedys, Hylobates pileatus, Nomascus leucogenys, and Hylobates moloch*) as a method of cognitive screening.

Materials & Methods: For this study, three Puzzle-Feeders™ by Primate Products Inc. were used across four subject cages each exclusively housing one species. Each cage had a male and female pair residing at the start of the study. The feeders were selected and seven levels of difficulty were created based on previous research done with ***Macaca fascicularis*** and the same model Puzzle-Feeder™ (Watson et al, 1999). The feeders were cleaned between every cage using diluted chlorhexidine solution with a 15-minute contact time protocol. Researchers and staff members used hand sanitizer before and after touching the feeders to limit contamination as much as possible. Feeders were loaded with one cubic inch piece of crisp pear that was kept as uniform as possible and mounted using four large key rings per puzzle attached to double end snap clips. During each testing session, four trials were available per cage lasting a maximum of 15 minutes to solve the puzzle followed by a 15-minute rest period. During the trial interval, the puzzle could be true solved, false solved, or left incomplete. The subjects who completed a true solve progressed to the next level and the process was repeated. The subjects who false solved or had an incomplete trial were given a second opportunity on the same level. If the second opportunity did not result in a true solve, the subjects were lowered to the last completed level. All subjects started the study at difficulty level one. All following testing sessions started based on the second to last completed level from the previous session which allowed the progression to move at a subject specific pace while keeping the treatment of each cage consistent.

Results: Each enclosure, housing a pair of gibbons, were presented with a puzzle for a total of 50 trials. Of the 50 trials, the Javan, Eastern Hoolock, Northern white-cheeked, and Pileated gibbons true solved 27/50 (54%), 29/50 (58%), 29/50 (58%), and 30/50 (60%) of their given puzzles, respectively (figure 2). To better understand what occurred at each level, figure 4 illustrates the number of times the different levels were attempted, while figure 5 identifies the number of trials that were true solves. The average time to solve a puzzle was also measured in this study (figure 3). None of the species were able to true solve level 7.

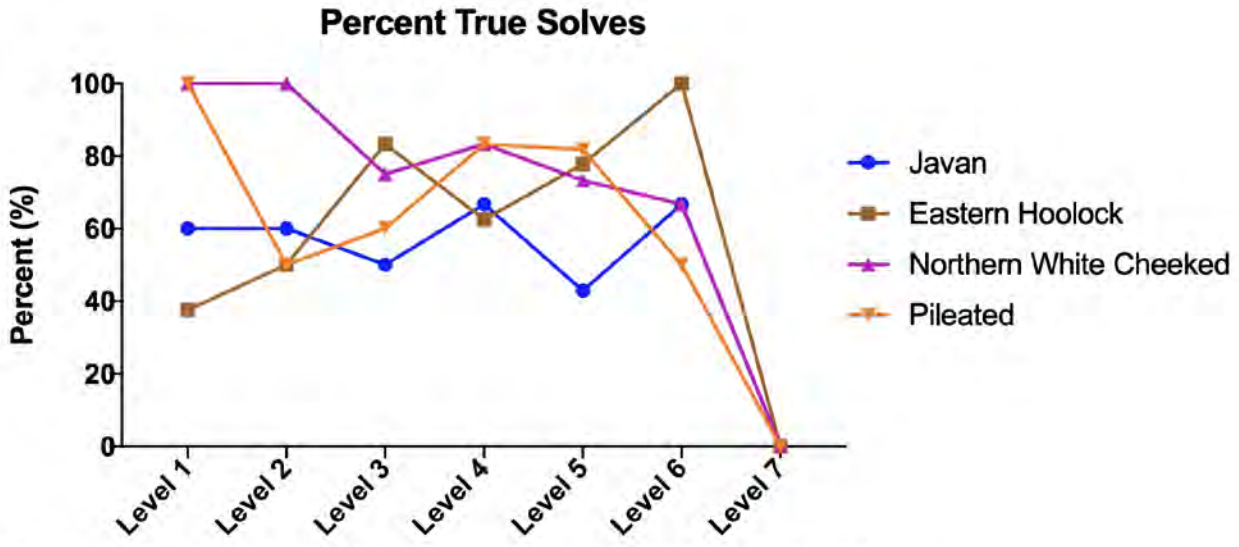

Figure 2: *The percent of puzzles true solved separated by levels and species.*

Figure 3: *Average time of true solves separated by levels and species.*

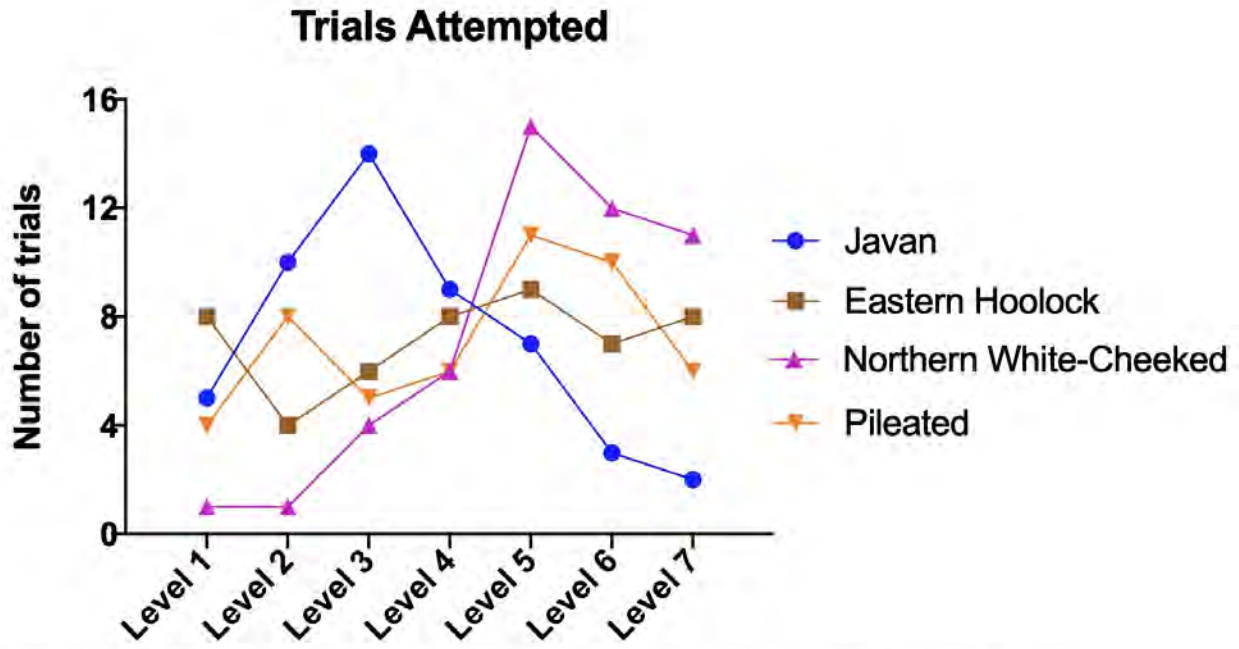

Figure 4: *Number of trials attempted by each species separated by levels*

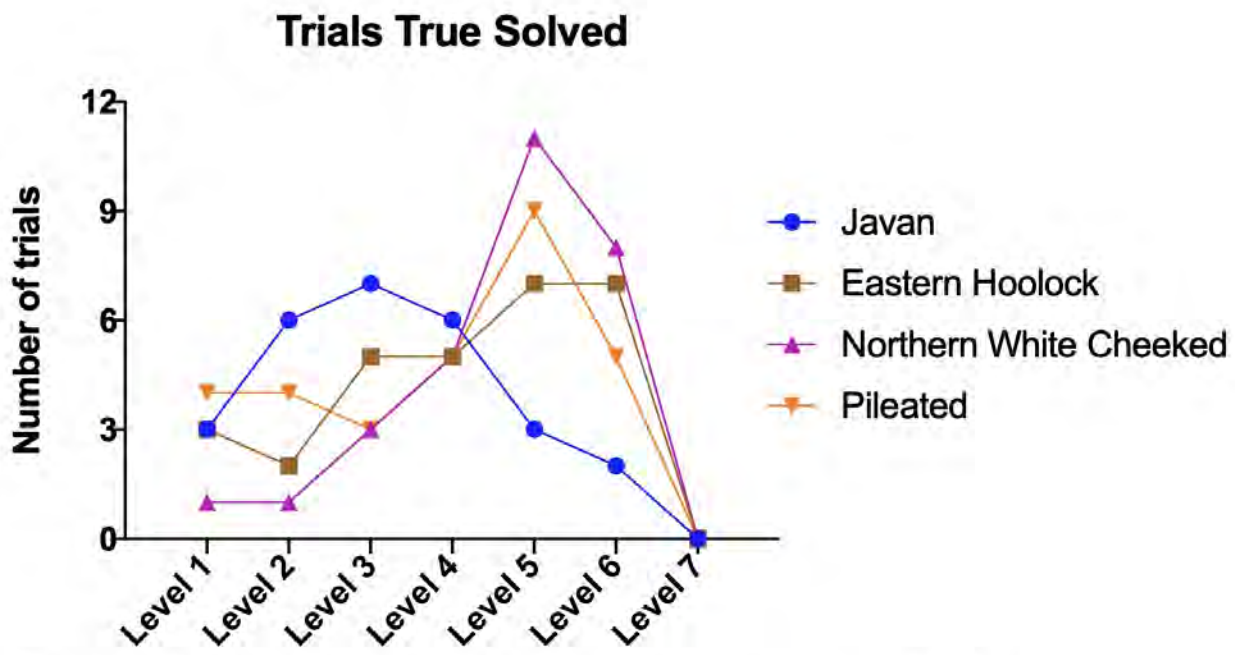

Figure 5: *Number of trials true solved by each species separated by levels.*

Conclusions:

1. All species recognized the enrichment device as having a food item and immediately utilized the finger holes to move the food item.
2. Each gibbon developed a unique method or strategy with the puzzle feeder to retrieve the food item.
3. The gibbons with faster solve times were capable of recognizing that the food item needed to move in the opposite direction once it contacted the edge of the puzzle.
4. The gibbons were able to progressively recognize the two exit ports as their target for retrieving the food item.
5. With more exposure to the puzzles, solve times remained consistent or were gradually reduced across every level for all four species.
6. It is likely that the gibbons are not able to perform an upward motion with their hands and fingers, thus limiting their ability to solve level 7 puzzles.

References: Not yet published or submitted for publication.

Maestas, Jesse, College of Veterinary Medicine
Advisor: Dr. Miguel Saggese, College of Veterinary Medicine
Project Title: Determining sub-clinical effects of lead exposure on Southern California Condors (Cathartes aura)
Authors: Jesse Maestas, Miguel Saggese

Project Abstract: Lead toxicity is a severe health problem affecting humans and animals alike. Lead toxicity has had substantial impacts on populations of waterfowl and the California condor (Gymnogyps californianus) was nearly driven to extinction and is facing substantial recovery challenges in part due to the ingestion of lead ammunition in animal carcasses. Despite the restrictions on lead-based ammunition, lead toxicities are continuing to occur in wild avian scavenging populations and continues to preclude their recovery. The pathophysiological mechanisms of lead toxicity are relatively well conserved across humans and animals resulting in similar clinical signs when exposed to high lead levels. However, research into the subclinical effects of lead exposure in Turkey Vultures are lacking. This project proposes to quantify the subclinical or sublethal aspects of acute lead exposure in turkey vultures in Southern California. Assessing the sub-clinical effects of lead poisoning may reveal previously unknown levels of immune depression with increasing parasite burden. These effects may impact vulture's social behavior, reproduction, and other aspects of their ecology. Therefore, in this study we hypothesize that Turkey Vultures exposed to lead will show changes in their hematology, clinical biochemistry and hemoparasite burden. Our study will provide the starting point to understand the sublethal effects of lead in this species by sampling Vultures in the field and analyzing their blood count, biochemistry, lead content and hemoparasitic burden.

Goals of the Study/Hypothesis: Lead toxicity is a severe health problem affecting humans and animals alike. Lead toxicity has had substantial impacts on populations of waterfowl and the California condor (Gymnogyps californianus) was nearly driven to extinction and is facing substantial recovery challenges in part due to the ingestion of lead ammunition in animal carcasses. Despite the restrictions on lead-based ammunition, lead toxicities are continuing to occur in wild avian scavenging populations and continues to preclude their recovery. The pathophysiological mechanisms of lead toxicity are relatively well conserved across humans and animals resulting in similar clinical signs when exposed to high lead levels. However, research into the subclinical effects of lead exposure in Turkey Vultures are lacking. This project proposes to quantify the subclinical or sublethal aspects of acute lead exposure in turkey vultures in Southern California. Assessing the sub-clinical effects of lead poisoning may reveal previously unknown levels of immune depression with increasing parasite burden. These effects may impact vulture's social behavior, reproduction, and other aspects of their ecology. Therefore, in this study we hypothesize that Turkey Vultures exposed to lead will show changes in their hematology, clinical biochemistry and hemoparasite burden.

Materials & Methods: Our study will provide the starting point to understand the sublethal effects of lead in this species by sampling Vultures in the field and analyzing their blood count, biochemistry, lead content and hemoparasitic burden.

Results: Project has been postponed due to COVID-19

Conclusions: Project has been postponed due to COVID-19

References: N/A