



**CUMMINGS SCHOOL
OF VETERINARY MEDICINE AT TUFTS UNIVERSITY**

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2018**

ABSTRACT BOOK

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Student: Sarah Adrianowycz V'20

Mentor: Dr. Nichola Hill

Title: Influenza Characterization in Glaucous-Winged Gull Colony in Cordova Alaska

Funding: NIH

Summary: My objectives are to screen fecal, serum, and swab samples collected from a population of Glaucous-winged Gulls (GWGU) in Cordova, Alaska to determine the current influenza characteristics within the population. Over the summer I will investigate influenza A viruses (IAV) prevalence in the samples collected during the 2017 field season. There are 1,592 fecal samples and 82 swab samples collected that require processing through real time PCR. There are an additional 40 serum samples collected from captured gulls which require processing using serum blocking ELISA to detect anti-influenza antibody.

By screening these samples, I will be able to detect the prevalence of IAV in the gull population and test my hypotheses about IAV prevalence and dynamics. I hypothesize that influenza prevalence in the gulls is influenced by three main drivers; the proportion of juveniles, the density of birds, and the sero-prevalence of the population. My second hypothesis is that the H16 subtype of IAV circulates as the dominant subtype in the GWGU population and will remain the dominant subtype in the 2017 field data. My final hypothesis is that the gulls in Cordova are a reservoir for IAV and that they serve as a viral source to other species that utilize the same anthropogenic food source. This hypothesis will be assessed through Bayesian phylogenetic analysis to assess mean rates of IAV transmission between pairs of hosts, identifying individuals as a 'source' or 'sink' for transmission of the H16 subtype.

Prevalence data will be statistically analyzed using Generalized Linear Models (GLM) to determine which of the potential drivers (age, density, sero-prevalence) is the strongest predictor of prevalence in the study population. Analysis of the GWGU group is important because birds are the ultimate reservoir for IAV that infect humans. The highest IAV infection prevalence is found in the orders Anseriformes and Charadriiformes, the second of which contains gulls. Because of their high influenza prevalence, GWGU are a model species for the investigation of influenza dynamics. GWGU are a host in transition due to alterations in the marine ecosystem that drive them to rely on human food sources. Reliance on anthropogenic food sources such as fish scraps, garbage, and landfills brings this IAV reservoir in close contact with not only other birds but with humans who are also susceptible to viral infection. By studying IAV dynamics in the reservoir population, we will be able to monitor potential zoonotic threats in addition to learning more about how the virus behaves and the means through which it spreads.

Student: Rachael Alionhart V'21

Mentor: Dr. Elizabeth Byrnes

Title: Assessing Sex Differences of Post-Stroke Depression via CPP in an ET-1 Rat Model of Stroke.

Funding: NIH

Summary: One of the most common side effects of ischemic stroke is the development of post-stroke depression. This condition emerges in nearly one third of people following a stroke and affects women at higher rates than men. By using endothelin-1 (ET-1) to induce ischemic stroke in rats, we hope to observe a behavioral sex difference in the development of post-stroke depression. Rats will undergo conditioned place preference testing one week prior to insult (ET-1 or aCSF), and again at one and three weeks following insult. Results will be analyzed using the appropriate statistical tests to account for sex, treatment, and time from insult. Following behavioral testing, brains will be collected, sectioned, and stained to measure infarct size to confirm insult.

Student: Joseph Belgrad V'20

Mentor: Dr. Patrick Skelly

Title: Isolation of *Schistosoma mansoni* Eggs from Baboon feces

Funding: NIH

Summary: Schistosomiasis is a devastating disease of developing countries caused by blood flukes. Largely affecting Africa, at least 207 million individuals required treatment in 2016. Left untreated, the flukes causing the disease can live in the blood for decades and have been associated with increased HIV infection rates. Immune competent individuals do not typically elicit a protective immune response towards the adult worms preventing clearance of the infection. The primary method of treatment is large scale dosing of praziquantel in susceptible populations. No vaccine is available.

The relationship between schistosomes found in different species is not always clear. For instance, researchers in Tanzania have reported the presence of *Schistosoma* eggs within feces from a wild troop of baboons through fecal smear analysis. The long-term aim of this project is to determine how related the baboon schistosomes are to the schistosomes that infect humans in the area. Is there a baboon “strain” of schistosome compared to the human “strain”, or are the schistosomes in both hosts genetically indistinguishable? In this One Health project, we wish to understand whether exchange of schistosomes occurs

between baboons and humans. To begin this work, we aim to develop methods in the laboratory at CSVN to efficiently recover schistosome eggs from baboon feces and perform molecular analyses using the recovered material. This is the aim of the current application. Once these methods are established, we will, in later work, be well positioned to repeat the work in the field.

We will be modifying a current recovery method that we currently use in the laboratory. This involves harvesting and homogenizing the livers of experimentally infected mice. The homogenate is then passed through a series of sieves. An alternative isolation approach is to dilute the fecal sample in fresh water to promote parasite egg hatching. By covering the base of a flask containing the diluted sample, the hatched eggs (miracidia), being phototrophic, will swim to the surface where they can be recovered and placed on Whatman FTA filter paper. Intact eggs or miracidia should both be suitable for molecular analysis. The FTA paper containing a parasite egg or a miracidium will be added to standard PCR mix containing buffer, dNTPS and *S. mansoni* cytochrome oxidase 1 (cox1) primers. PCR products will be resolved by agarose gel electrophoresis. Products will then be purified and sequenced at the Tufts University Core Facility.

If successful, at the completion of this project, we will have identified a method to isolate schistosome eggs and/or miracidia from baboon feces and use that material for genetic analysis. Next, we will use these methods to examine schistosome eggs obtained from baboons in the wild. This longer-term work aims to answer an important public health question regarding the epidemiology of human versus baboon schistosomiasis. Are humans spreading the infection to baboons or are baboons helping to spread the infection to humans, or is the infection shared? The proposed summer research is the first step in answering these key questions.

Student: Kendall Carlin V'21

Mentor: Dr. Jonathan Runstadler, Dr. Marieke Rosenbaum and Dr. Patricia Mendoza

Title: Prevalence and Characterization of Influenza A virus in Semi-Captive, Non-Human Primate Species in Peru

Funding: NIH

Summary: Thousands of instances of illegal wildlife trafficking take place every year in Peru. Non-human primates (NHPs), are often trapped as juveniles and transported in subpar conditions to be sold as pets in private homes or in zoos, both in Peru and internationally. Sale of these animals usually takes place in wet markets where the NHPs have close contact with humans and other animal species. These market conditions are ideal environments for the spread of infectious diseases.

Influenza A virus (IAV) has caused pandemic outbreaks in mammalian and avian species. It is a highly adaptive pathogen, subject to frequent reassortment events. Unique strains of IAV circulate among birds and bats in Peru, but little is known about the virus in NHPs. A previous study conducted in Asia indicated that NHPs can host the virus both sub-clinically and as an active infection. Infected animals could pose a threat both to naïve populations of wild NHPs and to the humans and other animal species with whom they come in contact.

The aim of this study is to detect and characterize IAV circulating in NHP populations that have had extended contact with humans and other animals. Investigators will analyze a bank of previously collected samples as well as samples collected from NHPs at one of Peru's wildlife sanctuaries using ELISA, PCR, and genetic sequencing to determine both the prevalence and the types of IAV found in NHPs. These findings will improve the understanding of IAV ecology and transmission in Peru and be useful to public health officials and to wildlife conservationists hoping to release rehabilitated NHPs.

Student: Joseph Collins V'20

Mentor: Dr. Gillian Beamer

Title: A Prevalence Study of Common Laboratory Viral Infections in a Closed *Peromyscus leucopus* Colony with No Surveillance

Funding: NIH

Summary: *Specific Aim and Hypothesis:* Our primary aim is to detect prevalent murine viruses in a closed BSL-2 laboratory with no current sentinel/ surveillance program and, based on the results, use this information to establish a baseline health monitoring program to ensure continued or future exclusion of specific viral pathogens. We hypothesize that we will detect certain prevalent viruses, including murine norovirus, parvovirus, and hepatitis virus [8], in high levels as many of these viruses are not excluded in most commercial laboratories as well as Tufts' research facilities.

Experimental Design/Methods: We will test this hypothesis using whole blood samples collected from mice of the species *Peromyscus leucopus* currently residing in a Biosafety Level-2 (BSL-2) laboratory, which has been maintained closed since establishment. These samples will be sent to Charles River Laboratories for serology testing via Indirect Fluorescent Antibody (IFA) test to determine the presence of antibodies against several prevalent murine viruses, including those stated above. Fecal samples will also be collected for Polymerase Chain Reaction (PCR) testing at Charles River laboratories as a secondary method to detect viral nucleic acids as surrogate markers of active viral infection.

Expected Outcomes: Should the results indicate high exposure to these common viral pathogens, we will work with the scientist to design a surveillance program suited to the research goals for the use of the colony.

Significance: Health monitoring of laboratory rodents used in research is important in maintaining colony health and preventing unwanted infections. These infections can be both detrimental to the health of the rodents and can negatively impact the results of a research study. For example, a study involving a certain organ may not produce reliable results if the organ in question is infected with a pathogen, even if that virus remains clinically silent. Just as important, routine surveillance of rodents may detect a virus before it spreads to the rest of the colony, and early detection can allow the researcher to take the proper steps to eradicate the infection. A colony is only at risk to those viruses that are more prevalent than in routine laboratory settings. Thus, for a BSL-2 laboratory with no current surveillance system, the first step to ensure a healthy colony is to design a monitoring system that focuses on detection of known prevalent viruses.

Student: Haillie Crockett V'20

Mentor: Dr. Allen Rutberg

Title: Using Flight Initiation Distance and Fecal Glucocorticoid Metabolites to Quantify Habituation and Chronic Stress in Feral Horses

Funding: NIH

Summary: Two populations of horses in Carson National Forest, New Mexico, undergo treatment with Porcine Zona Pellucida (PZP) immunocontraception each year as part of a population control effort there. The two populations, which reside in the territories of Jarita Mesa and Jicarilla, demonstrate remarkably different responses to the presence of humans, with the Jarita Mesa horses appearing to be significantly less habituated and more likely to flee. This behavior has resulted in the need to trap the horses before treating them (compared to the Jicarilla horses which can be darted while roaming) which increases cost, time needed, and risk of injury to horses and humans. This study seeks to quantify this behavioral difference by measuring each population's mean Flight Initiation Distance (FID) as well as understand its relationship with chronic stress by measuring each population's mean fecal glucocorticoid metabolite (GCM) concentration. The specific aims of this study will be:

- To compare the mean FID of the two populations, with the expectation that the Jarita Mesa horses will have a higher mean FID than the Jicarilla horses.
- To compare the mean fecal GCM concentration of the two populations, with the expectation that it will be lower in the Jarita Mesa horses than in the Jicarilla horses.
- To assess the correlation between the two above variables with the expectation that they will be inversely correlated.

FID will be measured by a single researcher by a standardized approach technique. A rangefinder will be used to measure initial distance to the target animal, and flags will be used to mark alert and flight initiation distances as the researcher approaches. Relevant variables will be noted and video will be taken to confirm them. Fecal samples will be collected by convenience with a gloved hand and only when the individual has been seen eliminating. A photo of the individual will be taken when possible in order to identify it using

existing records and determine age, sex, and PZP treatment status. The samples will be analyzed at the Saint Louis Zoo Endocrinology Lab using MP Biomedicals DA I-25 corticosterone radioimmunoassay (RIA).

This project will help to advance our knowledge about habituation, flight behavior, chronic stress, and how they affect each other. Increasing our understanding of how these populations are affected by and react to the humans around them will likely improve the efficacy of the PZP treatment project, resulting in fewer feral horses being removed from their natural territory.

Student: Adrian Dannis V'20

Mentor: Dr. Emily McCobb

Title: Dogs to the North: Examining the Post-Adoption Success of Shelter Dogs Transported Long-Distance to Five New England Animal Shelters

Funding: Pet Smart Charities

Summary: Long- distance transport of adoptable shelter dogs has become a prominent strategy for both diversifying shelter offerings and combating pet overpopulation (Sullivan, 2014). One study has shown that almost half of dog-owning Americans are willing to adopt rescued dogs but have strong, complex, and unpredictable predilections into what type of dog they are looking for (Garrison & Weiss, 2014). Transporting dogs long distances allows shelters to diversify their dog population while simultaneously unburdening overpopulated shelters.

A groundbreaking 2016 study examining the logistics, finances, perceptions, and experiences related to shelter dog transport found that while most shelter personnel believed transportation programs truly saved dogs' lives, more than half of the shelters had ended relationships with partner sending or receiving organizations due to deception or other conflicts (Simmons & Hoffman, 2016). The Tufts Center for Shelter Dogs conducted a follow-up survey of over 350 shelter staff and found that the shelter employees who did not participate in a transport program (as a sender or a receiver) had a more negative opinion of transport programs and believed that transported dogs had more issues post-adoption than locally sourced dogs (McCobb & Dowling-Guyer, 2017). Together, the two surveys suggest that organizations participating in transport programs have a positive perception of those transport programs but have undefined challenges that may reduce the effectiveness of those programs. Considering there are only two studies that focus on shelter dog transport programs, more investigation is critical to delving into the basis of these preliminary findings.

This project will explore the negative perception that transported dogs may do worse post-adoption than locally-sourced dogs. Existing shelter data will be gathered and the post-adoption outcome of transported dogs will be systematically analyzed. Additionally, a subset of adopters will be contacted and surveyed about their in-home experiences with their transported dog, allowing for further characterization of how well transported dogs fare in their adoptive homes. Ultimately, this study will provide novel insight into the success of

transported dogs post-adoption and ultimately allow transportation programs to further refine an important strategy in combatting pet overpopulation.

Student: Kimberly Freid V'20

Mentor: Dr. Mark Pokras

Title: Lake Aerosols as Contributors to Blood Levels of Cyanobacterial Neurotoxin BMAA in the Common Loon

Funding: NIH

Summary: Cyanobacteria found in aquatic environments are capable of producing various cyanotoxins that can cause significant disease in both humans and animals. Harmful algal blooms characterized by massive cyanotoxin production have increased substantially in both frequency and magnitude in recent decades and many waterbird mortality events have been linked to these blooms. However, the long-term health effects of sub-lethal toxin exposure are still poorly understood. Common loons, as apex predators, serve as excellent indicators of toxin accumulation in their environment and of aquatic ecosystem health in general. Loons breed on freshwater lakes throughout North America that commonly have blooms of cyanobacteria and they have experienced significant population and range decline over the last century. New England loons were recently shown to have a high seroprevalence of beta methylamino-L-alanine (BMAA), a potent cyanobacterial neurotoxin that may play an important role in human neurodegenerative diseases like ALS. Though lesions characteristic of BMAA toxicity have been seen in birds post-mortem around the world, the clinical significance of chronic exposure for loons is not known. The goal of this study is to investigate inhalation of lake aerosols as a possible route of exposure to BMAA for loons on their breeding lakes in New Hampshire. ELISA technology will be used to compare BMAA levels in the blood of loons captured as a part of a long-term monitoring program to the amount of toxin in the air around their nesting sites. Establishing routes of exposure to this emergent cyanotoxin may both contribute a piece to the puzzle of understanding waterbird mortality trends and have broader implications for public health risks.

Student: Deanna Ineson V'20

Mentor: Dr. Lisa Freeman

Title: Is Cardiac Cachexia an Independent Risk Factor for Mortality in Dogs with Congestive Heart Failure?

Funding: NIH

Summary: Congestive heart failure (CHF) is a common condition in both human and veterinary medicine with many effects extending beyond the cardiovascular system. One

important systemic effect of CHF is muscle loss, or cardiac cachexia, which is associated with significant morbidity in humans and dogs. More importantly, in humans, cardiac cachexia is an independent risk factor for mortality. In dogs, however, an association between cardiac cachexia and survival has not been reported. This information is important for advancing the diagnosis, prevention, and treatment of cardiac cachexia in companion animals. In order to study associations with survival, we first need to determine the optimal definition for cardiac cachexia. The definition for cachexia in humans continues to be debated. Most human studies have relied upon the loss of body weight to diagnose cardiac cachexia. However, this method is considered to be insensitive because muscle is the primary tissue affected by cachexia and total body weight may not be affected until late in the disease. This is especially true in CHF, where fluid retention can mask weight loss until advanced stages of disease. Therefore, in order to optimize the definition for cardiac cachexia, our first aim is to retrospectively review medical records of dogs with CHF to compare muscle condition score to percent weight loss as the criterion for diagnosing cardiac cachexia. Our hypothesis is that there will be a greater prevalence of dogs with cardiac cachexia based on muscle condition score compared to the use of weight loss. Once we determine the optimal definition, our second aim is to evaluate the relationship between cardiac cachexia and survival in dogs with CHF, with the hypothesis that dogs with cardiac cachexia will have shorter survival times than those without cardiac cachexia.

Student: Tatyana Kalani V'21

Mentor: Dr. Christopher Whittier

Title: Identifying how Soil Can Act as a Predictor for Lead Exposure to Humans, Domestic Animals and Wildlife In Somerville, Massachusetts

Funding: NIH

Summary: Environmental lead contamination in urban areas such as the Greater Boston area is known to impact human, animal, and ecosystem health - being a health risk at even small concentrations. Any organism can acquire lead toxicity from soil, water, or air sources. Although human lead poisoning is a well-studied problem, there is currently a lack of data on the exposure risk from environmental lead contamination in urban areas, and a lack of research that focuses on understanding how lead contamination impacts the environment as well as wild and domestic animal species.

Over the summer of 2017, I designed and implemented a multi-faceted study to identify hot spots for environmental lead contamination in Somerville, MA. After systematic collection and testing of over 200 soil samples for lead, I used Geographic Information System (GIS) to develop a lead risk assessment map of the city, as well as to identify wild species most at risk (Figure 1). Expanding on my previous research, the current proposal aims to identify human and domestic animal lead exposure risk by incorporating child blood lead levels and pet ownership data into a lead risk assessment map for Somerville, Massachusetts.

Data for children will be obtained from the Massachusetts Department of Public Health, while pet ownership data will be obtained from the City of Somerville. GIS analyses will be performed to overlay the two datasets onto the original lead risk assessment map, and a Pearson's correlation test will be performed to assess association between childhood blood lead levels and lead levels in public soil. If an association is found, a physiologically-based pharmacokinetic model will be applied to predict lead levels in an organism that is exposed to contaminated public soil.

Student: Cambrey Knapp V'21

Mentor: Dr. Marieke Rosenbaum

Title: Determining the Prevalence of Zika Virus in Peruvian Populations of Trafficked New World Monkeys

Funding: NIH

Summary: The outbreak of Zika virus across Africa, Asia and more recently in South America has created a global health concern. Originally known to be spread to humans by mosquitoes of the *Aedes spp*, evidence suggests that nonhuman primates are a plausible reservoir for Zika virus, however there is no published surveillance in these species. The purpose of this study is to improve our knowledge of Zika virus disease ecology by determining the prevalence of Zika virus in New World monkey populations in Peru. This study will consist of both field and laboratory components. Field sampling will occur at the Taricaya Rescue Center in Puerto Maldonado, Peru, where both blood and saliva samples will be collected from semi-captive nonhuman primates. These samples and additional samples previously acquired by Dr. Rosenbaum from nonhuman primates throughout Peru will be analyzed at the Center for Technological, Biomedical and Environmental Research at the National University of San Marcos. The presence of Zika virus in the samples will be determined via RT-PCR, using an assay for the virus prepared in the Runstadler Lab at the Cummings School of Veterinary Medicine the spring prior to traveling to Peru. Both univariate analysis and multivariate logistic regression will be used to determine associations between Zika positive samples and predictor variables. Attempting to determine the prevalence of Zika virus in Peru will aid in disease surveillance efforts of the current outbreak in South America and bring about greater understanding of Zika virus ecology.

Student: Leslie Krienke V'20

Mentor: Dr. William Karlin

Title: Quantifying Error in Measurement of the Angle of Lateral Opening Using the Crosshair Cup Indicator

Funding: Merial Scholars Program

Summary: *Study Objectives:* To quantify inter- and intra-observational variability in measurement of the Angle of Lateral Opening (ALO) and inclination of acetabular cup placement using the crosshair cup indicator.

Hypothesis: We hypothesize that there will be minimal variability in both intra-observational measurements and inter-observational ALO and inclination measurements.

Experimental Design/Methods: This study will investigate the accuracy between three individuals when using the crosshair cup indicator within the Osirix reading software to measure the ALO of 20 radiographs of the crosshair cup indicator within a jig at various known ALO and angles of inclination.

Additionally, the study will investigate differences between each individual's ALO measurement when examining the same radiographs three different times.

Purpose: The goal of this study is to quantify inter- and intra-observational accuracy in measuring the ALO and inclination with the crosshair cup indicator. Inappropriate measurement of the ALO and inclination may result in improper placement of the acetabular cup and potential post-operational complications. It is our hope this method of measurement of the ALO and inclination will enable consistent results and proper placement of the acetabular cup leading to reliable and accurate cup placement.

Student: Andrew Lacqua V'20

Mentor: Dr. Christopher Whittier

Title: Phthalates, IGF-1, and Potential Health Risks in the Endangered Uta Spiny-tailed Iguana

Funding: NIH

Summary: **Background/Rationale:** Phthalates are ubiquitous compounds used in plastic manufacturing and many common household items. The chemical structure of phthalates resembles steroid-containing hormones that function in growth, metabolism, and reproduction. Many phthalates are known to disrupt reproduction, endocrine function, and growth (REG), best documented in fish and mammals, but very few studies have investigated

the effects of phthalates in reptiles. Mechanistically, phthalates inhibit estrogen binding to the estrogen receptor, resulting in decreased plasma IGF-1 and diminished cell growth. As such, plasma Insulin-like Growth Factor (IGF)-1 can potentially serve as an indirect proxy for phthalate level and phthalate effect on REG.

Hypothesis/Aims: Few studies have investigated connections between phthalate levels, IGF-1, and REG in reptiles. Here, we hypothesize that plasma IGF-1 can serve as an indirect proxy for phthalate level and phthalate effect on REG. This will help determine if potential phthalate exposure has had detrimental consequences on the Uta stansburiana (Uta stansburiana) in Uta, Honduras. This species is currently endangered, and populations have declined precipitously in the past 9 years (Streich & Gutsche 2009).

Methods: We will use a commercially available IGF-1 ELISA kit to quantify IGF-1 in blood samples from *C. bakeri*. Evidence of phthalate exposure will be detected and quantified using multiresidue matrix solid phase dispersion extraction and gas chromatography in skin samples from the same individuals.

Expected Results: We expect phthalate levels in the skin to be inversely correlated with plasma IGF-1. The results will link environmental exposure of endocrine-disrupting compounds to reptile decline in Honduras and increase our knowledge regarding an understudied and endangered species. They will also support the mission of the Kanahau Research and Conservation Facility.

Student: Karalyn Lonngren V'21

Mentor: Dr. Kevin Lindell

Title: Comparison of iSperm to Current Accepted Semen Analysis Methods

Funding: USDA

Summary: The goal of this study is to validate standard operating procedures for iSperm, a portable semen analysis tool, by comparing it to currently accepted semen analysis methods. Unlike traditional methods of semen analysis, because of its portability iSperm can be used to perform on-farm semen analysis prior to artificial insemination or cryopreservation, and it can also be used for breeding soundness exams. Since errors can occur in the process of storing and handling semen prior to AI or advanced reproductive technologies (ART) procedures, the ability to easily evaluate the sperm just prior to insemination would be very beneficial. Performing these analyses on farms is not feasible with the commonly used methods of semen analysis. This project will specifically be looking at sperm motility and concentration

measured by iSperm, and how it compares to the current gold standards in semen analysis, including computer-assisted sperm analysis, hemocytometer, and densitometer. Semen will be collected from bucks and rams and analyzed fresh by iSperm as well as phase contrast microscopy, hemocytometer and/or densitometer. Four serial dilutions of the semen will be made, and all four will be analyzed by iSperm so that it can be determined how the concentration of the sperm affects the results given by iSperm when compared to the traditional analysis methods. Portions of the semen will then be cryopreserved in OptiXcell 2 extender. The samples will later be thawed, and a post-thaw analysis will be completed by both iSperm and computer-assisted sperm analysis. A correlation of the results by differing methods will allow for the informed use of iSperm in the future.

Student: Josue Lugardo V'20

Mentor: Dr. Andrew Hoffman

Title: Toward Exosome Specific Biomarkers for Osteosarcoma in the Dog

Funding: NIH

Summary: Osteosarcomas (OS) are the most common and malignant bone cancers in both humans and animals. In up to 80% of patients, OS can metastasize, most often to the lung which leads to a poor prognosis. Currently, the main methods of diagnosing OS are either through radiographs or a tissue biopsy. Tissue biopsy, while capable of providing a definitive diagnosis, is invasive, expensive, and painful, and the histology of tumors is non-uniform leading to subjectivity in interpretation. While radiographs can determine the presence of the primary or metastatic OS, they lack sensitivity for early detection. Therefore, searching for a biomarker suitable for early diagnosis and tracking of OS progression is a hot topic in OS research. Recently, many researchers have focused on circulating miRNA within exosomes as a potential biomarker for a wide variety of diseases including cancer, especially OS. Exosomes are a subset of extracellular vesicles ranging 50-150 nm in size that are packaged with a wide variety of biomolecules such as dsDNA, mRNA, miRNA, enzymes, and lipids. MicroRNA's (miRNA) are non-coding RNA molecules of about 24 bp that can bind to mRNA molecules and dampen their expression miRNA which arise from the whole tumor and associated stroma are differentially expressed in OS and therefore circulating exosome miRNA is believed to have great potential as a minimally invasive diagnostic biomarker (i.e., liquid biopsy). For our research project, we seek to understand how OS vs. non-OS tissues from the same patients differ in miRNA content, and whether these differences are also expressed in plasma exosomes. To test these hypotheses, we will evaluate miRNA using RNAseq first in tissue samples (OS vs. non-OS) obtained from a well-annotated biorepository of canine OS samples from the National Cancer Institute. Next, we will test whether specific differentially expressed OS tissue related miRNA are also found in OS vs. healthy patient blood samples to assess biomarker potential.

Student: Caileen Moran V'21

Mentor: Dr. Robert Bridges

Title: The Role of Estrogen Receptor- α in the Display of Maternal-Like Behavior in Juvenile Male Rats and Female Rats

Funding: NIH

Summary: In this experiment, the importance of the presence of the estrogen receptor- α relative to the display of maternal behavior in juvenile rats will be investigated. The estrogen receptor- α (ER- α) is an important ligand activated transcription factor that works to control gene transcription in many species. Previous studies have shown estrogen to be an important hormone in the regulation of maternal behavior. Both male and female juvenile rats have been shown to exhibit increased level of maternal-like behavior when exposed to pups than older rats. This experiment aims at determining the importance of the estrogen receptor- α relative to this increase in maternal-like response.

ER- α knock-out and ER- α wildtype (WT) juvenile male and female rats will be bred and tested for maternal behaviors. During testing, each rat will be housed in a controlled environment consisting of a clear plastic cage, bedding materials, food and water. After 3 days of acclimation, each rat will be exposed to 3-8 day old pups obtained from the donor lactating rats. Upon pup exposure, each rat will be observed for a period of 15 minutes, and spot checked at 30, 45 and 60 seconds, in which maternal-like behaviors such as nest building, retrieving, grouping, and crouching over 3-8 day old pups will be recorded. The 3-8 day old pups will be obtained from the donor lactating rats. The pups will be left in the cage overnight and replaced by fresh pups the next morning, when the experimental animal will again be observed for a period of 60 min. this process will be repeated daily for up to 10 days. Once a rat has displayed maternal-like behavior for two consecutive days, it will be deemed maternal and assigned a score that is equal to the number of the first day of testing this behavior was exhibited. These data will then be used to determine if there is a relationship between the early display of maternal-like behavior in juvenile rats and the presence of the ER- α . It is hypothesized that ER- α KO rats will exhibit deficits in maternal like behaviors.

The conclusions gathered from this experiment would add valuable information to our understanding of the development of maternal behavior in rats. A greater understanding of this system will help to elucidate the complex changes that take place in the endocrine and brain networks that regulate maternal behaviors in many species, including humans. Maternal responses such as nursing, protection, expression of positive interactions with infants, and postpartum depression are all related to the endocrine pathway of maternal behavior. Understanding the intricacies of this pathway in rats helps to add insight to medical treatment and intervention for those having issues adjusting to becoming a paren

Student: Mattison Peters V'20

Mentor: Dr. Jean Mukherjee

Title: *Vibrio Parahaemolyticus* in Post-Harvest Oysters in Rhode Island and Massachusetts

Funding: NIH

Summary: *Vibrio parahaemolyticus* is a chitinolytic, gram-negative bacterium that is found in seawater. It commonly colonizes shellfish and seafood. Because humans often eat oysters raw, *V. parahaemolyticus* poses a significant health risk. *V. parahaemolyticus* causes gastroenteritis and septicemia in humans. In the United States, raw oyster consumption is associated with an estimated 2,800 illnesses each year. Elderly and immunocompromised individuals are particularly susceptible. Eastern oysters (*Crassostrea virginica*), commonly grown in New England coastal waters, accumulate *V. parahaemolyticus* by finely filtering water.

The greater the burden of *V. parahaemolyticus*, the more likely foodborne illness will occur in individuals consuming raw oysters. Following harvest, although oysters stop filtering water and accumulating *V. parahaemolyticus*, in the static environment within the oyster the *V. parahaemolyticus* continues to replicate.

Within New England, Massachusetts and Rhode Island are two of the largest producers of oysters. Both states have *Vibrio* Control Plans that specify regulations geared towards minimizing *V. parahaemolyticus* growth within shellfish. These regulations vary, and data is lacking on the correlation between the efficacies of regulatory guidelines and effects on *V. parahaemolyticus* growth.

This study is being conducted to inform evidence-based policy on how to minimize human risk of *V. parahaemolyticus* infection from raw oyster consumption. Specifically, we are interested in: 1) Evaluating the effects of state regulations on controlling *V. parahaemolyticus* growth; and 2) Determining whether “real world” methods similarly control growth.

Cooling methods at commercial oyster farms will be surveyed, and oysters will be sampled at various steps in the post-harvest process for *V. parahaemolyticus* growth. Laboratory raised oysters will be tested for *V. parahaemolyticus* growth during conditions mandated by both Massachusetts and Rhode Island regulations for two weeks following harvest. Temperatures of oysters will be logged throughout the study, and *V. parahaemolyticus* growth will be analyzed using the Most Probable Numbers method.

Student: Sasha Santiago V'21

Mentor: Dr. Lisa Freeman

Title: Cardiac Cachexia in Cats: Prevalence and Development of a Method for Earlier Diagnosis

Funding: The Barkley Fund

Summary: Heart disease affects up to 15% of all cats, with many cats developing congestive heart failure (CHF). In addition to the cardiovascular effects, a common systemic effect of CHF is cardiac cachexia, a complex wasting condition characterized by muscle loss, with or without weight loss. Cardiac cachexia is important because it is associated with high morbidity and mortality. The scientific community has yet to agree upon a consistent definition for cachexia, with 11 different definitions currently used for human cachexia. This discrepancy in definitions affects cachexia prevalence. For example, the prevalence of cardiac cachexia in humans (where the definition is based on weight loss) is estimated to be 10%, whereas in dogs (where the definition is based on muscle loss), the prevalence is >50%. In addition to the lack of a consistent definition, another major barrier to successful treatment of cardiac cachexia is reliance on weight loss as a criterion for the definition, which limits the ability to diagnose cardiac cachexia in its earliest stage. To address these gaps, the aims of this study are to 1) compare the prevalence of cachexia in cats with CHF using the different definitions available in the human and veterinary literature and 2) compare ultrasonographic measurement of muscle to the qualitative muscle condition score as a potential clinically-relevant quantitative method for early diagnosis of cardiac cachexia. To achieve Aim #1, medical records of cats seen by the Cardiology Service during a 3-year period will be retrospectively reviewed to identify cats with cardiac cachexia using each of the seven definitions that are applicable to cats. Agreement among the different definitions will be compared using Cohen's kappa. For Aim #2, 10 healthy cats and 10 cats with CHF will be assessed by muscle condition score and ultrasound-measured epaxial muscle. Normalized epaxial muscle thickness will be compared between cats with or without cachexia using independent t-tests, and among cats with varying severity of cachexia using ANOVA. Information from the proposed research will be used to develop diagnostic criteria which allow for earlier detection of cachexia in cats with CHF, when treatments are more likely to be effective. These diagnostic criteria can then be used in future studies evaluating medical and nutritional therapies for cats with cardiac cachexia.

Student: Lauren Scanlon V'21
Mentor: Dr. Hoque and Dr. Sawkat Anwer
Title: Incidence and Distribution of Clinical Mastitis in Chittagong, Bangladesh
Funding: OIE Twinning

Summary: In demonstrating the incidence and distribution of clinical mastitis in Chittagong, Bangladesh, it can be established where intervention is necessary. This targeted intervention can be at the level of the individual animal, individual farm, local veterinarian, or through a government initiative/ protocol. This part of the cohort study will focus on sample collection and analyzation. From there the cohort study can follow up on the diversity of associated pathogens and their pattern of antibiogram in order to establish the most effective antimicrobials, treatment protocols, or biosecurity measures for individual farms or the district in general. This targeted approach will allow for a valid treatment strategy and therapeutic efficacy, thus avoiding of the misuse of antibiotics and therefore antibiotic resistance.

Cohort Study Objectives:

1. Estimate the incidence of clinical mastitis at different levels of dairy cattle (quarter, cow and herd) in Chittagong and determine associated risk factors
2. Know the distribution of the incidence of clinical mastitis of dairy cattle in Chittagong according to grade and determine associated risk factors
3. Evaluate antibiogram of the selected organisms isolated from clinical mastitis cases
4. Describe how farmers manage clinical mastitis therapeutically and non-therapeutically

Student: Natalie Smith V'20
Mentor: Dr. Claire Fellman
Title: Evaluating Biomarkers for Pharmacodynamic Monitoring of Glucocorticoid Therapy
Funding: NIH

Summary: Glucocorticoids are frequently used in veterinary medicine to achieve the suppression of inflammation and immune responses necessary for the successful treatment of a wide range of diseases.

These drugs are known to be clinically effective, however the variation in the extent of efficacy in individual patients requires careful monitoring of therapy with appropriate dose adjustment so that patients are not overly immunosuppressed. Previous work in our laboratory has established cytokine suppression and lymphocyte proliferation as able to reflect the effects of other immunosuppressive agents like cyclosporine and mycophenolate, but did not show a consistent effect of the glucocorticoid dexamethasone. It is unclear whether this is due to the glucocorticoid tested, or potentially the activating stimulus. Developing a pharmacodynamic assay to assess biomarkers of glucocorticoid efficacy would be clinically valuable and allow for more reliable monitoring of therapy.

We propose to test several biomarkers that could be used for pharmacodynamic monitoring of glucocorticoid therapy. We will compare lymphocyte proliferation measured using flow cytometry, and the expression of interleukin 2 (IL-2), interferon gamma (IFN- γ), chemoattractant protein 1 (MCP-1) and lipocortin as measured by quantitative reverse transcription polymerase chain reaction (qRT-PCR) in canine whole blood treated in vitro with dexamethasone, methylprednisolone, and prednisolone. We will determine which of these biomarkers is the most sensitive to the concentration-dependent effects of glucocorticoids, and therefore holds the most promise as a pharmacodynamic marker. We will further optimize the assay by evaluating and comparing different immune cell activators, including concanavalin A (con A), phorbol myristate acetate (PMA) and ionomycin, and anti-CD3/anti-CD28 antibodies to see if one stimulus is more sensitive than others to the effects of the different glucocorticoids.

We hypothesize that the expression of lipocortin will increase, and the expression of IL-2, IFN- γ , and MCP-1 will decrease in a concentration-dependent manner in canine whole blood treated with dexamethasone, methylprednisolone, and prednisone in vitro. Based on previous results in our laboratory, we hypothesize that the extent of lymphocyte proliferation in glucocorticoid-treated blood will not vary in a concentration-dependent manner, and will not be significantly suppressed compared to blood that has not been treated with glucocorticoids regardless of agent or activating stimulus. Once developed, these pharmacodynamic assays will allow clinicians to more accurately monitor individual response to glucocorticoid therapy with the goal to improve patient outcomes.

Student: Derek Standlee V'20

Mentor: Dr. Megan Mueller

Title: Evaluating Cultural Humility and Accessibility in Veterinary Teaching Hospitals in the United States

Funding: Elizabeth A. Lawrence Endowed Fund

Summary: The field of veterinary medicine has lagged behind other professions in creating a diverse workforce that mirrors the population of the larger United States. Numerous efforts

are underway to encourage underrepresented populations to apply to veterinary schools in greater numbers, but the current state of these issues in veterinary education remains largely understudied. This exploratory study looks at the students and faculty of veterinary teaching hospitals to assess cultural humility and client accessibility practices using survey methodology.

The study has three specific aims: 1) to assess the average degree of and perceived importance of cultural humility in veterinary students and faculty, 2) to identify key demographic factors that are associated with cultural humility outcomes, and 3) to determine student and faculty levels of comfort with providing accommodations for clients with disabilities. These aims will be examined using a comprehensive survey that includes verified demographic questions as well as the Color-Blind Racial Attitudes Scale. Collectively, participant responses will not only pertain to understanding of established policies and skill sets, but also attitudes and beliefs.

As the population changes, so too must veterinary medicine develop new skills to meet the needs of its clients. These results will clarify how larger diversity outreach efforts are translating into institutional culture change, whether there are any differences between students and faculty, and potentially which areas teaching hospitals should dedicate resources to in terms of training and continuing education

Student: Kimberly Stein V'21

Mentor: Dr. Emily McCobb and Dr. Felicia Nutter

Title: Demographics and Access to Veterinary Care Among Bodega Cats in Bronx, NY

Funding: Maddie's Fund

Summary: The overall aim of this project is to assess the demographics and access to veterinary care among 'bodega' cats in Bronx, NY. Bodegas or corner-stores in NYC often have resident cats to mitigate the risk of rodent infestations. However, to date there are no published studies to quantify how many bodegas use this method of rodent control, or what level of veterinary care these bodega cats are receiving. Furthermore, neighborhood cats are often considered a nuisance and are removed and brought to the city shelter, which (i) adds to the already overburdened system and (ii) often leads to euthanasia of these cats. Quantifying and assessing the roles of bodega cats and the health care they receive could open a new door for neighborhood cats.

Objective #1: *Demographics.* Collect demographic data on a representative sample of bodega cats in Bronx, NY.

Objective #2: *Access to Veterinary Care*. The second aim is to understand the desire and ability to access veterinary care for these cats.

Objective #3: *The Bodega as a Community Link*. The final objective is to begin to understand the relevance of the 'bodega' as a potential link to veterinary care for community members with pets.

This project is exploratory as there is currently a lack of published data on 'bodega' cats in NYC. The research will take place over 10-12 weeks from June through August, 2018. Potential 'bodegas' will be identified via the Bodega Association of the United States, social media, word of mouth, and neighborhood canvassing. Using a list of identified bodegas in the Bronx, a random number generator will be used to select a subset of bodegas for in-person contact. Bodegas will be visited and asked whether or not they have a cat residing on premise. If not, they will be asked a subset of questions regarding if they have ever had a cat. If they do have a cat, they will be asked to participate in the survey. Data will be collected by the student during business hours utilizing a standard survey developed by the student and mentor. We hope to collect data on at least 75 unique 'bodega' cats. All bodegas will be located within the NYC borough of the Bronx. Participation will be voluntary and any cats that are not currently surgically sterilized or up to date on vaccinations will be offered these services at no cost through Adore-a-Bullie Paws & Claws Rescue's partnership with the ASPCA Stationary Spay/Neuter Clinic. Services include spay/neuter surgery, rabies and FVRP vaccination, FIV/FelV testing, and single application of revolution as deemed necessary by the clinic.

All data analysis will be completed using Stata 13. Demographic data will be quantified and reported as percentages. We are specifically interested in the percentage of bodegas owning cats, percentage of these cats that are surgically sterilized, and the reason(s) if they are not sterilized. Additionally, if they have ever been fined for rodents/rodent feces and if they have ever been fined for keeping a cat inside. Finally, we would like to gauge the acceptability of placing educational literature regarding spay/neuter services within the bodega. Upon completion, we hope to quantify the impact on the lives of bodega cats by comparing the number of sterilized cats before the study with after the study.