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ABSTRACT BOOK

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Merial Veterinary Scholars Program

Morris Animal Foundation

Award Type	Student	Mentor	Class Year	Research Title
ARMY	Ash, Lesley	Dr. David Sherman	2014	Assessment of Dietary Change and Parasite Load as they Relate to Morbidity and Mortality in a Discrete Scottish Population of Red-Billed Choughs (<i>Pyrrhocorax pyrrhocorax</i>)
ARMY	Barnett, Grace	Dr. John Berg	2015	Analysis of Preoperative Lactate Concentrations as Predictors of Survival to Discharge in Dogs Undergoing Resection of Splenic Masses
NIH	Barry-Heffernan, Caitlin	Dr. Robert Bridges and Dr. John Byrnes	2014	Role of the D1 Dopamine Receptor in Pertussis Toxin-Mediated Maternal Behavior in the Virgin Female Rat
NIH	Beck, Erika	Dr. Mei-Hsiu Hwang & Dr. Stephen Rich & Dr. Sawkat Anwer	2014	Detection and Characterization of Microfilaria, Hemoprotozoa, and Ascarid Eggs in Captive Formosan Black Bears Using Polymerase Chain Reaction, Hematology, and Fecal Analysis
NIH	Bille, Alycia	Dr. Armelle De Laforcade	2015	Hemostatic Changes in Dogs and Cats During Pregnancy
NIH	Bodi, Caroline	Dr. Elizabeth Byrnes	2015	Influence of Mother's Adolescent Opioid Exposure on Infant Rats' Ultrasonic Vocalization
ARMY	Chalam, Yamini	Dr. David Sherman	2014	Experimental Infection of <i>Mycobacterium avium</i> subsp. <i>Paratuberculosis</i> to Evaluate Susceptibility to Johne's Disease Among Different Breeds of Sheep in Australia
NIH	Chan, Nathan	Dr. Sawkat Anwer	2015	Mechanism of Action of Anticholestatic Effect of Tauroursodexycolate
MERIAL	Chevett, Kelly	Dr. Sandra Ayres	2015	Efficacy of Various Short Progesterone Priming Protocols on Pregnancy Rates in Previously Anestrous Does

Award Type	Student	Mentor	Class Year	Research Title
MERIAL	Connolly, Kevin	Dr. Cailin Heinze	2015	Feeding Practices and Attitudes of Dog Breeders
ARMY	Dale, Sarah	Dr. Catherine Brown & Dr. Joann Lindenmayer	2015	Antibiogram Analysis of <i>Staphylococcus intermedia</i> , <i>Staphylococcus aureus</i> , <i>Salmonella</i> and <i>Escherichia coli</i> Diagnosis Made at the Tufts Cummings School of Veterinary Medicine
NIH	DeAngelo, Christina	Dr. Sandra Ayres	2014	Non-Surgical Embryo Collection and Transfer in Rats
Formula Funds	DeFabrizio, Melissa	Dr. Alison Robbins	2014	Investigating the Use of Munitions Bunkers as Artificial Bat Hibernacula
ARMY	Dickey, Meranda	Dr. Maureen Murray & Dr. Carolyn Cray & Dr. Terry Norton	2015	Evaluation of Serum Amyloid A in Loggerhead Sea Turtles (<i>Caretta caretta</i>)
ARMY	DiMeglio, Julie	Dr. Emily McCobb	2014	Pilot Study to Establish A Survey of the Post-Operative Practices of Feral Cat Caretakers Participating in Trap-Neuter-Return Programs In New York City
NIH	Fontaine, Kylynn	Dr. Sam Telford	2014	Knowledge, Attitudes, and Behaviors Regarding Lyme Disease Among Martha's Vineyard Residents
NIH	Gallo, Miranda	Dr. Alicia Karas	2015	The Effect of Acute Injury and Chronic Disease on TIN Score in Common Laboratory Mouse Strains

Award Type	Student	Mentor	Class Year	Research Title
ARMY	Glass, Melanie	Dr. Flo Tseng and Dr. Jonathan Epstein	2015	The Relationship of Ectoparasites and Diurnal Bat Behavior to Prevalence of Novel Flaviviruses in Bangladeshi Flying Foxes, <i>Pteropus giganteus</i>
ARMY	Hamilton, Jessie	Dr. Therese O'Toole	2014	Thromboelastography in Dogs Undergoing Splenectomy: A Retrospective Study
ARMY	Jacobs, Rachel	Dr. Elizabeth Rozanski	2014	Dynamic Collapse of the Common Pharynx in Cats
ARMY	Jacobus, Kristy	Dr. Flo Tseng	2014	Identification, Mean Intensity, and Clinical Significance of Parasites in Stranded Pinnipeds in Southern Brazil
NIH	Johnson, Kelsey	Dr. Lois Wetmore	2014	Characterization of Exons 2,3, and 4 of the Equine <i>mu</i> Opioid Receptor 1 Gene
ARMY	Kozol, Stephanie	Dr. Emily McCobb	2015	Anesthetic Management and Short-Term Survival after Splenectomy
NIH	LaFauci, Kendra	Dr. Elizabeth Rozanski	2015	Assessment of Pleural Pressure in Veterinary Medicine Using Pleural Manometry
ARMY	Lewis, Stephany	Dr. Flo Tseng	2015	Efficacy of Tramadol as an Analgesic in Red-Tailed Hawks
NIH	Mazzaschi, Nicole	Dr. Robert Bridges	2014	An Ethological Analysis of the Reproductive Behavior of the Dwarf Armadillo (<i>Zaedyus pichiy</i>)

Award Type	Student	Mentor	Class Year	Research Title
NIH	Meadows, Kristy	Dr. Elizabeth Byrnes	2014	Relaxin-3 Production in Rats and Its Effects on Stress Response and Cognitive Function
ARMY	Merriday, Sarah	Dr. David Sherman & Dr. Joann Lindenmayer	2014	Effects of Vaccinating Goat Herds Against <i>Mycobacterium avium</i> Subspecies <i>Paratuberculosis</i> (MAP) on Milk Production and Culling Rates
ARMY	Morlock, Jillian	Dr. Claire Sharp	2014	Isolation, Culture, and Potency Assessment of Mesenchymal Stem Cells From Bone Marrow of Cats
ARMY	Moynahan, Shannon	Dr. Mark Pokras	2015	Drag Produced by Leg Bands on Common Loons (<i>Gavia immer</i>): Is it Significant?
ARMY	Nakayama, Yuki	Dr. Claire Sharp	2014	An Evaluation of Antibody Titers for Feline Herpesvirus-1 and Feline Calicivirus as Predictors for the Incidence and Severity of Upper Respiratory Tract Disease in Shelter Cats
NIH	Neabore, Scott	Dr. Charles Shoemaker and Dr. Greice Krautz-Peterson	2015	Developmental Expression Analysis in Schistosomes of Potential Complement Regulatory Proteins with Homology to CD59
ARMY	Patellos, Katherine	Dr. Elizabeth Rozanski	2015	A Novel Approach to Canine Laryngeal Paralysis
Formula Funds	Pereira, Brittany	Dr. Donna Akiyoshi & Dr. Alison Robbins	2015	Development of an Infective Hair Model for Testing Antifungal Drugs Against <i>Geomyces Destructans</i>
ARMY	Picciotto, Emily	Dr. Gretchen Kaufman & Dr. I.P. Dhakal	2015	Prevalence of Elephant Endotheliotropic Herpesvirus in Captive Breeding Asian Elephants (<i>Elephas maximus</i>) in Nepal

Award Type	Student	Mentor	Class Year	Research Title
ARMY	Reiss, Eliza	Dr. Kristine Burgess	2014	Incidence and Predictors of Hemangiosarcoma in Dogs with a Splenic Mass: 2008-2012
NIH	Rock, Meagan	Dr. Alicia Karas	2014	Effect of Strain, Gender, and Housing Condition on the TIN Score in Normal Laboratory Mice
Morris	Rosenbaum, Marieke	Dr. Lisa Jones-Engel and Dr. Joe Zunt	2013	Genetic Variation of <i>Mycobacteria sp.</i> in Nonhuman Primates with Close Contact to Humans in Peru
ARMY	Sharp, Sarah	Dr. Joyce Knoll & Dr. Michael Moore	2015	Hematological and Serum Chemistry Profiles as a Prognostic Indicators in Stranded Common Dolphins, <i>Delphinis delphis</i>
ARMY	Stephan, Sarah	Dr. Jean Mukherjee	2014	Identifying <i>Plasmodium</i> Genotypes Infecting Birds and Mosquitoes in the Galapagos Islands
ARMY	Sweeney, Joseph	Dr. Suzanne Cunningham	2015	Cardiomyopathy in the English Bulldog: A Retrospective Study Describing the Clinical Signs, Diagnostic Findings and Survival Statistics of English Bulldogs with Presumed Arrhythmogenic Right Ventricular Cardiomyopathy (1996-2011)
ARMY	Topliff, Elizabeth	Dr. David Sherman	2014	Locally Available Classical Swine Fever Vaccines Provide Adequate and Sustainable Protection in Lao Villages under Approved Conditions
ARMY	Tuttle, Emerson	Dr. David Sherman & Dr. Andrew Catley	2014	Decision Making for Effective Response to Foot and Mouth Disease Outbreaks in Ethiopia
NIH	Wheat, Alyssa	Dr. Barbara Davis	2015	Effects of Bisphenol-A as an Endocrine Disruptor of the Reproductive Tract of Sprague Dawley Rats

Awardee: Lesley Ash V'14

Mentor: Dr. David Sherman

Award Type: US Army

Research Project: Assessment of Dietary Change and Parasite Load as they Relate to Morbidity and Mortality in a Discrete Scottish Population of Red-Billed Choughs (*Pyrrhonorax pyrrhonorax*).

Summary: The objectives of this research will be to characterize and quantify parasite occurrence and diet in a discrete Scottish population of sub-adult red-billed choughs (*Pyrrhonorax pyrrhonorax*) through fecal analysis. Through these objectives, this research will consider and investigate four separate but interrelated hypotheses:

- 1) Parasite loads as assessed by fecal analysis are at levels likely to cause morbidity and mortality in the Islay population of sub-adult red-billed choughs.
- 2) Parasite occurrence and loadings are widespread across the chough sub-adult population.
- 3) There is a direct link between parasite occurrence and diet of the birds.
- 4) The current diet of the sub-adult chough is different from what would be expected based on historical data.

The red-billed chough is classified as being of high European conservation priority (Reid et al., 2009). Recently, the number of sub-adult choughs has decreased markedly with, for example, only 10-11% post-fledgling survival rates on Islay during each of the 2007-2010 breeding seasons (Reid et al., 2011). The objectives of this research will consider the relevance of parasite burdens, how widespread these may be in the sub-adult population and whether there are any links with the diet of sub-adult birds on Islay. Proving or disproving the stated hypotheses will shed light on whether the parasite burdens are high enough to cause the observed widespread detrimental effect on sub-adult chough survival and whether the parasite burdens are related to diet and/or any apparent dietary changes.

Parasite load and dietary composition will be determined through fecal analysis. Fecal sample collection will occur through winter and spring 2012 and collected samples will be preserved for summer analysis in 10% formalin and refrigerated at 4°C (Foreyt 1986). All fecal samples will be analyzed for the presence of ova using the McMaster technique (Rinaldi et al. 2011) for parasite eggs. Dietary items will be identified via microscopy. The parasite load and diet will be characterized and quantified.

Descriptive statistics and regression analyses will be used to analyze findings from the data sets.

Awardee: Grace Barnett V'15

Mentor: Dr. John Berg

Award Type: US Army

Research Project: Analysis of Preoperative Lactate Concentrations as Predictors of Survival to Discharge in Dogs Undergoing resection of Splenic Masses

Summary: Splenic masses are one of the most common ailments of older dogs. Both neoplastic and nonneoplastic masses can develop in the spleen: approximately 59% of splenic masses in dogs are malignant, and roughly 73% of malignant masses prove to be hemangiosarcomas (HSA). Hemangiosarcomas commonly rupture, causing hemorrhage within the abdominal cavity. Splenic masses are most commonly treated by splenectomy; in the case of HSA, which almost invariably metastasizes prior to diagnosis, splenectomy is largely performed as a palliative measure to prevent future bleeding episodes.

While several long-term survival studies of dogs undergoing splenectomy for various types of splenic masses have been conducted, the short term survival rate following surgery is unknown, and potential prognostic factors that might predict short term outcome have not been investigated. In the case of HSA, the decision whether or not to elect emergency surgery is often particularly difficult for owners, because it must be made quickly and because the surgery and aftercare are expensive and are not associated with good long term prognosis. Accurate information concerning the short term survival rate and clinical predictors of short term survival would be useful to clinicians attempting to advise owners about the likely outcome of surgery.

Serum lactate levels and changes in serum lactate levels in response to preoperative fluid administration (delta lactate) are known to be predictive of short term outcome in dogs with gastric dilatation-volvulus (GDV), a disease with systemic consequences that are very similar to those observed in dogs with splenic masses. The specific aims of our study will be to determine the short term survival rate of dogs undergoing splenectomy for splenic mass lesions, and to determine whether preoperative plasma lactate concentration or delta lactate are predictive of survival to discharge.

Awardee: Caitlin Barry-Heffernan V'14

Mentor: Dr. Robert Bridges and Dr. John Byrnes

Award Type: NIH

Research Project: Role of the D1 Dopamine Receptor in Pertussis Toxin-Mediated Maternal Behavior in the Virgin Female Rat

Summary: The neurotransmitter dopamine has been demonstrated to play an important role in the development of maternal behavior. Blockade of dopamine receptors around the time of parturition inhibits maternal behavior toward newly born pups, and also toward foster pups later in life, suggesting that dopamine is important for both the onset of maternal behavior and for maternal memory. The neurotoxin pertussis toxin, which is thought to increase central dopaminergic activity, also shortens the response time before virgin female rats display maternal behavior toward donor pups. The brains of rats injected with pertussis toxin also display evidence of changes in dopamine receptor expression. In particular, rats injected with pertussis toxin showed decreased expression of the dopamine D1 receptor in the nucleus accumbens, suggesting that this receptor in this brain region may be involved in mediating the effects of pertussis toxin.

The purpose of this study is to evaluate the neural mechanism of pertussis toxin action involved in maternal behavior. The brain regions to be analyzed (medial prefrontal cortex and nucleus accumbens) have previously been demonstrated to play a role in the development of maternal behavior. Specifically, pertussis toxin will be injected bilaterally into the ventral tegmental area of the brains of virgin female rats via stereotaxic surgery. Rats undergoing this surgery will also be implanted with a subcutaneous pump that will release SCH23390, an antagonist of the D1 receptor, or vehicle. Starting 3 days after surgery, rats will be tested daily for the expression of maternal behavior towards donor pups. At the completion of maternal behavior testing subjects will be tested for activity levels to validate the known effects of pertussis toxin after which neural tissues will be collected for subsequent measurement of dopamine receptor expression by qPCR and of DA and its metabolites' concentrations in the nucleus accumbens by high performance liquid chromatography.

The results of this study should determine whether the stimulatory effects of pertussis toxin on the development of maternal behavior are mediated via the dopamine D1 receptor.

Awardee: Erika Beck V'14

Mentor: Dr. Mei-Hsiu Hwang, Dr. Stephen Rich and Dr. Sawkat Anwer

Award Type: NIH

Research Project: Detection and Characterization of Microfilaria, Hemoprotozoa, and Ascarid Eggs In Captive Formosan Black Bears using Polymerase Chain Reaction, Hematology, and Fecal Analysis

Summary: I will determine if captive Formosan black bears (*Ursus thibetanus formosanus*) harbor endopara-sites by analyzing blood for hemoprotozoa (*Babesia* spp., *Hepatozoon* spp.) and microfilariae and ex-amining feces for ascarid eggs. I hypothesize that captive centers will have less parasite transmission, such that Formosan black bears that have been in captivity for a longer period of time are

less likely to have an active parasitic infection than those recently incorporated into facilities. Geohelminths like Baylisascaris will be rare in animals held in captivity for years because feces are not allowed to accumulate. Tick-borne infections (Babesia spp) are the next least likely to be found because zoos are not tick-friendly habitats. However, Dirofilaria spp. have a higher probability of infecting captive bears because mosquitoes cannot be excluded from enclosures. Additionally, a cumulative age effect may occur with older animals having higher microfilaremias from many years of exposure.

For over twenty years, these bears have been listed as endangered and given protection under Taiwan's Cultural Heritage and Preservation Law, the Wildlife Conservation Law, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as an Appendix I species. Their health status is important because there are fewer individuals and the Associations of Zoos and Aquariums (AZA) Bear Advisory Group recommends breeding East Asian bears over their North American counterparts. East Asian captive bears have a higher genetic success in reproduction and less intermixing between subspecies. In addition, in Taiwan and the majority of East Asia, there is little data available about parasites in wild and captive animals even though endoparasites are a principle cause of morbidity in zoo mammals.

Therefore, parasitology is a necessary field to determine the overall health of the bears. I will analyze blood and feces from 32 captive Formosan black bears in four facilities in Taiwan. Two facilities are in the south, one is in the north, and one is in central Taiwan. Thick and thin blood smears and fecal smears will be analyzed using light microscopy. Polymerase chain reaction (PCR) will be used to determine if dirofilaria or hemoprotozoa are present in blood. Based on a previous study, 18S rRNA is highly conserved amongst Babesia spp found in the US and Japan. I will use their protocols and primer pairs. Based on another study, 28S rRNA gene is highly conserved between nine different filarial species; this primer pair will be used to screen for microfilaria and later verify the filarial species present.

Awardee: Alycia Bille V'15

Mentor: Dr. Armelle De Laforcade

Award Type: NIH

Research Project: Hemostatic Changes in Dogs and Cats During Pregnancy

Summary: The purpose of this study is to evaluate hemostatic changes in dogs during pregnancy using thromboelastography (TEG). In addition, pilot data regarding the hemostatic state of cats that are pregnant at the time of spay will be obtained using TEG. TEG is a whole blood assay that provides a global assessment of coagulation. Unlike accepted plasma based coagulation tests, TEG takes into account the contribution of coagulation factors, platelet numbers and platelet function on speed of clot formation and overall clot strength. TEG is used in people in cardiac and liver transplantation, obstetrics, and in trauma. While TEG has been used to assess coagulation in a variety of disease states in veterinary medicine (such as immune mediated disease, protein losing states, and others) it has not been used to assess the hemostatic state of pregnant animals. The TEG is conveniently located in the Clinical Sciences Research Laboratory in the Foster Hospital for Small Animals at Tufts Cummings School of Veterinary Medicine.

In people, global tests of hemostasis have documented hypercoagulability during pregnancy, a physiologic change likely meant to reduce bleeding complications related to delivery. Changes in people thought to contribute to a hypercoagulable state include increased concentration of coagulation factors, increased fibrinogen concentration, increased platelet number and greater degrees of platelet activation. We hypothesize that dogs also experience hemostatic changes consistent with hypercoagulability, evidenced by increased Maximum Amplitude on TEG, increased fibrinogen, and increased platelet count. We further hypothesize that feral cats found to be pregnant during spay will also show changes on TEG supporting a hypercoagulable state. Although many dogs and cats experience pregnancy free of complications, a better understanding of hemostasis during pregnancy will help diagnose and treat complications of pregnancy.

Awardee: Caroline Bodi V'15

Mentor: Dr. Elizabeth Byrnes

Award Type: NIH

Research Project: Influence of Mother's Adolescent Opioid Exposure on Infant Rats' Ultrasonic Vocalization

Summary: Substance abuse and likelihood of dependency are traits that can run in families, involving both genetic and environmental influences. It has been studied that steady drug abuse in the user can alter brain structure and function. In the postnatal maternal environment, it is likely that the mother's prior drug exposure and maternal separation would influence the quality of maternal care and therefore development of the offspring.

Maternal care is a behavior that may be altered after frequent use of exogenous opioids during adolescent development. Frequent use of exogenous opioids during adolescent development would likely change the endogenous opioid system and therefore alter opioid-mediated actions, inherent in the mother-infant relationship. Rate of ultrasonic vocalization (USV) in rats can be an elicitor of maternal care and retrieval. It can serve as a highly informative tool in investigating the effect of opiates on the development of selected brain systems. The current experiment will measure separation-induced USV and maternal potentiation of USV during early development to determine whether the offspring of females exposed to morphine during adolescence display altered USV in response to maternal separation.

The current study will determine whether the offspring of mothers exposed to opiates repeatedly during adolescent have altered USV in response to maternal separation. Pup USV will be monitored using sound recording equipment. The presence or absence of maternal potentiation will also be noted. Data will be compiled and summarized to assess if there is a difference in distress cries in response to maternal separation.

A focus on female adolescent exposure is increasingly relevant to public health based on the high prevalence of opiates used and the frequency of substance abuse in adolescents in the nation. Aside from the non-medical use of these drugs, insight on the long-term effects of pain management in younger patients may also be elucidated.

Awardee: Yamini Chalam V'14

Mentor: Dr. David Sherman

Award Type: US Army

Research Project: Experimental Infection of *Mycobacterium avium* subsp. *paratuberculosis* to Evaluate Susceptibility to Johne's Disease Among Different Breeds of Sheep in Australia

Summary: Objective: The main objective of this study is to evaluate whether susceptibility to MAP, the etiologic agent of Johne's disease, is correlated to the breed of sheep. This study will involve the experimental inoculation of four prevalent sheep breeds in Australia, followed by repeated serum and fecal analysis to evaluate the immune response and disease progression.

Animals: This study will be conducted in Camden, New South Wales, Australia, in conjunction with the ongoing Johne's research program at The University of Sydney. 139 lambs have been selected for this study from four commonly used breeds of sheep in Australia. All lambs were born in September 2011 and will be confirmed to be MAP-free prior to inoculation.

Procedure: In February 2012, researchers from The University of Sydney will inoculate the lambs with a specific ovine strain of MAP designed for experimental infection. At 2, 4, and 6 months post-inoculation, blood and fecal samples will be collected and stored. In July 2012, ELISA will be performed on the blood samples to detect serum IgG response to the MAP inoculation. Additionally, fecal samples will be cultured to measure fecal shedding and colony growth as an indicator of MAP infection and disease progression. Statistical analysis will be performed on the data collected to determine whether the breed of the sheep can be associated with the rate of infection or the progression of the disease.

Relevance: Johne's disease is a contagious and untreatable disease of ruminants that leads to severe enteritis, wasting, and death of the infected animal. As such, the presence of MAP has a significant health and financial impact to sheep flocks internationally, with current control methods focused on vaccination and eradication. Establishing breed susceptibility to MAP infection can help improve upon current disease control methods, thereby reducing the death rate and financial toll associated with MAP and promoting the health of sheep flocks worldwide.

Awardee: Nathan Chan V'15

Mentor: Dr. Sawkat Anwer

Award Type: NIH

Research Project: Mechanism of Action of Anticholestatic Effect of Tauroursodexycolate

Summary: For bile secretion, certain transporters are moved from the cytoplasm to the canilicular membrane in a similar fashion as insulin induced glucose transporters.¹ Intrahepatic cholestasis can be caused by an abnormality in the translocation process of these transporters to the canilicular membrane. Understanding the pathway for bile transporter translocation will help to figure out ways to treat intrahepatic cholestasis but the pathway for the mechanism of bile transporter translocation is unknown at this time. What is known is that movement of bile transporters is due to phosphorylation by a number of hepatic protein kinases Cs (PKC) which can have either cholestatic or anticholesatic effects.²

Taurolithocholate is known to cause intrahepatic cholestasis by retrieving the organic anion transporter, multidrug resistant protein 2 (MRP2), from the canilicular membrane.³ It is recognized that tauroursodeoxycolate (TUDC) can reverse cholestasis caused by taurolithocholate via PKC-dependent mechanisms.¹ nPKC δ in particular is of interest because cyclic adenosine monophosphate (cAMP) translocation of MRP2 to the canalicular membrane is facilitated via nPKC δ .¹ Thus, it is possible that TUDC also acts via nPKC δ .

The specific aim of this proposal is to test the hypothesis that TUDC translocates MRP2 from the cytosol to the canilicular membrane by activating nPKC δ through the PI3K pathway. This hypothesis will be tested by answering the following two questions: 1) Does TUDC can activate nPKC δ ? and 2) is this action dependent on PI3K.

Awardee: Kelly Chevett (Atlantic Veterinary College, University of Prince Edward Island)

Mentor: Dr. Sandra Ayres

Award Type: Merial Veterinary Scholars

Research Project: Efficacy of Various Short Progesterone-Priming Protocols on Pregnancy Rates in Previously Anestrous Does

Summary: Goats are seasonal breeders, and it would be advantageous to farmers to breed their stock multiple times a year. Inducing goats to cycle has been done with some amount of success, but pregnancy rates are often low on the first breeding as the ovulation is usually infertile. In order to

induce cycling, hormonal control must be manipulated. The specific aim of the project is to compare pregnancy rates in goats, bred on either the first or the second induced estrus of the non-breeding season. Twelve female Alpine and Saanen dairy goats will be divided into 2 groups. All animals will be induced to cycle using a short progesterone priming protocol. Group A will be bred on this first induced heat. The remaining animals will not be bred, but allowed to continue this first estrus cycle for 7 days. At this time the animals will be short-cycled using PGF2 α , and bred on the resulting second estrus. Blood sample will be collected and analyzed to measure progesterone levels. This will be done daily during synchronization and breeding, and then two to three times a week during early pregnancy.

Awardee: Kevin Connolly V'15

Mentor: Dr. Cailin Heinze

Award Type: Merit Veterinary Scholars

Research Project: Feeding Practices and Attitudes of Dog Breeders

Summary: Gestation, lactation, and early development in dogs are life stages exquisitely sensitive to proper nutrition. Recognition of the unique dietary demands of reproducing animals, and selection of an appropriate nutritional program, is a requirement for a well-informed breeder. Feeding practices of dog breeders throughout the reproductive cycle can significantly influence fertility, litter survival, and can have long-term consequences on the health of pups; breeders are also regarded as a resource for pet care, and their feeding choices can influence those of dog owners after puppies transition to their new homes. It is unclear how well breeders are navigating the growing nutritional knowledge base, and whether their practices and attitudes toward reproductive nutrition have parity with scientifically-accepted feeding paradigms. Therefore, this study will survey dog breeders to determine 1) the population of dog breeders that are feeding their animals diets that meet currently accepted nutritional standards for reproduction and early development; and 2) the criteria and influences that guide their feeding practices.

This cross-sectional study will make use of a self-administered, anonymous, web-based questionnaire for data collection, and will include residents of the United States or Canada who breed at least one litter per year. The survey will collect demographic information on breeders (such as income, education, and experience), and feeding practices during four life stages: pre-pregnancy, gestation, lactation; weaning of puppies. The survey will also include questions to determine breeder criteria for diet selection, sources of diet guidance, and opinions of popular nutritional trends. Data on percentages of breeders feeding appropriate diets for each life stage will be presented. Differences in demographic data, preferred source of nutrition information, and type of diet (commercial vs. home prepared) will be compared between breeders who do and do not feed adequate diets. We hypothesize that many breeders are not feeding diets appropriate for the life stages of their animals and may be relying on public opinion and diet marketing rather than scientific evidence in their diet selection. An understanding of breeder feeding practices could allow veterinarians the opportunity to take a more proactive role in ensuring reproductive health in dogs.

Awardee: Sarah Dale V'15

Mentor: Dr. Catherine Brown and Dr. Joann Lindenmayer

Award Type: US Army

Research Project: Antibioqram Analysis of *Staphylococcus intermedia*, *Staphylococcus aureus*, *Salmonella* and *Escherichia coli* Diagnoses Made at the Tufts Cummings School of Veterinary Medicine

Summary: The Massachusetts Department of Public Health currently collects antibiotic-sensitivity data on certain organisms of concern from human hospitals throughout the state. The data is then used to create antibiograms, which can help inform human medical clinicians in their decisions to use or not use antibiotics, and which antibiotics to use.

This project seeks to create a similar antibiogram database on antibiotic-sensitivity for organisms of interest to the veterinary medical community. More specifically, the project will look at all culture and sensitivity tests performed in the Foster Hospital for Small Animals at Tufts Cummings School of Veterinary Medicine for *Staphylococcus intermedia*, *Staphylococcus aureus*, *Salmonella* and *Escherichia coli*. Data on any animal from the Flexible Information Retrieval and Storage System (FIRST) at the Foster Small Animal Hospital will be analyzed from 2000 to 2010 for documentation of the number of instances of these bacterial pathogens, the proportion that received culture and sensitivity testing, and the percentage with multiple drug-resistance.

Collecting data from multiple years spread out over time will allow for a trend-analysis that will help determine the level of antibiotic-resistance being diagnosed by clinicians at FHSA, how often clinicians are testing for antibiotic-resistant bacteria, and the factors related to the decisions to test and culture. Our conclusions will help provide a baseline for future analysis of data from other years or even other veterinary medical hospitals that could indicate how antibiotic-resistance has changed in recent times, and the clinical significance of that change.

Awardee: Christina DeAngelo V'14

Mentor: Dr. Sandra Ayres

Award Type: NIH

Research Project: Non-Surgical Embryo Collection and Transfer in Rats

Summary: In biomedical research today both gene transfer and gene modification in rats are used daily. To perform this type of research surgical embryo collection and transfer procedures in rats are currently required. These types of procedures can lead complications with anesthesia and infection. Many of the complications can then lead to discomfort, suffering and death for rats used during these procedures. To avoid these complications this project aims to develop a non-surgical procedure for collecting and transferring embryos in the rat species. In the mouse species techniques have recently been created to transfer embryos in mice which we aim to modify for the rat species. This procedure will lead to the elimination of the surgical risk involved in embryo collection and transfer.

Awardee: Melissa DeFabrizio V'14

Mentor: Dr. Alison Robbins

Award Type: Formula Funds

Research Project: Investigating the Use of Munitions Bunkers as Artificial Bat Hibernacula

Summary: The goal of this study is to assess the suitability of abandoned, munitions bunkers for hibernation of bats as a method to prevent winter mortality caused by white-nose syndrome, an infection by the fungus, *Geomyces destructans*. This fungus has become a successful pathogen in many bat species, most notably the little brown bat (*Myotis lucifugus*). It is a psychrophilic fungus that grows on the skin of the face and flight membranes of the bats, eventually causing severe depletion of fat stores, leading to starvation and death due to hibernation disruption. Munitions bunkers used as artificial hibernacula could be disinfected between each season to reduce or eliminate the infective load of *Geomyces destructans* in the environment. The first specific aim of this study is to assess the current bat population in several of the wildlife refuges where bunkers are located, in the U.S. Fish and Wildlife Service Eastern Massachusetts National Wildlife Refuge Complex, through the use of acoustic surveys of bat calls. This information will be used to assess the overall impact of white-nose syndrome on the population and get an idea of the population size that may be found in the bunkers. The second specific aim of this study is to determine whether or not the bunkers at Assabet River National Wildlife Refuge in Sudbury, MA currently have any detectable amounts of *G. destructans* present on the surfaces, through the use of a quantitative polymerase chain reaction test specific to this pathogen. This is important information because before the bunkers can be used as controlled environments to study bats, they must be free of this fungus, or disinfected. The final specific aim of this project is to analyze data on the winter temperature profiles of the bunkers that have been recorded, and then compare them to the winter temperature profiles of natural hibernacula used by bats. The results of this analysis will allow us to make temperature management recommendations on insulation, airflow, and temperature regulation for future studies on bat hibernation using the bunkers. Because of the significant role that bats play in maintaining animal, environmental and human health, the study and control of white-nose syndrome are essential to preserve these populations.

Awardee: Meranda Dickey V'15

Mentor: Dr. Maureen Murray, Dr. Carolyn Cray and Dr. Terry Norton

Award Type: US Army

Research Project: Evaluation of Serum Amyloid A in Loggerhead Sea Turtles (*Caretta caretta*).

Summary: All seven sea turtle species alive today are either threatened or endangered. In order to protect these species from extinction, it is important to gain as much information as possible regarding how to both properly monitor their populations in the wild and care for individuals in a rehabilitation setting. Clinical pathology parameters utilized in both of these settings include complete blood counts, plasma biochemistry panels and plasma protein electrophoresis⁵, but there is room for further development of diagnostics in these species.

Acute phase proteins are an important part of the acute phase response of the innate immune system. These proteins respond strongly and quickly to insult, and can be monitored to track a patient's progress or evaluate the health of wild individuals on a more sensitive level^{2,4}. These proteins and their use as a diagnostic tool have been studied in a variety of species, but data in sea turtles is currently lacking^{1,2,3,4,6}. Serum amyloid A is thought to be a major acute phase protein in many mammals, as well as reptiles⁸. A recent study has also shown serum amyloid A's involvement in bacterial infection and inflammation in the Chinese soft-shelled turtle (*Trionyx sinensis*)⁸. These findings support continued investigation into serum amyloid A's role in the sea turtle acute phase response.

Based on the assay validation method proposed by Kjelgaard-Hansen and Jacobsen⁷, developing the use of serum amyloid A as a tool in new species requires development of an acceptable method, evaluation of normals, as well as comparison to abnormal individuals. The University of Miami Acute Phase Protein Laboratory has developed an acceptable method through similar work in a variety of species^{1,3} and will be the site of evaluation of serum amyloid A in loggerhead sea turtles (*Caretta caretta*). Samples from 50 loggerhead sea turtles will be obtained from the Georgia Sea Turtle Center, some collected from wild individuals, and some banked from center patients. For purposes of the study, all individuals will be assessed through physical examination, complete blood count and plasma protein electrophoresis, whether using previously collected data or newly collected data. Acute phase protein testing will be completed on all samples. Through analysis of these results, parameters for normal sea turtles can be established. Individuals with elevated serum amyloid A levels will represent an opportunity for investigation of the clinical significance of this protein in sea turtles.

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Awardee: Julie DiMeglio V'14

Mentor: Dr. Emily McCobb

Award Type: US Army

Research Project: Pilot Study to Establish a Survey of the Post-Operative Practices of Feral Cat Caretakers Participating in Trap-Neuter-Return Programs in New York City.

Summary: The objective of this project is to establish and conduct a pilot study of the postoperative practices of feral cat caretakers involved in trap-neuter-return programs in New York City. The study will serve to determine what their procedures are, how they conform to the recommendations of the NYC Feral Cat Initiative, and how their procedures affect the welfare of the cats in the program.

Currently, there is no uniform post-operative recommendation for feral cat caretakers. This study will establish a survey of feral cat caretakers that can be utilized to determine their post-operative procedures and the effect of these procedures on cat welfare. A pilot survey will be conducted on a sample of caretakers in New York City, establishing a group of approximately fifty feral cats undergoing the trap-neuter-return procedure. Caretakers will be asked to keep a diary of the activity of a random sample of cats, and fill out a survey upon the cats' return to the colony. The survey will provide data regarding the extent to which the caretakers follow the procedures recommended by the Neighborhood Cats workshop or Humane Society online course required by the New York City Feral Cat Initiative.

Information will also be collected regarding the behavior of the cats while they are in the cages, and what their activity is like post-release. The information provided by the survey results can be used to improve the recommendations made by the NYC Feral Cat Initiative. If practices are deemed detrimental to the welfare of the cats, or if instructions are not followed due to misunderstanding or lack of feasibility, recommendations can be amended. In the future, the survey can function to allow comparison between different post-operative protocols in other trap-neuter-return programs based on the perceived welfare of the cats in the traps.

Overall, this research will serve to create a pilot study to inform further investigation into the formulation of optimal post-operative procedures for cat caretakers participating in feral trap-neuter-return programs.

Awardee: Kynn Fontaine V'14

Mentor: Dr. Sam Telford

Award Type: NIH

Research Project: Knowledge, Attitudes, and Behaviors Regarding Lyme Disease among Martha's Vineyard Residents

Summary: Specific Aim 1: To assess the current level of knowledge of Lyme disease and the attitudes and behaviors towards its prevention among residents of the island of Martha's Vineyard, off of Cape Cod, Massachusetts.

Specific Aim 2: To make preliminary associations between different variables, the use of preventive behaviors, and attitudes towards various interventions.

Population: Permanent and seasonal residents of the island of Martha's Vineyard (Dukes County, MA)

Methods: A knowledge, attitudes, and behaviors survey will be distributed during the summer to residents of Martha's Vineyard. The survey will be conducted via an internet-based tool, and invitations will be via e-mail. Questions will be asked about the use of behaviors that prevent Lyme disease, attitudes about Lyme interventions, knowledge of Lyme disease, and general demographic information. Data collected will be analyzed statistically for associations between attitudes and behaviors and other variables.

Relevance: Martha's Vineyard has one of the highest rates of Lyme disease in the United States, more than three times the rate on the mainland of Cape Cod. Lyme disease has a high treatment success rate when treated early with antibiotics; however, serious long-term effects can result if it is not treated. Some educational campaigns have been undertaken to combat the high incidence of Lyme, but the risk remains elevated. Additional public health interventions are needed to reduce the risk of Lyme among the general population. In order to develop interventions that will be successful and well-accepted by the public, data on the population that will be served is needed. Interventions for Lyme disease can take many forms, from educational to environmental, and are not always successful. For example, an effective vaccine was developed for Lyme disease, but the vaccine was ultimately removed from the market due to low sales. Public acceptance is one key to a successful intervention. Agencies such as the Martha's Vineyard Boards of Health will be able to use the results of this survey to guide future public health interventions on the island.

Awardee: Miranda Gallo V'15

Mentor: Dr. Alicia Karas

Award Type: NIH

Research Project: The Effect of Acute Injury and Chronic Disease on TIN Score in Common Laboratory Mouse Strains

Summary: Laboratory mice are the most widely used vertebrates in biomedical research. Identification of pain and distress in mice is important in terms of ensuring the quality of the science conducted as well as the welfare of the mice. The current pain and distress assessment techniques are not sufficient

to serve as rapid screening tools for large mouse populations. The TIN (Time to Incorporate Nest material) Score, is being investigated for its potential to provide a binary measure of well-being that can serve to alert animal care staff to the welfare concerns of a single cage amidst hundreds.

The goal of this study is to support and expand upon pilot data, which indicate a change in TIN Score following invasive yet routine laboratory procedures. First, effect of acute injury on TIN Score will be investigated by monitoring mice before and after common laboratory surgeries. An increased proportion of cages with negative TIN Score (TIN-) following surgery indicates a disruption of normal mouse behavior and the need for increased attention to prevent a decline in health. Second, the effect of chronic disease on TIN Score will be investigated by monitoring chronically ill mice (e.g., untreated diabetic Akita mice) by correlating signs of illness (e.g., weight loss) with a TIN- Score. A positive correlation between disrupted TIN Score and signs of illness indicate that the TIN technique is sufficiently sensitive and robust to identify mice in need of follow up care. Combined, these studies will work toward validating the TIN Score's feasibility and effectiveness as a distress monitoring technique for mice.

Awardee: Melanie Glass V'15

Mentor: Dr. Flo Tseng and Dr. Jonathan Epstein

Award Type: US Army

Research Project: The Relationship of Ectoparasites and Diurnal Bat Behavior to Prevalence of Novel Flaviviruses in Bangladeshi Flying Foxes, *Pteropus giganteus*

Summary: This study seeks to illuminate more information regarding novel zoonotic virus transmission, specifically examining novel flavivirus in the flying fox species, *Pteropus giganteus* in Bangladesh. Because of the high human population density and high contact rate with wildlife leading to recent emergent zoonotic infectious disease outbreaks in this country, Bangladesh is considered to be a hotspot area for the study of emergent disease ecology. This study will examine the relationship of bat ectoparasite load and flavivirus infection. Moreover, the relationship of flavivirus and ectoparasites to observed behaviors in a bat colony will be explored. The study will occur mostly in a field site outside the capital city of Dhaka except for some comparative behavioral data of urban bat roosts, which will occur in Dhaka. PCR analysis of bat serum and ectoparasites will take place at Columbia University in New York. Field work will be conducted in conjunction with ongoing work by the Ecohealth Alliance field team.

Awardee: Jessie Hamilton V'14

Mentor: Dr. Therese O'Toole

Award Type: US Army

Research Project: Thromboelastography in Dogs Undergoing Splenectomy: A Retrospective Study

Summary: Splenic disease is common in dogs. Most conditions involving the spleen require surgery as part of treatment. The most common indications for splenectomy in dogs include splenic masses and traumatic lacerations. Because the spleen is a vascular organ many complications of splenic disease lead to hemorrhage with disseminated intravascular coagulopathy or pathologic thrombosis. Thromboelastography (TEG) is an analytic in vitro point of care test that provides assessment of hemostatic function in whole blood. The TEG provides evaluation of both the plasma and cellular components of coagulation. The predictive use of thromboelastography for altered coagulation states has been demonstrated in dogs with a number of different conditions. To date, the usefulness of thromboelastography has not been shown for dogs undergoing splenectomy. This study aims to describe the coagulation status in dogs undergoing splenectomy. A database search in FIRST at the Tufts Cummings School Foster Hospital for Small Animals will be completed to identify dogs since 2001 that have undergone splenectomy. Cases will be narrowed down to those with available TEGs. A retrospective analysis of thromboelastograph values in relation to: outcome; reason for splenectomy; liver values; albumin levels; and urine protein levels will be performed.

Awardee: Rachel Jacobs V'14

Mentor: Dr. Elizabeth Rozanski

Award Type: US Army

Research Project: Dynamic Collapse of the Common Pharynx in Cats

Summary: Upper airway obstruction may develop in cats due to many causes, with the most common including laryngeal paralysis, and nasopharyngeal disease, including nasopharyngeal stenosis or neoplasia. Evaluation of these cats typically includes oral examination, laryngeal examination, and computed tomography (CT) or rhinoscopy. A diagnosis is reached in most, but not all cases. Recently, a case study identified dynamic collapse of the common pharynx (DCP) as a possible diagnosis in such a cat (1). However, the presence or absence of DCP is hotly debated in small animal pulmonology.

We hypothesize that this apparent dynamic collapse may be secondary to an undiagnosed more rostral partial airway obstruction, rather than a distinct and separate pathology. Cats, while not obligate nasal breathers, strongly prefer to breathe through their nose, even in the face of partial obstruction.

Anatomic and physiological principles support that a rostral obstruction could cause a more caudal but still extrathoracic collapse during inspiration; a study of the anatomy of the airway points to the pharynx as the most likely location of such a collapse.

We propose to measure the pharyngeal wall movement using fluoroscopy of 1) normal cats under sedation in both their normal, unobstructed states, as well as during an applied partial nasal obstruction and 2) cats with a known upper airway obstruction.

This study will determine if DCP is a separate disease of clinical importance in cats, or simply an artifact of upper airway obstruction.

Awardee: Kristy Jacobus V'14

Mentor: Dr. Flo Tseng

Award Type: US Army

Research Project: Identification, Mean Intensity, and Clinical Significance of Parasites in Stranded Pinnipeds in Southern Brazil.

Summary: I intend to examine the respiratory and gastrointestinal parasites and their clinical manifestations in pinnipeds stranded along the coast of southern Brazil. The most common species in the region is the South American fur seal (*Arctocephalus australis*) but other species will be examined, if available. Other species of pinnipeds recorded in Brazil include the South American sea lion (*Otaria flavescens*), Subantarctic fur seal (*A. tropicalis*), Antarctic fur seal (*A. gazella*), Southern elephant seal (*Mirounga leonina*), Crabeater seal (*Lobodon carcinophaga*) and Leopard seal (*Hydrurga leptonyx*).

This research will be performed at Centro de Recuperação de Animais Marinhos (Center for the Recovery of Marine Animals [CRAM-FURG]) in Rio Grande do Sul State, Brazil. Parasites will be recovered from both dead animals found on the beach during beach patrols and live, stranded animals being treated at CRAM-FURG. The aim is to search for parasites in at least 10 animals, both live and dead.

Feces collected from live animals and gastrointestinal contents from dead animals will be examined microscopically to identify both respiratory and gastrointestinal parasites, including adults, larvae, and ova. In addition, respiratory secretions from live animals and lung tissue from dead animals will be examined in order to identify respiratory parasites. Parasites will be counted in order to determine intensity of infection. Clinical signs and hematologic values from live animals and gross lesions from dead animals will be noted in order to make inferences about clinical significance of parasites found.

Respiratory and gastrointestinal parasites can cause significant health problems in pinnipeds, especially that of stranded pinnipeds. However, thus far, very little is known about the parasites affecting

pinnipeds in Brazil. Knowledge of parasites in these species will help to achieve better insight into their health and improvement in treatment of stranded seals.

Awardee: Kelsey Johnson V'14

Mentor: Dr. Lois Wetmore

Award Type: NIH

Research Project: Characterization of Exons 2, 3, and 4 of the Equine *mu* Opioid Receptor 1 Gene.

Summary: Opioid drugs are powerful analgesics whose effect as minimum alveolar concentration-reducing (MAC-reducing) agents has been well-characterized in multiple species^{5,8,10,12,14}. However, inter-individual variability has shown opioids to *not* reduce MAC in horses, instead producing unwelcome side effects such as behavioral peculiarities and increased locomotor activity^{2,7,13,15}. In fact, the only consistency in the effects of opioid administration in horses is their *inconsistency*. As a result, the benefits of opioids as analgesics remain relatively inaccessible to equine patients.

The mu opioid receptor 1 (OPRM1) gene is highly conserved across species, from invertebrates to higher mammals³. Its sequence has been extensively studied in human medicine, revealing single nucleotide polymorphisms (SNPs) that carry functional consequences, such as reduced clinical responsiveness and reduced incidence of side effects in patients administered opioid drugs^{1,9,11}. SNPs also exist within domestic animal species populations^{3,16}, horses included, rendering the OPRM1 sequence ripe for identification of SNPs and correlation of those SNPs with clinical effects of equine opioid administration.

Of the four exons in the OPRM1 gene, only exon 1 has thus far been sequenced and analyzed. One of the four resulting SNPs, G57C, produces a non-synonymous mutation; strangely, unlike its three SNP counterparts, a G57C homozygote has not yet been found. Association between SNPs and with MAC and locomotor phenotypes¹⁶ has yet to be determined. We postulate that additional SNPs in the opioid receptor gene may well hold the key to the wide individual variability in response to opioids. Furthermore, we postulate that the G57C SNP may represent a lethal mutation. To test these hypotheses, we will clone and sequence exons 2, 3, and 4 from genomic DNA of 60 horses; analyze these sequences for homology and presence of SNPs; and examine the entire OPRM1 gene's allelic frequency. In addition, we will continue to sample and sequence exon 1 from additional patient enrollment in search of a G57C homozygote. Our goals in the present study are to characterize the OPRM1 gene, support or refute the G57C SNP's putative lethal status, and correlate polymorphisms in the OPRM1 sequence with horses' responses to opioid administration.

Awardee: Stephanie Kozol V'15

Mentor: Dr. Emily McCobb

Award Type: US Army

Research Project: Anesthetic Management and Short-Term Survival After Splenectomy

Summary: Several studies have shown that when a dog presents with a splenic mass and hemoabdomen, the dog is likely to have a malignant and possible metastatic neoplasia and therefore a grave prognosis for survival. Clinicians commonly presume that a case that presents with characteristics of benign splenic lesions will have a good prognosis. Although this may be the case for a percentage of individuals, there are other individuals that are similarly presented yet do not survive to discharge and the overall short-term survival rate for dogs following splenectomy has not been reported. It is the goal of this overall study to determine the short-term survival rate for dogs undergoing splenectomy and to determine what peri-operative parameters are indicative of survival. Specifically, the student conducting this study will be evaluating peri-operative anaesthetic parameters, primarily intra-operative hypotension as a potential indicator of short-term patient survival. Four hundred and fifty records of patients that underwent splenectomy at the Foster Animal Hospital will be analyzed to retrieve clinical data from each individual. The short-term survival rate for dogs in this population will be determined. For this-subproject parameters representing peri-operative patient management will be analyzed to determine whether differences were correlated with the short-term survival. Results of this project could help clinicians better prepare owners of dogs with splenic masses about what to expect after surgery.

Awardee: Kendra LaFauci V'15

Mentor: Dr. Elizabeth Rozanski

Award Type: NIH

Research Project: Assessment of Pleural Pressure in Veterinary Medicine Using Pleural Manometry

Summary: The purpose of this experiment is to investigate whether or not pleural manometry can be used to evaluate the pleural pressure of canine and feline patients in an emergency and critical care setting. Pleural manometry has been previously performed in human medicine; however, its use in veterinary medicine has not been documented. Assuming this procedure can be duplicated in animals, we also hope to investigate how pressure changes relate to the volume of fluid removed as well as to

the ultimate resolution of respiratory distress. An electronic pleural manometer, comprised of a modified direct blood pressure transducer, will be used on canine, feline, and equine patients admitted to the emergency room to assess pleural pressure. Our intent is to measure the pressure at various intervals of volume removed (via thoracocentesis) and determine if there is a particular pressure at which dyspnea resolves or a correlation between pressure changes, volume removed, and certain conditions. Based on our findings we might be able to suggest the use of pleural manometry in determining the safety of a large volume thoracocentesis as well as a differential diagnosis of pleural effusion and/or trapped lung.

Awardee: Stephany Lewis V'15

Mentor: Dr. Flo Tseng

Award Type: US Army

Research Project: Efficacy of Tramadol as an Analgesic in Red-Tailed Hawkes

Summary: The proposed research is a behavioral study to determine the efficacy of tramadol as an analgesic in red-tailed hawks. The study will use a previously established method to quantitatively determine if tramadol affects the amount of perceived pain in red-tailed hawks with orthopedic injuries (by looking at the prevalence of pain-supressed behaviors).

The goal of this study is to determine whether or not tramadol can be used in this species an effective pain management tool.

Awardee: Nicole Mazzaschi V'14

Mentor: Dr. Robert Bridges

Award Type: NIH

Research Project: An Ethological Analysis of the Reproductive Behavior of the Dwarf Armadillo (*Zaedyus pichiy*)

Summary: The pichi (*Zaedyus pichi*) is a dwarf armadillo native to Argentina and Chile. Pichis are small, hairy armadillos that can be distinguished from other species by their small size (approximately 1 kg body weight), short ears, and sharply pointed marginal scutes. The pichi has rarely been studied in the

wild and more seldom in captivity, thus there is limited information available about their reproductive behavior and physiology.

Previous studies have suggested that pichis may be induced ovulators, although this has not been confirmed. Having induced ovulation would be advantageous for this solitary species because it would increase the chances successful breeding in case of an encounter between males and females – which, in turn, would increase the chances of long-term survival at low population densities.

This is the first time that the possibility of an armadillo having induced ovulation is being studied. This study will therefore lay the foundation for additional research not only on pichis, but also on other armadillos. Behavioral observations of free-ranging armadillos are extremely challenging and describing the reproductive behavior of pichis kept in a semi-captive environment is the first step that will be valuable during field studies. Additionally, it will provide important data to help improve future reproductive studies. Knowledge of the reproductive strategy of any species is essential for assessing its chances of long-term survival and for developing conservation strategies. The survival of a species is directly linked to its ability to reproduce, so it is necessary to know how and when it breeds in order to decide how to manage and save it from extinction

I will be analyzing reproductive behavior from videos of previously conducted semi- captive pichi matings. I will conduct on-site pichi matings at the Instituto de Medicina y Biología Experimental de Cuyo in Mendoza province, Argentina. I will collect blood samples from 4 captive females (1 female will be mated, 3 are controls) in the week before the experiment, as well as right before pairing a male and a female. Directly after the mating, I will obtain another blood sample from all females, as well as approximately 6 hours post-copulation, then 24, 48 and 72 hours post- copulation. If pichis are induced ovulators, there should be elevated LH levels in samples collected after mating, whereas the levels should be low before pairing and in non-mated females.

Awardee: Kristy Meadows V'14

Mentor: Dr. Elizabeth Byrnes

Award Type: NIH

Research Project: Relaxin-3 Production in Rats and its Effects on Stress Response and Cognitive Function

Summary: The past decade has seen some intriguing developments concerning the relaxin-3 neuropeptide. It's discovery, in 2002, led to a better understanding of the process through which this neuropeptide affects numerous aspects of brain function, including but not limited to stress response, appetite, spatial memory improvements and cognitive function (1). The purpose of this study is to determine if females, after pregnancy and the act of giving birth, show an increase in both relaxin-3

production and relaxin-3 receptors (RXFP1 and RXFP3), and how those increases, if discovered, affect both stress response and spatial memory in the test subjects.

Research in the relaxin-3 neuropeptide and its receptors has important possibilities as the neuropeptide itself, once thought to primarily effect gestation has increasingly been shown to have widespread effects on the brain and behavior. A more detailed understanding of relaxin-3 could potentially lead to treatments for various ailments such as insomnia, anxiety, depression and various cognitive defects.

Through the use of rats as an animal model, we propose to determine if pregnancy has any long-term effect on relaxin-3 and/or RXFP1 and RXFP3 receptors in the brain. Moreover, the current study will determine whether the effects of prior pregnancy on stress responding and/or spatial memory correlate with levels of relaxin-3. Previous research on relaxin-3 has suggested that results in the rat brain translate to other mammalian species. Thus, the current study will examine the long-term effect of pregnancy on neural relaxin-3 and its cognate receptors.

Awardee: Sarah Merriday V'14

Mentor: Dr. David Sherman and Dr. Joann Lindenmayer

Award Type: US Army

Research Project: Effects of Vaccinating Goat Herds against *Mycobacterium avium* Subspecies *paratuberculosis* (MAP) on Milk Production and Culling Rates.

Summary: Research Question: Does vaccination of commercial goat herds in France against *Mycobacterium avium* subspecies *paratuberculosis* limit the decrease in milk production and culling rates?

Specific Aim 1: To determine whether or not dairy goats that are vaccinated against MAP have greater milk production than unvaccinated dairy goats.

Specific Aim 2: To determine whether the culling rate in the vaccinated cohort is less than unvaccinated cohort.

Population: Four French goat herds with approximately 300 goats per herd were chosen for a field trial undertaken from 2006 until 2010. Data was collected from replacement does born in 2006 and 2007 totaling 544 goats. Within each herd, one half of the kids born in these two years were vaccinated with a killed *M. a. paratuberculosis* vaccine (GUDAIR™, CZ Veterinaria, Spain) and the other half was left unvaccinated.

Procedures: Monthly records on milk production and culling rate will be collected from individuals from the four herds from the years 2006 to 2011. Individuals will be separated into two cohorts based on their vaccination status. Statistical analyses will be performed to compare the vaccinated and unvaccinated cohorts. Outcomes that will be evaluated for significance are milk production and culling rates.

Relevance: Johne's disease causes significant economic losses in farmed ruminant species particularly in intensively managed dairy operations. From a public health perspective, there is a growing body of evidence suggesting a linked pathogenesis between MAP and Crohn's disease in humans.^{i,ii} A study in India, the highest milk producing country, found that "the rate of MAP detection in the stool samples of animal attendants was directly proportional to the duration of association with goat herds endemic for Johne's disease."ⁱⁱⁱ The financial burden of disease along with the potential causality of negative human health outcomes provides the rationale for more research on MAP prevalence and measures of control of disease. In France 11,483 professional farms with a total of 825,258 goats were registered in 2007.^{iv} Vaccination of sheep herds has been an accepted control strategy and has been implemented by a number of countries for goat herds. Research on MAP in goats and control programs for goat herds is limited. The purpose of this study is to examine some of the effects of instituting a vaccination control program in goat herds.

Awardee: Jillian Morlock V'14

Mentor: Dr. Claire Sharp

Award Type: US Army

Research Project: Isolation, Culture, and Potency Assessment of Mesenchymal Stem Cells From Bone Marrow of Cats

Summary: The purpose of this study is to establish techniques to isolate feline bone marrow derived mesenchymal stem cells (MSCs), expand them in culture, confirm their identify as MSCs, and produce concentrated MSC conditioned media (MSC-CM) with anti-inflammatory properties.

Use of stem cell therapy (SCT) has shown promise as a functional cure of musculoskeletal conditions in companion animals. However, thus far, only the regenerative capacity of SCT has been exploited in veterinary medicine. While bone marrow-derived mesenchymal stem cells were originally touted in human medicine for their regenerative properties, their greatest therapeutic promise is now known to relate to their anti-inflammatory and tissue repairing properties. The paracrine effects of MSCs, materialized in the form of MSC-CM, also confers these immunomodulatory properties without the need for cell transplantation. Based on the work done thus far in rodent models and human clinical trials, it appears that delivering allogeneic MSC-CM has the potential to provide broad spectrum coverage to sick cats with inflammatory, infectious and immune mediated diseases associated with high

mortality, revolutionizing the way we treat these diseases, and conferring significant survival benefit. The first step prior to evaluation of the therapeutic role of MSCs and MSC-CM in cats is to successfully manufacture feline MSCs to scale and evaluate feline MSC-CM for its anti-inflammatory potency.

In this study, MSCs will be harvested from two healthy blood donor cats maintained at the Tufts Cummings School of Veterinary Medicine, with IACUC approval. The isolated MSCs will be plated on polystyrene tissue culture flasks and incubated to facilitate growth and maintenance of the culture at clinical scales. The phenotype of the cultured cells will be confirmed using flow cytometry and MSC-CM will be produced. Finally, the anti-inflammatory properties of the MSC-CM will be evaluated using a PMBC IL-10 potency assay.

Awardee: Shannon Moynahan V'15

Mentor: Dr. Mark Pokras

Award Type: US Army

Research Project: Drag Products by Leg Bands on Common Loons (*Gavia immer*): Is It Significant?

Summary: Through the dimensional study of the loon leg and construction of a computer model, I will measure the drag produced by the introduction of leg bands. Variables will include number of leg bands, angle of water flow and swimming speed. I hypothesize that the introduction of bands to the loon leg will significantly increase drag, increase the energetic costs of swimming, and potentially reduce survival of these birds.

Awardee: Yuki Nakayama V'14

Mentor: Dr. Claire Sharp

Award Type: US Army

Research Project: An Evaluation of Antibody Titers for Feline Herpesvirus-1 and Feline Calicivirus as Predictors for the Incidence and Severity of Upper Respiratory Tract Disease in Shelter Cats.

Summary: Specific Aims: The objective of this study is to evaluate whether or not antibody titers for feline herpesvirus-1 (FHV-1) and feline calicivirus (FCV) at the time of shelter admission may be a worthwhile tool for predicting the incidence and severity of upper respiratory tract disease (URTD) for cats in shelter settings. We also aim to determine if prior immunity to FHV-1 and FCV affects the

animal's ability to mount a quicker and more robust response to vaccination. The relative effectiveness of intranasal and injectable formulations of trivalent modified live vaccines will also be explored. Our last aim is to determine if there is any relationship between a cat's antibody titer to FHV-1 and the amount of FHV-1 shed by the cat.

Methods: We will enroll 100 cats at a local humane society into the study over the course of one month. Oropharyngeal swabs and serum will be collected on intake, as well as days 4, 7, and 14 post-vaccination. DNA will be extracted from the oropharyngeal swabs for real-time PCR analysis to quantitate the amount of FHV-1 shedding, and viral neutralization (VN) will be performed on the serum to determine the antibody titer for FHV-1 and FCV. Each cat will be randomly assigned to receive an intranasal or injectable trivalent vaccine on intake for FHV-1, FCV, and feline panleukopenia virus. All cats in the study will be monitored daily for one month following admission for clinical signs of URTD, and clinical scores will be tabulated for the severity of disease observed.

Significance: URTD is a treatable disease that commonly leads to euthanasia of otherwise healthy cats in shelters due to its highly contagious and difficult to manage nature. While numerous studies have been done on risk factors associated with the incidence of disease (e.g. prevalence of causative agents, vaccination protocols, and husbandry practices), the correlation between a cat's immune status at the time of presentation to the shelter and its ability to respond adequately to vaccination and/or its susceptibility to URTD have yet to be investigated. Confirmation of such correlation would be valuable in risk assessment and development of management schemes to reduce the incidence and severity of URTD in shelter cats.

Awardee: Scott Neabore V'15

Mentor: Dr. Charles Shoemaker and Dr. Greice Krautz-Peterson

Award Type: NIH

Research Project: Developmental Expression Analysis in Schistosomes of Potential Complement Regulatory Proteins with Homology to CD59

Summary: Schistosomiasis is a widespread and debilitating condition caused by schistosomes, a parasitic flatworm. These parasites can live for years in the blood vessels of their vertebrate host, including humans, without being detected by the immune system. Studies have suggested that proteins in the schistosome tegument (syncytial double membrane that covers the entire worm surface) are able to inhibit the complement system of its vertebrate host. A group of seven genes coding for schistosome tegument proteins are homologues of the human CD59 gene, a complement regulating protein that prevents cell lysis by inhibiting assembly of the pore-forming membrane attack complex (MAC) through interaction with the final complement components, C8 and C9. Our goal is to determine the time period,

post infection, when the parasite begins to express each of the SmCD59 complement regulatory proteins and whether the gene expression of each homologue increases during parasite development.

Specific Aims: The goal of my project is to determine the levels of expression for each of seven potential CD59-like complement-regulating proteins during the development of newly transformed *S. mansoni* and assess whether these genes become upregulated as the schistosomes mature. We hypothesize that some or all of the SmCD59 homologues participate in the protection of the schistosomes from host complement and that one or more of these genes will be turned on during the first seven days of infection.

Awardee: Katherine Patellos V'15

Mentor: Dr. Elizabeth Rozanski

Award Type: US Army

Research Project: A Novel Approach to Canine Laryngeal Paralysis

Summary: *Study Objectives:* To investigate alternative treatment options for canine laryngeal paralysis by evaluating the effect of arytenoid collagen injections on laryngeal resistance.

Hypotheses:

- 1) Oral injection of collagen will fix the laryngeal cartilages in an open position, and thus decrease laryngeal resistance.
- 2) Canine laryngeal specimens treated with arytenoid collagen injections will exhibit lower laryngeal resistance than untreated specimens and will have a similar improvement (decrease in resistance and increase in cross-sectional area) as larynxes treated with conventional arytenoid lateralization.

Experimental Design and Significance of Proposed Research:

Canine laryngeal paralysis (Lar Par) is a common acquired degenerative disease of aging large breed dogs. Surgical therapy is currently favored, but the treatment is considered palliative. This form of treatment may be risky for older dogs, and may be declined by clients due to the high costs and risk associated with general anesthesia and an invasive surgical procedure. A less invasive, non-surgical technique is ideal for affected dogs. Laryngeal injection of collagen has been used to improve function in humans with vocal cord paresis, and in dogs with urethral sphincter incompetence.^{1,2}

This experiment will investigate the effectiveness of arytenoid collagen injections as a treatment for canine laryngeal paralysis as compared to arytenoid lateralization. We expect that increasing the cross-sectional area of the rima glottis with collagen injections will lower resistance to inspiration.

Twelve larynxes will be collected from the donation program. The resistance across the larynx will be measured and a photograph will be taken to document the laryngeal lumen cross-sectional area. Six larynxes will undergo standard arytenoid lateralization by a board-certified small animal surgeon (Mike Kowaleski DVM, DACVS) and six larynxes will be treated with injection of collagen. Resistance measurement and cross-sectional area calculations will be repeated after the procedure. A paired *t*-test and ANOVA will be used to compare pre and post resistance and cross-sectional area to determine the effect of therapy.

Awardee: Brittany Pereira V'15

Mentor: Dr. Donna Akiyoshi and Dr. Alison Robbins

Award Type: Formula Funds

Research Project: Development of an Infective Hair Model for Testing Antifungal Drugs Against *Geomyces Destructans*

Summary: White Nose syndrome (WNS), a fungal disease caused by *Geomyces destructans* (*G. destructans*), is severely threatening the survival of many species of hibernating bats in North America. An estimated 1 million bats have already succumbed to this disease, for which there is no known treatment or prevention. *In vitro* studies have isolated antifungal drugs that possess activity against *G. destructans*; however, studies are still undergoing to discover an *in vivo* treatment of infection.

Experiments have shown that *Microsporum canis*, a causative agent of ringworm in dogs and cats, reacts differently to antifungals when in its laboratory culture form as opposed to its actual infective form on hairs. To study the efficacy of antifungal drugs in a manner that is more applicable to *in vivo* infections, a method has been developed that isolates the infective spores from the hairs and crusts of an infected animal. We wish to use a similar procedure to isolate *G. destructans* spores from the hairs and crusts of infected bats so that we can then test the efficacy of different combinations of antifungal drugs on the infective form of the organism. We will compare the results of this procedure to the results of parallel testing of the same antifungals in a traditional antifungal disk test on a lawn of pure *G. destructans*.

Awardee: Emily Picciotto V'15

Mentor: Dr. Gretchen Kaufman and Dr. I.P. Dhakal

Award Type: US Army

Research Project: Prevalence of Elephant Endotheliotropic Herpesvirus In Captive Breeding Asian Elephants (*Elephas maximus*) In Nepal

Summary: Elephant endotheliotropic herpesvirus (EEHV) is a growing threat to the health and viability of the Asian elephant population worldwide. The disease is characterized by sudden onset of lethargy, edema of the head, proboscis and limbs, oral ulcers, and internal hemorrhaging. If left untreated, the infection will result in death within one week of the onset of symptoms. There is currently no knowledge of the prevalence of EEHV in Nepal, a country within the natural range of wild Asian elephants. The objective of this project is to determine whether latent EEHV infections are present in the breeding herd at the elephant breeding center in Chitwan National Park, Nepal. Conjunctival swabs will be collected twice per week for 4 weeks from up to 30 female and juvenile elephants. Serial trunk wash samples will also be collected as possible from selected animals. Polymerase chain reaction (PCR) analysis will be performed to determine whether or not EEHV DNA is present in the samples. If EEHV DNA is detected, positive samples will undergo DNA sequencing to determine which strains of EEHV are present in the breeding herd.

Awardee: Eliza Reiss V'14

Mentor: Dr. Kristine Burgess

Award Type: US Army

Research Project: Incidence and Predictors of Hemangiosarcoma in Dogs with a Splenic Mass: 2008-2012

Summary: To retrospectively evaluate dogs who presented to the Foster Hospital for Small Animals with a splenic mass and clinical signs that could indicate hemangiosarcoma. All patients consented to tissue banking and had their splenic tissue submitted for histopathology upon splenectomy or necropsy. We hope to determine the incidence of splenic hemangiosarcoma in these patients, as well as other common splenic diseases that represent alternate diagnoses. Hemangiosarcoma is a progressive, rapidly metastasizing cancer and it carries a drastically different prognosis than benign splenic growth or soft tissue sarcomas that may present similarly. We are working to identify clinical findings that indicate or rule out a diagnosis of hemangiosarcoma in dogs with a splenic mass. We also hope to characterize the relative survival times of dogs receiving chemotherapy treatments or not after a diagnosis of hemangiosarcoma and subsequent splenectomy.

Awardee: Meagan Rock V'14

Mentor: Dr. Alicia Karas

Award Type: NIH

Research Project: Effect of Strain, Gender, and Housing Condition on the TIN Score in Normal Laboratory Mice

Summary: Minimizing and alleviating pain in laboratory animals without compromising the methodological integrity of a research project is important ethically, legally and scientifically.¹ Modalities for pain recognition and assessment in a laboratory setting, however, are largely based on uncritical, qualitative anthropomorphic assumptions. There is a significant need in the field of laboratory animal research for an objective, simple assessment tool for pain and distress evaluation of rodents – specifically laboratory mice. The Time to Integrate to Nest (TIN) Score is a nest behavior scoring system that measures a mouse's ability to engage in the normal behavior of nesting, assigns a yes or no value to their behavior, and provides laboratory personnel with an objective measure of mouse pain and distress.

This study seeks to expand on prior research related to TIN Scores by categorizing the effect of strain, gender and housing condition on the TIN Score in normal laboratory mice. To do so, we will observe and rate the TIN Score of normal mice of the six most common inbred and outbred strains. We will examine the frequency of positive TIN Scores and negative TIN Scores for each strain. We will also examine the effect of gender and housing condition on the TIN Score in each of these strains. The information gained in this study will provide a necessary baseline for the TIN Score in a wide variety of laboratory settings and, we predict, help validate its use as a meaningful and useful assessment tool for pain and distress in mice.

Awardee: Marieke Rosenbaum V'13

Mentor: Dr. Lisa Jones-Engel and Dr. Joe Zunt

Award Type: Morris Animal Foundation

Research Project: Genetic Variation of *Mycobacteria sp.* in Nonhuman Primates with Close Contact to Humans in Peru

Summary: The Peruvian Amazon is one of the richest regions for nonhuman primate (NHP) diversity in the world and supports at least 32 distinct species of New World primates, many of which are listed as threatened or endangered (Bennett et al. 2001; Hopkins and Nunn, 2007). Human population growth and economic development in Peru is increasing human-NHP interactions through habitat encroachment, hunting, wildlife trade, and through access to zoos/sanctuaries. Additionally, harboring

exotic pets in homes is common. As such, a rich human-NHP interface is abundant in Peru, and has not been systematically studied.

Tuberculosis is an infectious disease caused by subspecies of the *Mycobacterium tuberculosis* complex (*M. tuberculosis*, *M. africanum*, *M. bovis*, *M. canettii*, *M. microti*, and others, together known as the MTBC). The disease is globally distributed, infecting an estimated 2 billion humans and causing some 2 million deaths per year (WHO, 2009). The MTBC has been implicated as a cause of tuberculosis in several genera of captive and free-ranging NHP (Alfonso et al., 2004; Michel et al., 1998). These reports have led to a presumption that NHP are highly susceptible to mycobacterial infection and fatal disease (CDC, 1993; Wolfe et al., 1998). However, recent laboratory data indicate that the pathological manifestations of tuberculosis infection in NHP is much more diverse than previously understood (Gormus et al., 2004; Capuano, III et al., 2003; Flynn et al., 2003).

One of the major challenges in tuberculosis research, especially in NHP, is to accurately detect mycobacteria and diagnose infection. Historically, diagnosis of tuberculosis in NHP has relied on clinical examination, radiographs and intradermal tuberculin skin tests (TST), all of which have significant drawbacks (Lerche et al., 2008). Radiographs and TST are both logistically difficult to perform and unreliable for detecting infection (Lerche et al., 2008). Existing serologic assays based on the detection of MTBC-specific antibodies and measurement of cytokine levels have been shown to be suboptimal, with both false positive and false negative results (Vervenne et al., 2004). Increasingly, molecular methods employing polymerase chain reaction (PCR) have been suggested as a means to detect the presence of MTBC DNA in bronchoalveolar lavage, gastric aspirate and, for humans, sputum samples (American Thoracic Society, 2000). As early as 1995, PCR was used to detect *M. tuberculosis* in necropsied liver and lung tissues from a *M. fascicularis* monkey with a history of respiratory problems (Rock et al., 1995).

Diagnosis and detection of MTBC infection amongst NHP in nonlaboratory settings poses additional difficulties. Logistical barriers in field settings typically preclude the use of TST, blood collection, radiographs and physical exams. Molecular detection of MTBC using easily collected and stored biological samples holds promise for advancing our ability to detect and characterize the presence of MTBC in NHP populations.

In this pilot study we propose to further our understanding of MTBC found in New World monkeys (NWM) through the use of a non-invasive sample collection technique. Buccal samples will be collected and tested for the presence of *Mycobacteria sp.* using the Qral Swab PCR (OSP) assay developed by Dr. Jones-Engel's laboratory at the University of Washington's National Primate Research Center (WaNPRC). As MTBC is predominately a respiratory or gastrointestinal pathogen, we hypothesized that DNA from MTBC is present in the oral cavities of NHP and can be detected by amplification of the IS6110 repetitive nucleic acid sequence characteristic of the MTBC (Eisenach, 1994), a method that is currently being used to detect the presence of MTBC DNA in free-ranging macaques in Asia (Wilbur et al., in press).

In a country with a complicated history of endemic TB in human populations (Smith-Nonini, 2005), characterizing and documenting the prevalence of MTBC in NHP with close contact to humans is the first step towards understanding how this complex social interaction may affect the health of both species and will elucidate the role human-NHP interactions in Peru have on bidirectional tuberculosis disease transmission dynamics and NHP health and conservation status. Data generated in this pilot study will provide concrete evidence towards effectively concentrating further research efforts and resources on disease processes which may pose threats to either species (Leendertz et al., 2006).

Awardee: Sarah Sharp V'15

Mentor: Dr. Joyce Knoll and Dr. Michael Moore

Award Type: US Army

Research Project: Hematological and Serum Chemistry Profiles as Prognostic Indicators in Stranded Common Dolphins, *Delphinis delphis*

Summary: The paucity of published blood values for common dolphins disadvantages veterinarians and responders when faced with disposition decisions regarding stranded individuals of this species. In addition, the only reference ranges available were established from captive dolphins, whose values differ from those of stranded dolphins due to the stress and minor injuries caused by the stranding event itself. Therefore, a great need exists for a more applicable set of hematological prognostic indicators for stranded common dolphins in order to improve their veterinary care. This summer research project aims to accomplish this through the examination of blood parameters in light of post-release survival data from stranded dolphins.

Existing blood profiles from a minimum of twelve stranded common dolphins released from Cape Cod, MA between 2010 and 2012 will be analyzed for correlations with either post-release survival or failure. Satellite-tagged dolphins with transmission durations of three weeks or greater will be considered successfully released. Satellite tagged and non-satellite tagged individuals that died, re-stranded after release and subsequently died or were euthanized will be considered failures. If significant differences are found in blood parameters of these two groups, the relative significance of each specific parameter will be examined and prioritized based on its likelihood to affect survivorship.

This work will be conducted off-campus at the International Fund for Animal Welfare (IFAW), based in Yarmouth Port, MA under the on-site veterinary supervision of Dr. Michael Moore (IFAW/WHOI) and on-campus guidance of Dr. Joyce Knoll (TCSVM). This research has the potential to improve the veterinary care and welfare provided to stranded dolphins on Cape Cod and elsewhere by establishing a set of much-needed prognostic indicators specific to these animals.

Awardee: Sarah Stephan V'14

Mentor: Dr. Jean Mukherjee

Award Type: US Army

Research Project: Identifying *Plasmodium* Genotypes Infecting Birds and Mosquitoes in the Galapagos Islands

Summary: The endemic bird population, within the Galapagos Islands, is currently under threat due to the recent introduction of malaria. Avian malaria is caused by *Plasmodium* sp. Maintenance of the avian *Plasmodium* life cycle requires mosquito vectors that serve as definitive hosts responsible for transmission and birds that are the intermediate hosts.

The discovery of avian malaria in the Galapagos is of grave concern following the rapid extinction of multiple bird species within Hawaii due to the introduction of *P. relictum* [1-3]. Currently, little is known about the specific mosquito vector and pathogenesis of *Plasmodium* sp. within the endemic bird population within the Galapagos Islands.

Our hypothesis is that endemic species of birds within the Galapagos Islands are infected with multiple *Plasmodium* sp. and that these *Plasmodium* sp. are being harbored by one or both of the non-native mosquito species (i.e. *Aedes aegypti*, *Culex quinquefasciatus*) present on the Islands.

Thus, we are interested in determining the prevalence of various *Plasmodium* sp. Within both endemic birds and the three mosquito species inhabiting the Galapagos Islands.

Identification of the specific *Plasmodium* sp. affecting the birds in the Galapagos along with the particular mosquito vector(s) is crucial for determining what measures might be useful for controlling/eliminating this threat to the endemic bird population.

Awardee: Joseph Sweeney V'15

Mentor: Dr. Suzanne Cunningham

Award Type: US Army

Research Project: Cardiomyopathy in the English Bulldog: A Retrospective Study Describing the Clinical Signs, Diagnostic Findings and Survival Statistics of English Bulldogs with Presumed Arrhythmogenic Right Ventricular Cardiomyopathy (1996-2011)

Summary: Background/Specific Aims: Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a degenerative familial myocardial disease that has been described in people, cats, and Boxer dogs. The disease is characterized by fibrofatty infiltration of the right ventricular myocardium, with or without concurrent left ventricular involvement. Individuals with this condition are at risk for fatal arrhythmias and this disease is a leading cause of sudden death in young athletes. Currently, the Boxer serves as the only definitive canine model for this disease. However, empirical observations and recent studies suggest that the related English bulldog breed may be affected by a cardiomyopathy very similar to ARVC of the Boxer. Limited electrophysiologic and echocardiographic characteristics of this disease have been described in a small number of bulldogs; however the clinical features, treatment, and survival of this disease have not been well-characterized. The goal of this study is to describe the presenting signs, clinical characteristics, treatment, and survival data of English bulldogs with presumed ARVC. The information obtained in this study will help broaden the clinical knowledge of the disease in canines and provide information about prognosis for English bulldogs diagnosed with ARVC.

Experimental Design: This will be a retrospective study of English bulldogs that were diagnosed with presumed ARVC by the attending clinician. Medical records will be reviewed and clinical and treatment information will be recorded. Owners will be contacted to gather information about survival time and cause of death.

Awardee: Elizabeth Topliff V'14

Mentor: Dr. David Sherman

Award Type: US Army

Research Project: Locally Available Classical Swine Fever Vaccines Provide Adequate and Sustainable Protection in Lao villages under Approved Conditions

Summary: Classical Swine Fever (CSF) or Hog Cholera is caused by a single serotype of Classical Swine Fever Virus (CSFV), and is the source of great economic loss to the swine industry worldwide (OIE, 2008). In Laos, CSF is an endemic disease posing a constant threat to the health of pig populations and the livelihood of farmers. A detriment to productivity, trade, and the lifespan of pigs, CSF has become a disease management priority to the Lao government (Conlan et al. 2008).

Previous research in association with this study was conducted for the Australian Centre for International Agricultural Research (ACIAR), investigating complications in CSF vaccination, diagnostic,

and biosecurity procedures within Laos. Through farmer interviews and market observations, it was determined that the combination of a sell-when-sick practice (a pig is sold before it dies and is worth less than alive) and a lack of quarantine and vaccination protocols were contributing to the spread of CSF (Conlan et al., 2008). Pig farmers are some of the poorest members of the Lao community, only considering disease intervention as a worthwhile investment if their production levels are drastically increased.

Objectives of this study will be to advocate and implement improvements to the cold chain handling and field use of locally available CSF vaccines in Lao villages. Diagnostic assessment of seroconversion (humoral immune response) post vaccination will also be done in order to practically adopt effective vaccination protocols into the smallholder pig systems of Laos. The ultimate goal is to realistically reduce the potential risk of CSF infection in project pilot villages and improve productivity in order to encourage farmer participation in sustainable control efforts. This will be done by incorporation of the most thorough, yet cost-efficient vaccination and diagnostic protocols in combination with specially tailored biosecurity measures in this provincial farming environment.

Awardee: Emerson Tuttle V'14

Mentor: Dr. David Sherman and Dr. Andrew Catley

Award Type: US Army

Research Project: Decision Making for Effective Response to Foot and Mouth Disease Outbreaks in Ethiopia

Summary: Outbreaks of foot-and-mouth disease (FMD) have the potential to devastate livestock industries both locally and on an international level. This disease presents as a persistent concern for owners of livestock in countries such as Ethiopia where the virus is endemic, but also poses a bioterrorism or import risk to countries with industrialized livestock production systems, such as the U.S. In turn, the international community acquires a benefit from control and eradication efforts of FMD. A current and predominating policy position supported by the World Organisation for Animal Health (OIE) and the Food and Agriculture Organization (FAO) views trade from countries with endemic FMD as an inherent import risk, with eradication being the primary means to access international markets. However, opposing perspective views eradication in endemic regions in Africa as near impossible due to complexities of FMD epidemiology and the immense cost of widespread vaccination programs, and thus seeks for alternative approaches to control the disease. This study will examine the realities of these differing policy positions, employing perspectives from a country with endemic FMD. The goals of this

study are to 1) review the current status of FMD in Ethiopia in relation to recent trends in livestock and meat exports, and 2) to review viable control options for the disease in Ethiopia. Review of the literature, government surveillance program data, and OIE reports over the last twenty years will be employed to collect epidemiological data regarding FMD prevalence, distribution, and livestock mortality in the main livestock export areas of Ethiopia. Export information will be obtained from review of policy documents from the Ethiopian Ministry of Agriculture and Ministry of Trade. In addition, market-access scenarios and technical control options for FMD will be assessed based on interviews with up to 15 key informants representing government officials, the Ethiopian Veterinary Association, and livestock trade associations. These interviews will evaluate the informant's perception of benefits and risks of different market-access scenarios as well as the capacity of veterinary services in Ethiopia to control FMD, and will be scored using a simple method to compare perceptions amongst individuals. Recommendations for policy revision will be made with both short-term and long-term control efforts in mind, which will be of use both to the Ethiopian government as well as external actors who wish to support FMD trade-related programs.

Awardee: Alyssa Wheat V'15

Mentor: Dr. Barbara Davis

Award Type: NIH

Research Project: Effects of Bisphenol-A as an Endocrine Disruptor of the Reproductive Tract of Sprague Dawley Rats

Summary: Overall Goal: The major goal of my research will be to determine the histopathological effects of bisphenol-A (BPA) as an endocrine disruptor of the female Sprague-Dawley rat reproductive system. The hypothesis is that exposure to human-relevant doses of BPA to Sprague-Dawley rats during gestational development causes asynchrony in the adult female reproductive tract that will manifest as histopathological alterations in the ovary, vagina, uterus, and cervix via BPA action as an endocrine disruptor. Equally as important, this research will allow me an opportunity to learn how to cut, process, and stain histological samples and learn how to interpret them with the help of the pathologist (Dr. Barbara Davis).

Importance: BPA is a ubiquitous compound used to make plastics such as baby bottles, soda cans, and reusable water bottles and food containers.⁶ Over six billion pounds of the compound are produced worldwide annually, and it has a tendency to leech out of the products in which it is used.⁶ In a 2003/2004 study, 92.6% of a sample of 2500 Americans had BPA in urine samples.¹ This statistic is of concern because as of yet, long term toxicity effects of the plasticizer have yet to be determined. In addition to its ubiquitous use, BPA is a synthetic estrogen, and thus may have toxicity and potential carcinogenicity similar to other synthetic estrogens such as diethylstilbestrol (DES). Until now, few

studies have been conducted to determine effects of BPA exposure during developmental windows of susceptibility in animal models of human disease.

Methods: Sprague-Dawley rats have been exposed to varying doses of BPA during their development, lactation, and into adulthood. Samples from the ovary, vagina, uterus, cervix, and pituitary have been collected from control and exposed rats at multiple time-points, and will be prepared and observed for deviations from normal reproductive histology. A lexicon and grading scheme will be used to evaluate each sample of each tissue type. Tissue effects will be analyzed by Fisher's exact test for pairwise comparisons and the Cochran-Armitage test for dose-response trends.

Expected Results: Regardless of the outcome of this research, findings will be significant. If reproductive tissues are normal, BPA could be a potentially safe compound. If reproductive tissues are abnormal, as predicted, this research will provide further evidence that BPA is in fact detrimental to developing fetuses and should be seriously considered for removal from worldwide manufacturing.