

B1 – Beachler

Project Title: Comparison of freezing methods for equine spermatozoa

Principal Investigator(s): Theresa Beachler

Collaborating Investigator(s): Derek Kraayenbrink, Tyler Dohlman, Caitlin Wiley, and Eleas Wu

Would the proposed project be in-person or virtual? In-person

Veterinary Scholar Focused Abstract: (300 words or less):

Over the last sixty years, cryopreservation of spermatozoa has continued to evolve, in an attempt to obtain the best results and conception rates, with the exploration of different extenders, holding receptacles (straws vs. pellets), along with freezing protocols in many of our domestic species, including bulls, small ruminants, small animals, and horses. The purpose of this project is to compare two cryopreservation protocols for freezing stallion semen based on post-thaw evaluation parameters, including total, progressive, and hyperactive motility, morphology, and viability. Specifically, a controlled slow-rate cooling method will be compared to that of standard freezing techniques for horses on liquid nitrogen vapor. Routine light microscopy will be utilized to evaluate subjective motility and morphology parameters. Motility parameters will also be evaluated objectively utilizing a computer assisted sperm analysis (CASA) program, while viability will be assessed using both an automated cell counter (Nucleocounter-SP) and HOST testing to evaluate spermatozoal membrane integrity. Through participation in this project, students will gain experience in routine semen collection and the routine assessment of ejaculates from many domestic species commonly evaluated in veterinary medicine.

B2 – Cassmann

Project Title: Comparison of freezing methods for equine spermatozoa

Principal Investigator(s): Eric Cassmann

Collaborating Investigator(s): M. Heather West Greenlee and Justin J. Greenlee

Would the proposed project be in-person or virtual? In-person

Veterinary Scholar Focused Abstract: (300 words or less): Transmissible spongiform encephalopathies (TSEs) are fatal neurodegenerative diseases associated with an accumulation of misfolded prion protein (PrP^{Sc}). Normally folded cellular prion protein (PrP^C) is expressed in mammalian cells and is involved in maintenance of cellular iron homeostasis, and prion disorders are associated with iron dyshomeostasis. Ferroptosis is a non-apoptotic and non-oxidative damage related form of regulated cell death implicated in several neurodegenerative diseases including Alzheimer's and Parkinson's disease. The role of ferroptosis in neurodegeneration has been highlighted as an interventional pathway to potentially abate the severity of neurodegenerative diseases. The aim of this study is to determine if protein hallmarks of ferroptosis other than iron dyshomeostasis are present in brain tissues of animals with prion disease.

B3 – Dersheid

Project Title: Improving Mycoplasma hyopneumoniae Diagnostic Immunohistochemistry Assay

Principal Investigator(s): Rachel Derscheid

Collaborating Investigator(s): Jennifer Groeltz Thrush, Pablo Piñeyro

Would the proposed project be in-person or virtual?

In-person

Veterinary Scholar Focused Abstract: (300 words or less):

Mycoplasma hyopneumoniae (MHP) is the cause of enzootic pneumonia in swine and a contributor to Porcine Respiratory Disease Complex. It continues to be an economic burden as well as a diagnostic challenge, due to its inherent growth properties and pathogenesis within individual pigs as well as within swine herds. The veterinary diagnostic laboratory currently has a protocol for MHP immunohistochemistry (IHC), but it has very low sensitivity in routine diagnostic specimens. We have access to a number of hybridomas, some of which have been screened, and would like to find an antibody or antibody cocktail with higher sensitivity for our routine diagnostic cases. This project would entail the student reviewing previous screening data and selecting likely candidates. This would be followed by testing these candidates for sensitivity and specificity, using current protocol or adapting the current protocol. Additionally, our histology laboratory has seen some decrease in sensitivity over time of MHP IHC and hypothesizes this is due to the effect or combination of effects of extended formalin fixation, age of cut slide, or age/storage of block. We have a number of formalin-fixed samples transferred to ethanol to test effect of fixation time. Student would gain understanding of antibody production, laboratory skills in protein assays, reading immunohistochemical and hematoxylin and eosin stains on porcine lung, and statistical analysis of sensitivity and specificity. Results could potentially be presented at the annual meeting of American Association of Veterinary Laboratory Diagnosticians and/or American College of Veterinary Pathologists. Impact of project would be immediate, with the laboratory using the developed assay as standard operating procedure.

B4 – Dewell

Project Title: Intensive assessment of animal welfare and outcome of hospital and chronic feedlot cattle

Principal Investigator(s): Grant Dewell

Collaborating Investigator(s): Suzanne Millman, Renee Dewell

Would the proposed project be in-person or virtual? In-person

Veterinary Scholar Focused Abstract: (300 words or less): This study aims to provide feedlot producers and veterinarians with evidence to inform husbandry protocols and to better determine the appropriate clinical decision for cattle in chronic pens. One unexplored area, particularly for beef cattle, is the care of compromised and non-performing (chronic) cattle in feedyards. Newly arrived calves may experience challenges associated with changes in diet, disease exposure, mixing with new cattle and finding resources in unfamiliar environments. The overarching goal of this project is to investigate animal welfare, economic, and production outcomes of calves that are pulled from feedlot pens into chronic pens. At the conclusion of this project we expect to 1) characterize demographics of typical chronic pens, 2) determine animal-based outcomes associated with primary diagnosis and 3) develop decision aids to improve animal-based outcomes regarding treatment and euthanasia.

The summer scholar student working on this project will primarily assist in data collection from feedyards, on farm welfare assessments, data management, and contribute to scholarly works through literature review and technical writing. Candidate should be familiar with beef cattle and interested in animal welfare/behavior. Travel to feedyards may be necessary, including early morning departure and late returns. In addition to participating with this project the student is expected to assist research group with other relevant research projects.

B5 – Fasina

Project Title: Parvovirus RNA processing and epitranscriptome

Principal Investigator(s): Olufemi Fasina

Collaborating Investigator(s):

Would the proposed project be in-person or virtual: In-person

Veterinary Scholar Focused Abstract: (300 words or less): Posttranscriptional mRNA regulation is a critical cellular homeostatic node often hijacked by viruses for a productive life cycle and currently utilized for the design and development of two severe acute respiratory coronavirus 2 (SARS-CoV2) vaccines. Parvoviruses are linear single-stranded DNA viruses that infect animals and humans and represent an excellent tractable model for understanding virus-host cell interactions, and they are currently utilized for gene therapy and oncolytic virotherapy. Alternative RNA processing strategies including, alternative splicing and alternative polyadenylation, are modulated by parvoviruses to generate a diverse proteome, including the capsid protein, which determines the tissue specificity for gene therapy applications. We recently reported and characterized the first parvovirus non-structural protein, NP1, that modulates alternative splicing and alternative polyadenylation for efficient capsid production. This proposal will test and explore the hypothesis that a linear single-stranded DNA virus, bocaparvovirus minute virus canine (MVC) infection, modulates viral and potentially cellular RNA methylation for a productive viral life cycle in an NP1-dependent manner. RNA methylation and the epitranscriptome is a recently characterized posttranscriptional modification that regulates viral pathogenesis, cellular differentiation and transformation, and neurodegeneration. Results from this project will elucidate the interaction of the epitranscriptome with the parvovirus life cycle, generate and provide new insights and methods to enhance parvoviral capsid production with significant impact on parvovirus; adeno-associated virus (AAV), and human bocaparvovirus gene therapy, potential oncolytic virotherapy applications, and viral pathogenesis.

B6 – Jergens

Project Title: Effect of synbiotic/IgY supplement on the mucosal microbiota in dogs with inflammatory bowel disease

Principal Investigator(s): Albert Jergens

Collaborating Investigator(s): Curtis Mosher, Michael J. Wannemuehler, Dipak Sahoo

Would the proposed project be in-person or virtual? In person (masks required)

Veterinary Scholar Focused Abstract: (300 words or less):

Background

As alterations in the microbiome (dysbiosis) are associated with mucosal inflammation in dogs with inflammatory bowel disease (IBD), treatments that attempt to normalize bacterial composition and function while reducing mucosal inflammation have been utilized. A synbiotic is a product that contains a prebiotic and probiotic that may have synergistic effects in aiding recovery of dysbiosis and reducing intestinal inflammation in dogs with IBD. There are few clinical studies evaluating the use of synbiotic therapy in canine IBD.

Aim

To investigate the effects of adjunctive synbiotic/IgY treatment on the composition and spatial organization of mucosal microbiota in dogs with IBD.

Methods

Twenty IBD dogs were randomly assigned to the synbiotic/IgY (n=10) and placebo (n=10) groups. Tissue sections from endoscopic biopsies of the duodenum, ileum, and colon from dogs with active IBD will be studied by fluorescence in situ hybridization (FISH) on a quantifiable basis. Mucosal bacteria will be associated to clinical indices, histopathological lesions, and biomarkers of intestinal inflammation.

Student tasks

The summer scholar will perform FISH studies using the research lab of Drs. Wannemuehler and Jergens. This will include tissue hybridization, image capture, generation of 3-color FISH files for bacterial localization, and bacterial quantification using computer software. Results will be correlated to clinical disease activity indices.

B7 – Kopper

Project Title: Effect of Passage on Equine Intestinal Epithelial Cell Culture

Principal Investigator(s): Jamie Kopper

Collaborating Investigator(s):

Would the proposed project be in-person or virtual? In person

Veterinary Scholar Focused Abstract: (300 words or less): Gastrointestinal (GI) disease is the leading cause of equine mortality. Mortality is due to damage to the inner epithelial lining of the colon, resulting in increased permeability (“leakiness”) of the GI tract leading to laminitis, sepsis, endotoxemia and multiple organ dysfunction syndrome (MODS). Few new advances have been made to improve treatment of equine GI disease. This is mostly due to our inability to study the equine specific intestinal epithelium outside of the horse. Last year, our lab developed and characterized 3D (organoid) and 2D (monolayer) cell culture for the equine gastrointestinal tract which is a substantial advancement in the study of equine intestinal diseases. The objective of this study is to determine the effect of passage (subculture) on structure, composition and function of 3D equine colon organoids (colonoids) and 2D equine colon monolayer cell culture. To reliably use these models for equine intestinal research it is imperative that we are performing experiments using 3D and 2D cell culture of comparable composition, structure and function. We hypothesize that equine colonoids and colon epithelial monolayers will retain their physiologically relevant structure, composition, and function for four passages. Equine colonoids and confluent colon epithelial monolayers will be passaged. For each passage (P0-P4) the structure (assessed by hematoxylin and eosin stain and transmission electron microscopy), cell type composition (assessed by RT-PCR and RNA- in situ hybridization) and monolayer function (assessed by transepithelial resistance and flux) will be assessed and compared. We expect that the structure, composition and monolayer function will remain consistent for four passages. This study will strengthen the use of equine colonoids and colon epithelial monolayer cell culture for multiple passages which will allow us to reliably use this cell culture system for external grant funding and to advance treatments for equine intestinal disease

B8 – Kraus

Project Title: Evaluation of novel renal biomarkers as predictors of post-anesthetic acute kidney injury associated with intra-operative hypotension in healthy dogs and cats.

Principal Investigator(s): Bonnie L. Hay Kraus, DVM, DACVS, DACVAA

Collaborating Investigator(s):

Karin Allenspach, DVM, Ph.D, DECVIM

Emily Wheeler, DVM, DACVAA

Joyce Carnevale, DVM, DABVP (Canine/Feline)

Laura R. Van Vertloo, DVM, MS, DACVIM

Tamara Swor, DVM, DACVS-LA, DAVECC

Would the proposed project be in-person or virtual? In person.

Veterinary Scholar Focused Abstract: (300 words or less):

Human patients have an increased risk of developing post-anesthetic acute kidney injury (AKI) when intra-operative mean arterial blood pressure is less than 55mmHg for as little as 10 minutes and less than 60mmHg for 11-20 minutes. Patients that develop post-operative AKI have a significantly higher 30 day mortality and higher risk of developing chronic renal disease in the long term. (Walsh 2013, Sun 2015, Tang 2019) However, there is limited information regarding the association between general anesthesia and acute kidney injury in veterinary patients. (Rogers-Smith 2020) The objectives of this study are to measure renal biomarkers pre and post-operatively and to correlate them with the severity and duration of intra-operative hypotension (IOH) in healthy dogs and cats anesthetized for the Iowa State University College of Veterinary Medicine VM3 teaching laboratory. The biomarkers evaluated include: blood symmetric dimethylarginine (SDMA), creatinine, cystatin C (CysC) and neutrophil-gelatinase-associated lipocalin (NGAL) and urine specific gravity and urine protein:creatinine ratio. Identifying and understanding anesthetic risk factors such as IOH that contribute to post-operative AKI and the magnitude and duration of IOH that is associated with harm could improve perioperative care by guiding intervention and potentially decreasing morbidity/mortality. We hypothesize that one or more of the measured renal biomarkers will provide early recognition of renal injury and increasing severity and duration of IOH is associated with higher risk of AKI.

The successful summer scholar student will analyze blood and urine samples collected during the Spring 2022 semester and collate anesthetic record data.

B9 – Kubai

Project Title: Canine ophthalmic investigations to help guide clinical applications.

Prospective study #1: Determining the pharmacokinetics of Convenia within the tear film of dogs.

Retrospective study #2: Determining common ophthalmic disorders between brachycephalic and non-brachycephalic canine population that presented to ISU from 2012-2022.

Principal Investigator(s): Dr. Melissa Kubai

Collaborating Investigator(s): Drs. Lionel Sebbag and Rachel Allbaugh

Would the proposed project be in-person or virtual? In Person

Veterinary Scholar Focused Abstract: (300 words or less):

Prospective study #1: Infectious keratitis is a common ocular disease process that affects a majority of our ophthalmic patients. Client compliance can be an issue that reduces the ability to effectively treat our patients' infectious keratitis due to numerous topical ocular medications that owners find challenging to administer. Finding alternative non-topical medications that can effectively get into the tear film of our canine patients may aid in alleviating the compliance issues with topical medications, along with providing alternative non-topical therapeutics to treat infectious keratitis. Convenia, a common long-acting antibiotic has a relatively broad antimicrobial spectrum, which could be beneficial if concentrations reach and maintain high enough levels in the tear film. This study will investigate the concentrations of Convenia in the tear film at different time points for two weeks post antibiotic injection in 6 research colony dogs. We will also compare tear film concentrations to serum concentrations of the antibiotic within our sample population.

Retrospective study #2: Determining the common ophthalmic disorders between brachycephalic and non-brachycephalic canines in our clinical patient population. This study will evaluate common ophthalmic diseases that we see in our canine population at ISU and determine if there are differences in the ocular diseases between our brachycephalic and non-brachycephalic canine population. This study is important to provide information to best educate our ophthalmic colleagues, referring veterinary population and clientele as to common disease occurrences in various breeds.

B10 – Li/Clavijo

Project Title: Broadening participation of first-year undergraduate and DVM students at Iowa State University in sequencing data analysis

Principal Investigator(s): Ganwu Li and Maria Clavijo

Collaborating Investigator(s):

Would the proposed project be in-person or virtual?

In-person

Veterinary Scholar Focused Abstract: (300 words or less):

This BCP plan is funded by phase II NSF project “Data-Driven Disease Prevention and Control in Animal Health “. To broaden participation of first-year undergraduate and DVM students at Iowa State University in research, PIs (Drs. Li and Clavijo) will work closely with First-Year Mentor Program, an interdisciplinary program at Iowa State, to recruit first-year undergraduate students, particular those female and under-represented minority students. In addition, PIs will also work with DVM Summer Research program in the College of Veterinary Medicine to recruit first-year DVM students. As mentioned before, a high percentage of DVM students are female. In Past three years, Dr. Li has supervised three first-year undergraduate students. Among them, all are female and one is under-represented minority student. In addition, Dr. Li also supervised four female DVM student.

Target and Strategies: The goal of this effort is to train first-year undergraduate and DVM students, particularly female and under-represented minority students, for the basic knowledge and skills in sequencing data analysis (bioinformatics analysis). Each student will be assigned a small project such as assembling bacterial or viral genomes, identifying bacterial virulence and/or antibiotic resistance genes; performing phylogenetic analysis, determining genome site mutations, insertions and deletions, and analyzing recombination. A tutor will guide them throughout the project. The students will work for the project 3-6 hours every week for a semester (First-year undergraduate students work in the spring semester and the DVM students work in the summer semester). At the end of the semester, the students must prepare a poster to present their results and write a report.

B11 – Loy

Project Title: Application of Fourier Transformed Infrared Spectroscopy (FTIR) and machine learning classifiers for typing of veterinary associated strains of *Salmonella* spp.

Principal Investigator(s): Dustin Loy, DVM, PhD, DACVM

Collaborating Investigator(s): Rodney Moxley, DVM, PhD DACVM

Would the proposed project be in-person or virtual? In person (UNL)

Veterinary Scholar Focused Abstract: (300 words or less):

Salmonella spp. are associated with a broad range of infections in numerous veterinary species and are a significant cause of foodborne illness in humans. There is significant variation in the disease causing potential across different groups, serotypes and strains of animal associated *Salmonella*. Additionally, the emergence of multi-drug resistant (MDR) strains of *Salmonella* has caused significant concern due to the zoonotic potential for these infections. Current typing methods of *Salmonella* include serotyping, which requires use of anti-sera which is time consuming and/or whole genome sequencing, which is cost prohibitive. Fourier transformed infrared spectroscopy (FT-IR) is an emerging tool in clinical microbiology that allows for rapid and cost effective generation of spectroscopic fingerprints that vary based upon the composition of bacterial cell wall and outer membrane. This technology has been applied for microbial identification at the sub-species level. Machine learning algorithms can be applied to generate reproducible models that allow for classification of unknown strains or genotypes of *Salmonella* from microbial FTIR fingerprints. This project would develop machine learning based classifier tools to enable rapid identification of *Salmonella* serogroups associated with disease causing strains, with an emphasis in pathogenic strains isolated from poultry and cattle. Additionally, classifier tools that distinguish serotypes of interest, such as *Salmonella* Typhimurium and or/genotypes of interest such as the presence of antimicrobial resistance genes can be pursued. The outcome of this project would be classifier tools that rapidly predict strains and serogroups of *Salmonella* in a cost effective manner. This would allow for enhanced diagnostics and surveillance programs to be used in veterinary labs, food safety programs, and by livestock industries.

B12 – Olds

Project Title: Evaluation of antimicrobial resistance in captive Bonobo (*Pan paniscus*)

Principal Investigator(s): June Olds, DVM, DACZM

Collaborating Investigator(s):

Amanda Kreuder DVM, PhD, DACVIM (LAIM), Paul Plummer DVM, PhD, DACVIM (LAIM), DECSRHM

Would the proposed project be in-person or virtual? In-Person

Veterinary Scholar Focused Abstract: (300 words or less):

Bacterial isolates that are resistant to antibiotics (AMR) can be identified in all environments and can originate from multiple sources. AMR bacteria can colonize and be shed without evidence of clinical disease by all animals. The purpose of this project is to screen bonobos (*Pan paniscus*) housed at the Ape Cognition & Conservation Initiative (aka Ape Initiative or ACCI) in Des Moines, Iowa for antibiotic resistant bacteria that could impact the health and management of these animals and human caretakers. The results of this pilot study in ACCI bonobos may be used to support a multi-institutional investigation of AMR bacteria in bonobos in accredited AZA (Association of Zoo & Aquarium) facilities within the US.

Individual fecal samples will be collected from each bonobo. Because intermittent diarrheal episodes may be documented, both normal and abnormal appearing feces will be collected during the study period. In addition, samples of wildlife feces in animal areas, when available, will be tested. Outdoor water samples, fruits and vegetables fed to the animals may be sampled as well, especially during outbreaks of diarrhea. Samples will be cultured for extended spectrum beta-lactamase (ESBLs) bacteria, carbapenem resistant Enterobacteriaceae (CREs) and resistant *Campylobacter*. Isolates identified will be prepared for long-term storage and subjected to MALDI-TOF for bacterial identification. Results of the study will be published in presentations and a peer-reviewed journal.

B13 – Pieper 1

Project Title: Evaluating the effectiveness and accuracy of client obtained cytology for dermatology evaluation

Principal Investigator(s): Jason Pieper

Collaborating Investigator(s): Darren Berger

Would the proposed project be in-person or virtual? In-Person

Veterinary Scholar Focused Abstract: (300 words or less):

With the recent impact of COVID-19 in veterinary medicine, most practices have become inundated with extra clientele and are extremely busy. In addition, some clients have decided to avoid public exposure to COVID-19 due to personal health risks and are reluctant to bring their animals to a veterinarian. Veterinary specialists are also limited in their geographical areas which requires some clients to travel significant distances for specialty care. As a result, telemedicine is starting to increase in popularity and is being demanded by clients. One of the most important aspects of a veterinary dermatology appointment is to take cytology samples of the animals to be evaluated by the dermatologist. While veterinary dermatologists can look at the animal from a distance with a high-quality camera and live interaction with the client and animal, acquisition of clinical samples are still a large hurdle in the diagnostic process. We decided to evaluate the possibility of clients obtaining adequate cytology samples on their own animal after watching a tutorial on how to obtain the appropriate samples. We will then compare these findings with samples obtained by the trained personnel in veterinary dermatology statistically. The overall purpose of this study is to identify if client obtained samples are adequate in order to perform telemedicine for veterinary dermatology cases.

B14 – Pieper 2

Project Title: Evaluation and validation of a sampling method for aerobic bacterial culture and the comparison of two methods effect on bacterial recovery

Principal Investigator(s): Jason Pieper

Collaborating Investigator(s): Darren Berger, Amanda Kreuder

Would the proposed project be in-person or virtual? In-Person

Veterinary Scholar Focused Abstract: (300 words or less):

Superficial pyoderma can commonly be a mixed population of bacteria in varying quantitative amounts. Aerobic bacterial culture is the diagnostic method of choice to identify these organisms along with antibiotic susceptibility. A variety of techniques have been proposed for sampling clinical lesions of superficial pyoderma for this purpose. Acquiring a maximal number of bacteria for aerobic bacterial culture is ideal in order to have a better representation of the entire bacterial population present and increase the potential odds of identifying clinically relevant resistant bacteria which are increasing in occurrence. This study has three main objectives. The first is to validate a phosphate buffered collection method using cadaver skin and known bacterial population solution. The second is once standardized, to determine the expected variation from clinical cases with the same sampling method. The final objective is to identify if there is a difference in quantity of bacteria isolated from epidermal collarettes when sampling with a dry sterile culture swab versus a sterile saline soaked culture swab. The overall purpose of this study is to determine if there is a difference between sampling methods with the recoverability of bacterial organisms from epidermal collarettes in canine skin.

B15 – Wheeler

Project Title: A comparison of acepromazine and trazodone for the reduction of hospital associated stress in dogs evidenced by salivary cortisol, behavior, and heart rate variability

Principal Investigator(s): Emily Wheeler, DVM, DACVAA

Collaborating Investigator(s):

Bonnie Hay Kraus, DVM, DACVS, DACVAA

Dipak Kumar Sahoo, PhD

Jonathan Mochel, DVM, DVM, MSc, PhD

Would the proposed project be in-person or virtual? In Person

Veterinary Scholar Focused Abstract: (300 words or less):

It is well documented that veterinary patients experience stress in the veterinary hospital.^{1,2} Stress is a normal physiological response that can be protective, but when stress is exaggerated or prolonged, it can have deleterious effects which include but are not limited to immunosuppression, impaired wound healing, and gastrointestinal dysfunction.³ Therefore, it is important to patient health and welfare to identify and address stress. Cortisol is a glucocorticoid released from the adrenal cortex due to activation of the hypothalamic-pituitary-adrenal (HPA) axis as part of the stress response.⁴ Animals may also exhibit certain behaviors in response to a stressor, and sympathetic nervous system activation can cause an increase in heart rate and a decrease in heart rate variability.³ Acepromazine and trazodone are two medications commonly used to treat stress and anxiety in hospitalized dogs. However, previous studies have produced mixed results on the efficacy of these drugs for this purpose, so their utility for stress reduction is not completely clear.⁵⁻⁸ As well, a direct comparison of the efficacy of these drugs for stress reduction in hospitalized dogs has not been performed. The purpose of this study is to assess how administration of acepromazine or trazodone compared to a negative control affects stress level exhibited by dogs in a hospital environment. This study will evaluate client-owned dogs hospitalized for elective procedures. They will be assessed by video recording and subsequent behavior assessment, sampling of salivary cortisol, and a heart rate monitor before and after administration of either acepromazine, trazodone, or a placebo. We hypothesize that dogs that receive acepromazine or trazodone will show a decrease in salivary cortisol, a decrease in stress behaviors, and an increase in heart rate variability compared to control dogs and there will be no difference between the two treatment groups.