

B1 - Beachler

Project Title: Effect of age, season, and scrotal circumference on cryotolerance of small ruminant semen

Principal Investigator(s): Dr. Theresa Beachler

Collaborating Investigator(s): Derek Kraayenbrink, Dr. Tyler Dohlman

Abstract:

Cryopreserved or frozen semen continues to remain a dynamic industry, with its use increasing exponentially in many of our domestic species, including horses, dogs, cattle, and small ruminants. In small ruminants, the combined use of frozen semen and laparoscopic surgical insemination allows for the insemination of up to 50 to 100 females from a single ejaculate compared to that of a single ewe or doe during natural service. Seminal characteristics have been shown to change with age and season in a variety of species, including boars, horses, and small ruminants. The purpose of this study is to analyze the effects of age, time of year, scrotal circumference, and semen parameters on the efficacy and viability of ovine and caprine cryopreserved semen samples. A combination of retrospective analysis of ejaculates previously frozen at ISU and prospective evaluation of cases presented to the ISU Theriogenology Service will be performed. Students will gain experience with routine semen collection and the assessment of routine semen evaluation parameters, including concentration, subjective and objective CASA motility assessment, and morphology. Students will also gain experience with freezing techniques in various domestic species.

B2 - Derscheid

Project Title: Systemic colibacillosis in neonatal swine at the ISU VDL 2013-2022: Case incidence and virulence factors

Principal Investigator(s): Dr. Rachel Derscheid

Collaborating Investigator(s): Dr. Ganwu Li, Dr. Nubia Resende de Macedo

Abstract:

Systemic colibacillosis in neonatal swine at the ISU VDL 2013-2022: Case incidence and virulence factors

Escherichia coli is a common bacterium with pathogenic potential across many veterinary species. In swine, *E. coli* is most commonly associated with post-weaning enterotoxigenic colibacillosis. The bacterium remains within the intestine and colon, attaching to the surface of enterocytes and causing disease through toxin production. These toxins are relatively well-characterized with a commonly used genotyping polymerase chain reaction (PCR) test providing rapid diagnostics for clinical cases of diarrhea. In many species, *E. coli* can cause systemic bacterial disease in neonates. While pigs are no exception, this has become exceedingly rare in commercial systems in North America. Within the last few years, there is a perceived, slight increase in the number of cases of systemic colibacillosis in suckling pigs. Because of its ubiquitous nature as well as the potential to be a commensal and environmental contaminant, isolating *E. coli* from systemic sites is insufficient for a diagnosis.

This project has 2 primary components:

1. Utilize the ISU Veterinary Diagnostic Laboratory (VDL) Information Management System (LIMS) database to identify cases of swine systemic and enteric colibacillosis over the last 10 years
2. Perform NGS on a subset of *E. coli* isolates to identify potential virulence factors of systemic versus enteric versus non-pathogenic isolates.

Results would be of interest to swine veterinarians and diagnosticians and could potentially be utilized to develop diagnostic tools for analyzing *E. coli* isolates. Results could be submitted for potential presentation at the 2024 American Association of Swine Veterinarians meeting in Nashville, TN.

B3 - Kreuder

Project Title: Evaluation of normal and pathogenic flora of the upper and lower respiratory tract of goats

Principal Investigator(s): Dr. Amanda Kreuder

Collaborating Investigator(s): Dr. Ron Griffith

Abstract:

In this project, the summer scholar will participate in a large clinical trial related to antimicrobial use and antimicrobial resistance in goats and will be part of a team of 6-8 students responsible for completion of the animal portion of the study in association with several faculty and graduate students. As part of this larger clinical efficacy study for treatment of respiratory disease in goats, the summer scholar will be responsible for screening goats on arrival via nasopharyngeal swabs and in the lower respiratory tract at the time of necropsy for the presence of bacterial pathogens in the Pasteurellaceae family. Identified pathogens will have antimicrobial susceptibility testing performed to evaluate the carriage of antimicrobial resistance. Additional samples will be utilized for metagenomic analysis of the upper and lower respiratory flora as time and funding permits. The student will gain valuable experience directly working with goats to perform physical exams, diagnostic sampling, routine treatments and vaccinations, and necropsies as part of the large clinical efficacy study. Additional experience culturing diagnostic samples, performing antimicrobial susceptibility testing, and extracting DNA in a bacteriology lab will also be gained during this work.

B4 – Kubai 1

Project Title: Treatment of Fungal Keratitis in vitro using Ultraviolet-C (UV-C) light: A pilot study.

Principal Investigator(s): Dr. Melissa Kubai

Collaborating Investigator(s): Dr. Rachel Allbaugh

Abstract:

Infectious keratitis is a common ophthalmic condition affecting veterinary patients, leading to significant morbidity and loss of the eye if not treated aggressively. The initial antimicrobial therapy for infectious keratitis is selected empirically and further modified based on the results of corneal cytology and culture with susceptibility. Aggressive topical therapy often requires treatment with antimicrobials every 1-2 hours daily along with multiple other topical medications, placing a significant burden on the owner-pet relationship and poor compliance.

A pilot study investigating the effect of UV-C light at different treatment durations in vitro against our most common equine corneal fungal pathogens (*Aspergillus* and *Fusarium spp.*). Previous studies showed that treated areas with UV-C light, regardless of treatment duration, were effective at inhibiting bacterial growth in vitro using common canine microbes: *Staphylococcus pseudintermedius*, *Streptococcus canis*, and *Pseudomonas aeruginosa*.

Our first objective is to determine the minimal treatment dose in vitro that will inhibit fungal growth using UV-C light on culture plates and to determine optimal fungicidal activity. Based on results of this pilot study, we will determine the optimal distance between the treatment device and the cornea that will make the UV-C light device effective and feasible for future clinical use.

B5 - Kubai 2

Project Title: Evaluation of serum alpha2-macroglobulin concentration in bovine serum intended for ophthalmic use.

Principal Investigator(s): Dr. Melissa Kubai

Collaborating Investigator(s): Dr. Rachel Allbaugh

Abstract:

Determination of superior anti-collagenolytic topical therapy for inhibiting proteases and collagenases are essential to the successful treatment of infectious keratitis in dogs, cats, horses, and bovine. In this study we will be evaluating the level of an important modulator of corneal malacia (Serum α 2-macroglobulin) and determining the concentration of A2M using a species-specific ELISA for bovine and comparing these study results with previous reported levels of A2M in canines and equines.

B6 - Mavangira

Project Title: Influence of somatic cell counts on oxidant status during bovine mastitis

Principal Investigator(s): Dr. Vengai Mavangira

Collaborating Investigator(s): Dr. Patrick Gorden

Abstract:

Mastitis negatively impacts the dairy industry with costs estimated at greater than US\$2 billion annually. Factors contributing to the costs of production include decreased milk production due to mammary tissue damage, treatment costs, labor, and death or early removal of animals from the herd. Mammary tissue damage in cattle with clinical mastitis was shown to be a consequence of severe inflammation and excessive production of reactive oxygen metabolites (ROM). While the role in clinical mastitis is known, the degree of ROM production and contribution to decreased milk production in mastitis without clinical signs (subclinical, the most prevalent form of mastitis) is unknown. The objective of the summer study will be to investigate ROM production and its correlation with milk production in cows with subclinical mastitis. The approach will use milk samples collected for routine testing of somatic cell counts to identify and rank cows with mastitis. Production of ROM and bacterial cultures will be determined in the same milk samples. The correlation between short-term milk production (determined from the next test date) will be correlated to ROM production. The results from this study will provide preliminary information for optimizing ROM production to mitigate mammary tissue damage and loss of milk production. Overall, this study will contribute to decreasing the costs of production in the dairy industry.

B7 - Millman

Project Title: Does Social Buffering Enhance Animal Welfare And Performance When Beef Calves Are Commingled In Feedyard Environments?

Principal Investigator(s): Prof. Suzanne Millman

Collaborating Investigator(s): Dr. Grant Dewell, Dr. Renee Dewell, Dr. Anna Johnson, Dr. Derek Haley

Abstract:

This summer scholar position will contribute to aspects of our USDA-funded project, developed in collaboration with a commercial beef feedyard, with the goals of enhancing sustainability and minimizing ecological footprint in beef production. Commingling of calves from different sources presents biological and behavioral stressors, and is associated with increased risk for Bovine Respiratory Disease. Social buffering refers to the phenomenon of enhanced recovery from distress in the presence of a conspecific, with known neuroendocrine mechanism. In this proposal we explore whether preferential relationships among beef feeder cattle produces social buffering, with positive animal welfare, health and performance outcomes. Preferential relationships among calves will be identified using social network analysis. Impacts of social buffering on behavior, health and performance of comingled lightweight cattle on a commercial feedlot will be determined. Familiar heifer calves, sourced as groups from the same farm, will be followed through the feeding period, and health, performance and behavior outcomes compared to evaluate effects of social buffering in commercial conditions. Results from this project will provide needed guidance on commingling practices in U.S. beef operations.

B8 – Olds

Project Title: The relationship between social behavior and urinary cortisol of individual bonobos in human care

Principal Investigator(s): Dr. June Olds and Prof. Suzanne Millman

Collaborating Investigator(s): Jared Taglialatela, PhD, Director, Ape Cognition & Conservation Initiative, Des Moines, IA, and Associate Professor, Kennesaw State University.

Abstract:

In the wild, bonobos live within a fission-fusion society where an individual's social environment is characterized by frequent changes in group size and composition. For bonobos in human care, management strategies typically focus on regularly changing group structure in an attempt to mimic the dynamic social experiences of bonobos in natural settings. For social species, changes in social factors may cause increases or decreases in the stress experienced by individual animals – indeed, social partners can help mitigate the impact of environmental stressors, as well as serve as stressors themselves. This study seeks to evaluate the relationship between individual behavior, social factors, and urinary cortisol levels of bonobos in human care within an AZA certified facility. The findings of this study may help give direction for implementing management strategies to positively impact individual bonobo welfare.

In this study, the student will be actively involved in developing an ethogram, collecting behavioral data from bonobos in social contexts, and correlating individual behavioral data with urine cortisol levels. Specifically, the student will design and implement an ethogram and sampling method focused on capturing individual social behavior (e.g. grooming, playing, agonistic interactions) as well as behaviors that have been previously associated with physiologic stress (e.g. scratching and other self-directed behaviors). In addition, the student will assist Ape Initiative staff with the collection of urine samples that will be assayed for urinary cortisol. Data will be analyzed to test two hypotheses: 1) Individual social context (e.g. number of individuals in a social group, demographics of the social group) will impact urinary cortisol levels and 2) Urinary cortisol levels will be negatively correlated with pro-social behaviors (e.g. grooming and playing) and positively correlated with stress-related behaviors (e.g. scratching).

B9 – Patterson

Project Title: Construction of a Porcine Reproductive and Respiratory Syndrome Virus containing a stable reporter.

Principal Investigator(s): Dr. Abby Patterson

Collaborating Investigator(s):

Abstract:

Porcine reproductive and respiratory syndrome virus (PRRSV) is a positive sense, enveloped, single-stranded RNA virus belonging to Arteriviridae family. Disease in the host species (porcine) is characterized by reproductive failure in dams and respiratory disease in pigs of all ages. Due to the economic significance of the disease, acquired immunity through vaccination is an important tool in prevention and control of the disease. To develop effective vaccines, high-through-put and easy to perform in vitro assays to detect and quantify viral replication are desired. Recombinant viruses containing a reporter protein is one method to increase the ease and speed of in vitro assay development. Therefore, the goal of this project will be to construct a recombinant PRRSV which expresses a reporter protein. The student will be responsible for performing a literature review to identify a reporter protein and the most effective location for its expression. Once identified, the student will be responsible for construction, recovery, and characterization of the recombinant PRRSV.

B10 – Pieper

Project Title: Prevalence and Predisposition of Cutaneous Autoimmune and Immune-Mediated Diseases in dogs and cats in a Tertiary Hospital

Principal Investigator(s): Dr. Jason Pieper

Collaborating Investigator(s): Dr. Darren Berger

Abstract:

Skin and ear diseases are some of the most common reasons for dogs and cats to be presented to a veterinarian. While cutaneous autoimmune and immune-mediated diseases can have very characteristic clinical signs, they are commonly misdiagnosed. This is partially due to autoimmune and immune-mediated diseases being perceived as extremely rare. Additionally, the true prevalence of some of the more common autoimmune and immune-mediated diseases may be geographically variable due to regional genetic pools and breed preferences. The only studies previously performed evaluating the prevalence of autoimmune and immune-mediated diseases are almost 40 years old and specific to the northeastern portion of the United States. The goal of this project would be to investigate the prevalence of autoimmune and immune-mediated diseases in central United States over a 12-year period. The project will be a retrospective evaluation of the medical records from the Lloyd Veterinary Medical Center. A computer search of all the medical records for a newly diagnosed cutaneous autoimmune or immune-mediated disease will be performed. Additionally, further evaluation of those medical records will be performed to identify signalment, seasonality, etc. These results will be compared to the general population of animals presenting to the Lloyd Veterinary Medical Center to identify any increased risks or trends compared to the general hospital population. This project will help to better determine the true prevalence of cutaneous autoimmune and immune-mediated diseases in dogs and cats in the central United States.

B11 – Van Vertloo

Project Title: Effect of gabapentin on feline blood pressure measurement and stress level

Principal Investigator(s): Dr. Laura Van Vertloo

Collaborating Investigator(s): Dr. Emily Wheeler, Dr. Joyce Carnevale, Prof. Suzanne Millman

Abstract:

Measurement of blood pressure in the feline patient is an important part of a complete medical evaluation. High blood pressure is seen in several common conditions of the elderly cat such as chronic kidney disease and hyperthyroidism. Unfortunately, obtaining clinically meaningful and reliable blood pressure measurements from cats is hindered by the effects of stress. Gabapentin is commonly used in practice to reduce stress associated with veterinary visits in cats, making it easier for veterinary personnel to perform necessary handling and diagnostics. It has been shown in placebo-controlled trials to reduce stress scores in cats and does not appear to impact hemodynamic parameters, including blood pressure. For these reasons, pre-treatment with gabapentin may facilitate more accurate blood pressure measurement in feline patients, particularly those with higher levels of stress and anxiety.

This summer, we will be evaluating the effect of gabapentin on blood pressure outcomes and stress responses in healthy cats. We hypothesize that cats will have reduced stress scores when pre-treated with gabapentin, which will correlate with improved blood pressure outcomes. Our study will involve obtaining stress scores and indirect blood pressure measurements in healthy cats over two separate visits. During this project, the student will learn about feline clinical practice, animal behavior and animal welfare, and will gain clinical skills including obtaining blood pressure measurements and low stress handling of cats. The student will learn about experimental methods pertaining to animal behavior and welfare, experimental design, literature reviews, statistical analysis and scientific writing.

The ideal candidate has interest in feline medicine or animal behavior and welfare, has good communication and organization skills for recruiting and coordinating study participants, and skills for working independently and in a team. Students are encouraged to discuss their interest in this project with Drs. Van Vertloo, Carnevale, Wheeler, or Millman.

B12 - Withdrawn