Project Title: Field efficacy of oral chlortetracycline at three dosing levels in controlling ovine respiratory disease

Principle Investigator(s): Kelly Still Brooks

Collaborating Investigator(s): Paul Plummer

Abstract: (300 words or less): The overall goal of this project is to evaluate the clinical efficacy of oral chlortetracycline (CTC) at three dose levels for control of ovine respiratory disease compared to unmedicated negative controls (CON). The overall null hypothesis is that a 14 day course of oral CTC (80-500 mg/hd/day) will not decrease the incidence or severity of ovine respiratory disease in feeder lambs when natural challenged. The specific aims of this study are to evaluate the effect of CTC medicated feeds at three dose levels (80, 350, and 500 mg/hd/day) on lamb growth performance, incidence of clinical cases, and severity of pathologic lung lesions. 240 weaned feeder lambs will be enrolled in the study, blocked by sex, weight, and respiratory score, and randomly allocated to pen groups of 5 and assigned to one of four experimental treatments (CTC80, CTC350, CTC500, CON); the experimental unit is the pen and the observational unit is the lamb. Each treatment will be replicated 2-3 times per iteration, for up to 8 iterations. Outcome measures include average daily gain and feed conversion, core body temperature, clinical diagnosis of respiratory disease, lung score, and pulmonary culture & tetracycline sensitivity.
Project Title: *Ex-vivo* biomechanical comparison of 3.5 mm versus 4.5 mm cortical bone screw for fixation of sagittal fractures of the navicular bone in horses.

**Principal Investigators:**
Dr. Dane M. Tatarniuk, DVM, MS, DACVS-LA (VCS)
Dr. David G. Suarez-Fuentes, DVM (VCS)

**Collaborating Investigator:**
Dr. Karl H. Kraus, DVM, MS, DACVS (VCS)

**Abstract:**
Currently, there is minimal information in the literature regarding proper screw selection to repair navicular (distal sesamoid) bone fractures in horses surgically. Historically, surgical references describe the use of either a single 3.5 mm or 4.5 mm cortical screw placed in lag fashion to repair this specific fracture configuration\(^1\). Although inherently the 4.5mm cortical screw may seem preferable for overall strength based on the natural larger size of the screw, the 3.5mm cortical screw is advocated as having fewer complications with soft tissue interference during placement due to the smaller screw head diameter\(^1\). As such, biomechanical evaluation of the two screw sizes when placed in lag fashion across the navicular bone would be beneficial to determine if, and by what magnitude, the two screw sizes differ in strength. The objective of this study is to biomechanically describe and compare the 3.5 mm and 4.5 mm cortical screws in the fractured navicular bone using an *ex vivo* equine model.

Twelve (n=12) navicular bones will be harvested from the feet of healthy adult horses (n=3). Cadaver radiographs of navicular specimens will help rule in/out pre-existing navicular bone degeneration. Navicular bones will be equally and randomly assigned to either 3.5mm or 4.5mm cortical screw group. A midsagittal fracture of each navicular bone will be created uniformly using a band saw, at exactly the halfway point from the lateral to medial wing of the navicular bone. The navicular bone will be fixated in a custom-made radiolucent wooden clamp that will hold the two fractured portions in apposition along the dorsal and ventral surface. Then, a 3.5 mm or 4.5 mm cortical screw will be placed in routine lag fashion (glide hole, thread hole, measure, tap, screw with no countersinking performed) under the assistance of fluoroscopy. Consistent screw direction across the fracture plane will be confirmed using post-repair radiographs and measuring the angle of the screw relative to the flexor surface of the navicular bone. Screw placement time will be recorded and compared between the two groups. Repaired navicular bones will be biomechanically tested for ultimate compressive load applied at failure in a material-testing machine\(^a\). Mode of failure (screw or bone), if not clearly apparent, will be determined via post-failure radiographs.
Our central hypothesis is that the 4.5 mm screw will fail at a significantly higher compressive load compared to the 3.5 mm screws. Results of this study will provide veterinary surgeons extrapolated evidence-based reference for screw selection when fixating sagittal fractures of the navicular bone in horses.

Reference:


Footnote:

a. Electrodynamic Material Testing System 800LE3
Project Title: Understanding the development of epilepsy from rodent models

Principle Investigator(s): T. Thippeswamy, Professor, BMS, CVM

Collaborating Investigator(s): None

Abstract: (300 words or less): The main goal of the projects in my lab is to test whether preclinical neuroprotectants, when given soon after the symptomatic drugs following an acute exposure to a neurotoxin, for example kainic acid or oragnophosphates prevent delayed neurotoxicity and reduce mortality and morbidity. These neurotoxins induce seizures. Although seizures can be controlled in some individuals by using antiseizure drug such as diazepam, it does not protect seizure consequences at a later stage. The process of development of epilepsy, i.e, spontaneous recurrent seizures is called epileptogenesis. In spite of advancement in science and technology it not yet clear why some individuals become epileptic after a single seizure or following exposure to neurotoxin or traumatic brain injury. Several changes occur after first seizure and there is a phase called “latent period” with no obvious clinical signs of seizures after first seizure. We are interested in investigating the electrographic activity, neurobiological changes that occur in the brain during this latent period, in a way, “period of epileptogenesis”. We use both rat and mouse models. The projects involve, radio transmitter implant in mouse and rat for continuous EEG recording to understand real time changes in the brain during epileptogenesis. Brain, serum and cerebrospinal fluid (CSF) will be collected for various analyses at different time points after first set of seizures. The common techniques used are, histology and immunofluorescence, Western blot, EEG data analysis and behavioral testing for cognitive learning and memory. The summer project student will get the opportunity to work with postdoc and a graduate student to investigate cellular and molecular mechanisms of epileptogenesis.
Project Title: **Investigations into human-pig cellular interactions and innate memory in a SCID pig**

**Principal Investigator(s):** Christopher Tuggle

**Collaborating Investigator(s):** Crystal Loving (NADC), Joan Cunnick (ISU)

**Abstract:** (300 words or less):

At Iowa State University, we have discovered a line of pigs with Severe Combined Immune Deficiency. We have published analyses of the immune cell deficits (T-B-NK+) and the molecular defects (Waide et al., 2015 J. Immunology). Major uses of the SCID pig are in testing efficacy of stem cell-derived therapies. In the future we will test creation of a human immune system in the pig for evaluating vaccine efficacy. We are interested in determining the cell-cell interactions between human and pig to evaluate the ability of human hematopoietic cells to survive in SCID pigs. Specifically, we are testing the recognition of human CD47+ cells by SIRPA+ porcine cells; initially, we have shown that porcine macrophages (Mf) do not phagocytose human RBC but mouse Mf do (Boettcher, et al., unpublished). We have sources of human cord blood stem cells, which we want to test for interactions with porcine Mf in culture. We are also interested in studying NK cell memory that has been reported in rodents to exist in the absence of an adaptive immune system. We have the exact SCID cellular phenotype needed to determine whether NK cell memory exists in the absence of adaptive immunity. In initial work with normal pigs, we have shown that porcine NK cells have memory to specific haptens 30+ days after sensitization in vivo (Powell et al., unpublished). We plan to repeat this study in SCID pigs. We will use molecular and flow cytometry approaches to investigate these questions in cells from both normal and SCID pigs. A summer student will be able to participate in these experiments, as well as experience animal work within the established SCID biocontainment facilities at Vet Med.
Project Title: Effect of waiting room experience on blood pressure measurement in the cat

 Principle Investigator(s): Dr. Laura Van Vertloo, VCS - Small Animal Internal Medicine

 Collaborating Investigator(s): Dr. Joyce Carnevale, VCS - Shelter Medicine/Behavior, Suzanne Millman, VDPAM/BMS - Animal Welfare/Behavior

Abstract: Measurement of blood pressure in the feline patient is an important part of a complete medical evaluation. It becomes especially important with aging as secondary hypertension 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 frequently made challenging by the effects of stress associated with the hospital visit.

We will be evaluating the effect of different waiting room experiences on blood pressure and stress responses. We hypothesize that cats will experience less stress when provided opportunity to wait in the examination room and when concealed in a carrier covered with a towel sprayed with Feliway. Our primary variable of measurement will be blood pressure readings, with secondary variables including time to obtain blood pressure readings, and physiologic and behavioral indicators of feline stress. This is a continuation of data collection that was begun last summer and is expected to be completed this summer.

During this project, the student will learn about feline 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. There also will be opportunities to be involved in other projects in the animal welfare laboratory during the summer.

The ideal candidate has interest in feline medicine, shelter 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. Feline handling and clinical skills are an asset, but not a requirement. Students are encouraged to discuss their interest in this project with Drs. Van Vertloo, Carnevale, or Millman.
Title: Detection of *Anaplasma marginale* in novel samples to classify herd status.

Primary Mentor: Brian Vander Ley (UNL-GPVEC)

Other Participants: Dusty Nagy (University of Missouri), Dale Grotelueschen (UNL-GPVEC)

Introduction: Anaplamosis, caused by *Anaplasma marginale*, is an important disease in parts of the United States. In regions where it is endemic, infections result in poor growth performance, abortion, and in many cases death. In areas where Anaplasmosis is not yet endemic, methods of detection are very important to be able to adequately mitigate the impact of infection. One of the possible routes of transmission is through reuse of contaminated needles. The purpose of the proposed study is to determine the utility of used needles as a sample to detect *A. marginale* at a herd level.

Materials and Methods: Several cow herds will be tested, some in endemic areas and others that are very likely to be free. Needles will be collected and biologic material will be removed by eluting with phosphate buffered saline. The eluent will then be tested for *A. marginale*. At the time the needles are collected, blood samples will be collected to detect *A. marginale* by conventional means to establish the status of the herds.

Locations Involved: This study will be based at the Great Plains Veterinary Educational Center in Clay Center, Nebraska. Study herds will be in Nebraska and Missouri primarily.
Project Title: The effects of oral anti-inflammatory glucocorticoids on glucose homeostasis and fluid balance in clinically healthy cats

Principle Investigator(s): Jessica Ward, DVM, DACVIM (Cardiology)

Collaborating Investigator(s): Darren Berger, DVM, DACVD; Jean-Sebastien Palerme, DVM, MSc, DACVIM (Internal Medicine); Wendy Ware, DVM, MSc, DACVIM (Cardiology)

Abstract: (300 words or less):
Glucocorticoids (GCs) have a wide variety of clinical applications in feline medicine, but their use in cats with heart disease is limited by concern for precipitating congestive heart failure (CHF). Steroid-associated CHF in cats has been reported after injection of long-acting GCs, thought to be due to transient GC-induced hyperglycemia causing intravascular fluid shift. However, GCs may also have a therapeutic role in advanced decompensated CHF by increasing glomerular filtration rate (GFR) and potentiating diuresis. The objective of this prospective clinical trial is to determine whether anti-inflammatory doses of an oral intermediate-acting GC (prednisolone) cause clinically relevant hemodynamic changes in healthy cats. Study subjects will be volunteered student or staff-owned cats presenting to the Iowa State University Dermatology service for treatment of allergic dermatitis, and a matched control population of untreated cats. Study cats will receive prednisolone (1.0 mg/kg/day) for 2 weeks, followed by a taper and washout period. Testing performed at day 0 (baseline), 3, 7, 14 and 35 (washout) will include a CBC, chemistry panel, urinalysis, blood pressure, echocardiogram, and plasma volume calculation; in addition, serum insulin, fructosamine, NT-proBNP, and urine aldosterone:creatinine ratio will be performed at days 0 and 14 only. Data between groups and time points will be compared using a mixed linear effects model. We hypothesize that a short course of oral anti-inflammatory prednisolone will not cause clinically significant hyperglycemia or hemodynamic changes in healthy cats.
Antibiotic resistance in foodborne pathogen *Campylobacter*

Funded by USDA NIFA: funding is available to support a scholar’s stipend for the entire 13-week program.

We have not discussed this project with any first- or second-year veterinary students

Principal Investigator: Qijing Zhang, VMPM

Co-PIs: Orhan Sahin, Paul Plummer, and Grant Dewell

*Campylobacter* is a major foodborne pathogen and a leading bacterial cause of gastroenteritis in the United States and other countries. Clinical treatment of campylobacteriosis requires the use of fluoroquinolone (FQ) or macrolide antibiotics, but antibiotic-resistant *Campylobacter* is increasingly prevalent, compromising the efficacy of clinical treatment. Because of its significance to public health, CDC has recently identified drug-resistant *Campylobacter* as a serious antibiotic resistance threat in the U.S. *Campylobacter* is highly prevalent in food producing animals, and ruminants are important reservoirs for this pathogenic organism. Ruminant *Campylobacter* can be transmitted to humans via contaminated milk and water, or direct contact. Additionally, ruminants are an important part of *Campylobacter* ecology and may serve as a source of *Campylobacter* transmission to other farm animals, such as poultry. Previously, most efforts on antibiotic-resistant *Campylobacter* were devoted to poultry, which led to withdrawal of FQ antimicrobials from poultry production in the U.S. in 2005. However, national surveillance data indicate that FQ-resistant *Campylobacter* continues to persist and even shows a rising trend after FQ withdrawal in poultry, suggesting that alternative source(s) of FQ-resistant *Campylobacter* may exist. Our recent study on *Campylobacter* isolates from feedlot cattle herds in various geographic regions revealed a sharp increase in proportions of FQ-resistant *Campylobacter* in cattle in the U.S. during the past decade, which coincided with the approved use of fluoroquinolone antimicrobials for control and treatment of respiratory disease in cattle. Using Campylobacter isolates collected from cattle farms, this summer research project will focus on analysis of FQ resistance mechanisms and the genetic relationship of the FQ-resistant *Campylobacter* isolates. Antimicrobial susceptibility testing of bacterial isolates and molecular typing techniques will be used in this study. The generated information will provide new insights into the molecular epidemiology of FQ resistance in bovine *Campylobacter* and facilitate the control of this major foodborne pathogen.