Project Title: Characterization of *Escherichia coli* isolated from intestinal biopsies of dogs with chronic inflammatory bowel disease

Principle Investigator(s): Allenspach, K, Jergens, AE

Collaborating Investigator(s): Nolan, L, Logue, C

Abstract: (300 words or less):

Previous studies in humans and dogs have shown an association between chronic GI signs, histopathologic inflammation, and microbial imbalances in the intestines, especially with inflammatory bowel disease (IBD). Mucosally invasive *E. coli* strains isolated from affected Boxer dogs are novel in phylogeny, and have an adherent and invasive phenotype (AIEC) similar to strains isolated from people with Crohn’s disease. We have recently isolated *E. coli* strains from endoscopic biopsies of IBD dogs that contain virulence factors that may be linked to disease pathogenesis, similar to humans.

We hypothesize that the composition of virulence genes and number of mucosa-associated *E. coli* will correlate with the presence and severity of IBD in dogs.

Mucosal isolates of *E. coli* obtained from endoscopic intestinal biopsies of ~20 dogs with chronic IBD will be interrogated for their content of virulence genes using molecular techniques. The number and spatial distribution of mucosal *E. coli* will be determined by fluorescence in situ hybridization (FISH) with probes to 16S rDNA. Disease activity will be evaluated by objective histopathology and severity of GI signs using a clinical scoring index. Principal components analysis will be used to derive the relationship between clinical disease activity, mucosal bacteria, virulence genes, and intestinal histopathology. We will also examine the phylogenetic similarities of *E. coli* isolated from IBD dogs to mucosal *E. coli* cultured from human IBD patients.

The Summer Scholar involved in this project will work with a team of clinician/basic scientists. Specific activities will include review of patient metadata, performance of molecular microbiologic techniques, intestinal histopathology, and FISH analysis for assessment of mucosal associated *E. coli*. 
Project Title: Efficacy of a novel intramammary vaccine delivery system for PEDV to decrease pre-weaning mortality and enhance mechanisms of immunity

Principle Investigator(s): Bailey Arruda

Collaborating Investigator(s): Arruda P, Zhang J, Schwartz K, Jones D

Abstract: (300 words or less): There is an urgent need to develop an effective vaccine to prevent porcine epidemic diarrhea (PED) in nursing piglets through the stimulation of lactogenic immunity in PEDV naïve sows as a means to decrease pre-weaning mortality and enhance immunity without the need for acclimatization. The objective of this proposal is the development and demonstration of efficacy of a novel intramammary vaccine delivery system for PEDV. There is experimental evidence that intramammary vaccination with a similar pathogen, transmissible gastroenteritis virus (TGEV), will stimulate higher levels of protective IgA in milk. The development of this novel, single administration, cost-effective, polymer-based vaccine platform will release PEDV antigen prior to and during lactation in the mammary gland. Such a system will provide passive immunity to piglets throughout the suckling phase due to the production of both IgG and IgA. In the future, this platform would be customized to include other agents including deltacoronavirus, rotavirus, TGEV and bacterial toxins, thereby diminishing the economic losses attributed to enteric diseases as well as decreasing the labor associated with vaccine administration. This novel platform could provide enhanced efficacy of immune mechanisms, particularly lactogenic immunity in nursing piglets, which is foundational for enteric disease control and a very high research priority.

The student involved in this project responsibilities could include virus culture and lyophilization; assist in implantation placement; viral inoculation; serum, colostrum, milk and fecal sample collection; clinical scoring of diarrhea; performing PEDV ELISAs, and necropsy.
Project Title: **Accuracy, precision and stability of compounded toceranib phosphate formulations for use in dogs**

Principle Investigator(s):
- Chad Johannes, DVM, DACVIM (SAIM, Oncology), Assistant Professor, Veterinary Clinical Sciences
- Darren Berger, DVM, DACVD, Assistant Professor, Veterinary Clinical Sciences

Abstract: (300 words or less):
Toceranib phosphate (TP, Palladia®) is an orally administered receptor tyrosine kinase (RTK) inhibitor anti-cancer therapy. TP disrupts signaling at c-Kit, as well as a variety of other RTKs, such as vascular endothelial growth factor receptor (VEGFR) and platelet-derived growth factor receptor (PDGFR). This results in both direct antitumor and antiangiogenic effects in a variety of solid neoplasms of the dog. TP is FDA-approved for treatment of canine mast cell tumors but is utilized for many other cancers including anal sac carcinoma, squamous cell carcinoma, thyroid carcinoma and metastatic osteosarcoma. TP has a narrow margin of safety in dogs and adverse events can be substantial, especially if dosing is not accurate. Due to tablet size availability and label recommendation to not split tablets, dosing of small dogs can be challenging. This has led to anecdotal recommendation of compounded TP formulations that lack pharmaceutical and clinical evaluation.

The purpose of this study is to determine the accuracy of TP containing products from national compounding pharmacies that provide veterinary products. In conjunction with accuracy, the precision or reproducibility of formulations from each pharmacy will be evaluated. The final purpose is to determine the stability of compounded TP formulations (specifically suspensions) as therapeutic courses for canine cancer are protracted. It is expected that the Summer Scholar Program student will perform a majority of this work with oversight provided by primary investigator(s). This project will afford student exposure to standard precision measurement and sampling techniques, chemical stability determinations with high-performance liquid chromatography and basic pharmacokinetic study design and sampling. A Summer Scholar poster, an abstract (Veterinary Cancer Society Conference), and a peer-reviewed manuscript will originate from this work. The project will provide evidence for continued clinical efficacy evaluation of compounded TP products or insight that certain compounded TP formulations should be avoided.
Project Title: Residual antibacterial activity of four commercially available antimicrobial solutions applied to canine hair against methicillin-sensitive and methicillin-resistant *Staphylococcus pseudintermedius* – an *in vitro* investigation.

Principle Investigator(s): Darren Berger, DVM, DACVD

Collaborating Investigator(s): Jim Noxon, DVM, DACVIM, Adam Krull, DVM PhD

Abstract: (300 words or less):
Canine pyoderma is commonly encountered in veterinary medicine and *Staphylococcus pseudintermedius* is considered to be the primary causative agent. Superficial pyoderma is typically secondary to an underlying condition such as atopic dermatitis, ectoparasites, or an endocrinopathy. Therapy usually consists of either systemically administered antimicrobials or combination therapy with the addition of topical agents. However, with the recent rise in multi-drug and methicillin resistant bacterial infections, topical therapy is increasing in importance. The purpose of this study is to determine whether a difference exists in the efficacy and residual activity of four commercially available antimicrobial solutions following application to the canine hair coat. It is expected the Summer Scholar Program student will perform a majority of the work on this project with direct oversight provided by the investigators. This project will provide the student exposure to study design, non-invasive sampling techniques, and basic microbiology lab techniques. A summer scholar poster presentation, submission of work for poster or oral presentation to the 2018 NAVDF forum, and an original peer-reviewed published manuscript are expected to originate from this work.
Project Title: **Testing mosquitoes from Iowa for the presence of novel viruses by next-generation sequencing**

Principle Investigator(s): Brad Blitvich (2116 VMPM; blitvich@iastate.edu)

Collaborating Investigator(s): none

Abstract: (300 words or less):

The advent of next-generation sequencing technologies has revolutionized microbiology by facilitating the identification of both known and previously unrecognized viral pathogens in biological and environmental samples. In this project, next-generation sequencing will be used to identify viral sequences in mosquitoes collected from various study sites throughout Iowa. Mosquitoes from 10 species and three genera (*Aedes*, *Anopheles* and *Culex*) will be tested. Viruses of greatest interest will be further characterized. In particular, the abilities of select viruses to replicate within various vertebrate and insect cell lines will be assessed in order to identify viruses that have the potential to infect humans and vertebrate animals.
Abstract: (300 words or less):
Traditional diagnostic tests for *Brachyspira* spp. infections in pigs have relied on selective anaerobic culture of multiple fecal samples from groups of affected pigs. Large sample numbers and turnaround time often complicate this process as the percent of pigs shedding spirochetes may be low and culture requires 6 days to complete. Recently, effective direct sample PCR assays have been developed that can reduce the time to diagnosis to 24 hours from sample receipt at the diagnostic laboratory; however, questions remain regarding the diagnostic sensitivity of these assays. Historically, selective culture has proven more sensitive than PCR for detecting *Brachyspira* spp. in feces; however, these comparisons have not been made on population level samples such as oral fluids and environmental swabs. Additionally, most comparisons are made directly on the samples received at the laboratory without any type of enrichment. Accordingly, this study will compare selective anaerobic culture and a duplex PCR on individual pig fecal samples, pooled feces, oral fluids, and environmental swab samples collected from pens of pigs exhibiting diarrhea suggestive of swine dysentery (SD) or from subclinical pigs on farms with a recent history of SD. In addition, samples will be split on arrival with half set up for immediate comparison and the remaining aliquot placed in an enrichment broth and kept anaerobically for 48 hours before comparison. Testing will be performed on samples received routinely at the Iowa State University Veterinary Diagnostic Laboratory and farms meeting the inclusion criteria as well as known negative farms. Comparisons of the pen-level diagnostic sensitivity and specificity of culture and PCR with and without enrichment will be determined for oral fluids and environmental swabs with culture of feces being the gold standard.
Project Title: Assessment of High Volume, High Quality, Spay Neuter Clinic Anesthesia and Pain Management Protocols for Cats

 Principle Investigator(s): Dr. Joyce Carnevale – VCS Community Practice Outreach Program
 Co-Principle Investigators: Dr. Bonnie Hay Kraus – VCS Anesthesia, Dr. Stefano Di Concetto, VCS Anesthesia, Dr. Dean. Riedesel, VCS Anesthesia

Abstract: High Volume, High Quality, Spay Neuter (HVHQSN) clinics perform surgery on feline patients ranging in age from 6 weeks to seniors. Effective anesthesia and pain management protocols are associated with few intra- and post-operative complications and provide appropriate analgesia during the recovery period. Since most patients are discharged the day of surgery, post operative evaluation and additional administration of analgesic medication is limited. Recently, long acting injectable analgesic robenacoxib and buprenorphine have become available and may provide effective post-operative analgesia for up to 24 hours in cats.

The goal of the project is to evaluate anesthetic and pain management protocols that could improve post-operative pain management and avoid side effects including hyperactivity and hyperthermia commonly associated with current protocols.

The student will assist Drs. Carnevale, Kraus, DiConcetto, and Riedesel in evaluating protocols for anesthesia and pain management for feline patients presenting to HVHQSN facilities. Specifically, the student will survey HVHQSN clinics to determine current drug protocols and complications, collate data collected on patients in the Surgical Education courses (VCS 449 and VCS 451), oversee patient care including post-operative patient monitoring and pain assessment, and collect and prepare data for statistical analysis.

The student will gain clinical experience in feline anesthesia, pain management assessments, medicine and surgery, and using the electronic medical record system. The student will also learn about designing experiments, conducting a literature review, and preparing a scientific poster and paper.

The ideal candidate is interested in anesthesia and pain management, feline behavior, medicine, and surgery and shelter medicine. Experience using Excel and creating data bases, good communication skills, and the ability to work independently and in a group as well as clinical experience and handling of cats would be beneficial. Students are encouraged to talk to Drs. Carnevale, Hay Kraus, or DiConcetto regarding the project.
Project Title

Principle Investigator(s): Joyce Carnevale, DVM, ABVP (C/F) and Suzanne Millman, B.Sc. (Agr), Ph.D.

Abstract: (300 words or less):
The student will assist Drs. Carnevale and Millman with developing an online CE course for training veterinary practitioners to recognize and respond to suspected companion animal abuse and neglect cases. Specifically, the student would have primary responsibility for developing case scenarios with photographic and video images, together with narrative and possible role-play of stakeholder involvement. These case scenarios will be integrated into the online course, to illustrate practical examples that a practitioner is likely to encounter, common myths, and opportunities for effective action. We will develop the case scenarios with participation by veterinarians (e.g. IVMA members), the sheltering community (e.g. Animal Rescue League of Iowa cruelty response team) and using guidance materials previously developed by AVMA and ASPCA.
Project Title: Biomechanical ex vivo comparison of five commonly used skin closure patterns in abdominal surgery in horses

Principal Investigators:
Dr. Stephanie S. Caston, DVM, DACVS (VCS)
Dr. David G. Suarez-Fuentes, DVM (VCS)

Collaborating Investigators:
Dr. Eric M. Zellner, DVM (VCS)
Dr. Karl H. Kraus, DVM, MS, DACVS (VCS)

Abstract:
The ideal skin closure in the equine patient provides adequate apposition of skin margins, adequate holding strength, and proper cosmesis. An ideal skin closure helps prevent excessive inflammation, dehiscence and reduces the risk of postoperative infection. Many suture patterns have been used for the closure of surgical abdominal skin incisions in horses. However, to date, different suture patterns’ tensile strength and mode of failure in the equine patient has neither been evaluated or objectively measured and compared. The objective of this study is to biomechanically compare five commonly used skin closure patterns in abdominal surgery in horses: simple continuous, subcuticular, modified subcuticular, continuous horizontal mattress and staples. These patterns will be evaluated and compared in an ex vivo equine model based on previous ex vivo models (Zellner et al, JAVMA 2016 248(12);1377-82 and Suarez-Fuentes et al, 2016; [in review]). Fifty (n=50) specimens of skin will be harvested from the abdominal ventral midline region of healthy adult horses euthanized for reasons other than abdominal surgery. These skin specimens will be randomly assigned to the five closure pattern groups, prepared, and tested in a material-testing machine. All the suture patterns will be performed using 2-0 poliglecaprone 25 or stainless steel skin staples – materials commonly used for skin abdominal closure in horses. The tensile strength, mode of failure, suturing time, and assessment of apposition will be recorded. Our hypothesis is that no statistically significant differences will be seen in the holding strength and mode of failure of the simple continuous, subcuticular, modified subcuticular, continuous horizontal mattress suture patterns or skin staples. The skin staples followed by the simple continuous suture pattern are hypothesized to be faster to perform than the other patterns. The results of this study will provide evidence for closure pattern selection of the equine skin during abdominal surgery.
Project Title: A comparison between lecture and simulator training of bovine castration

Principle Investigator(s): Frank Cerfogli, DVM

Collaborating Investigator(s): Kelly Still-Brooks, DVM
Troy Brick, DVM

Abstract:

Surgical castration of male bovine is common practice in the United States. Surgical skills including castration of male bovine often considered an entry-level skill for veterinary graduates. The use of simulators for training surgical procedures has become common practice for most all levels and forms of medical training. Simulators are increasing in both form and function; however, there is not currently a simulator for surgical castration of the bovine. The creation of a surgical castration bovine simulator might increase student confidence and competency as well as decrease the number of post-surgical complications. Potential complications associated with castration include hemorrhage, excessive swelling or edema, infection, poor wound healing, failure and death. There is extensive literature on surgical and post-surgical pain from bovine castrations as well as associate post-surgical production performance. However, there is limited literature defining or characterizing the specific complications and their frequency for surgical bovine castration.

The goals of this project are; 1. Create a bovine surgical castration simulator, 2. Identify and characterize the complications of surgical castration in beef cattle when students receive lecture training only, 3. Determine if a bovine surgical castration simulator training reduces the complication type(s) and or complication frequency.