Project Title: **Evidence based incremental care approach to managing acute canine vomiting**

Principal Investigator(s): **Karin Allenspach, Joyce Carnevale**

Collaborating Investigator(s): Jon Mochel, April Blong

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

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

Acute vomiting in dogs is a common presentation to primary care and emergency veterinarians. According to claims submitted by multiple pet insurance policy holders, acute gastrointestinal signs is consistently in the top 10 presenting complaints for canine claims. However, acute vomiting can be associated with a wide variety of causes, and treatment plans can therefore vary from minimal outpatient supportive care to prolonged hospitalization and surgical intervention. There is minimal evidence-based information available to help clinicians predict which patients will necessitate more aggressive in-hospital and/or surgical management. Since more advanced care and hospitalization and/or surgery are costly, financial considerations play a factor in the owner's decisions regarding the extent of veterinary care they will agree to pay for. The primary aim of this project is to devise a comprehensive incremental-care and evidence-based algorithm for dogs presenting with acute vomiting to primary care practice, which will streamline this decision-making process and identify the risk factors associated with prolonged hospitalization and or/surgery. The algorithm will aid in proper allocation of resources to the patients more likely to require more involved veterinary care. Phase 1 of the study has included prospectively enrolling 200 dogs presenting to Iowa State Small Animal Emergency Service with the primary presenting complaint of acute vomiting. In phase 2 of the study, the algorithm will be applied to 100 prospectively enrolled patients from a variety of primary care clinical settings to validate the impact of the algorithm on patient management and outcomes as well as cost of care. We are enrolling a veterinary student into Phase 2 of this project for summer 2022.

A2 – Andreasen

Project Title: Cytochemical Characterization of Hamster Neutrophils

Principle Investigator(s): Claire B. Andreasen DVM, PhD, Department of Veterinary Pathology

Collaborating Investigator(s): Ellie Putz, PhD, USDA-ARS- NADC.

Would the proposed project be in-person or virtual? This project can be either:

1) run as in-person or 2) adapt as a no contact project with a laboratory set-up with only the veterinary student present and PI instruction and meetings via Zoom. Either does require performing hands-on techniques.

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

Even though the hamster has been used as an animal model for numerous diseases, little work has been done to characterize hamster neutrophils. There has been controversy over the name of the hamster primary polymorphonuclear cell (PMN) as a neutrophil, heterophil or pseudo-heterophil based on faint eosin staining of the primary granules in blood smears. This characteristic is similar to the staining of human neutrophil granules. Often neutrophils and true heterophils differ in cytochemical staining that can correlate to the biochemical content of granules and resulting granule pH. We have recently characterized blood smear morphology changes in hamster neutrophils during health and inflammation, especially in the hamster leptospirosis model. Hamsters have been assumed, as rodents, to have the same neutrophil granule cytochemical contents as mice and rats; however, those two species differ in alkaline phosphatase and defensin content. This work has not been done in hamsters. The granule morphology and content within neutrophils is important to: 1) identify neutrophils from other granulocytes, 2) determine if cell staining morphology correlates to granule contents seen in neutrophils or heterophils (MPO often decreased to absent), and 3) determine if hamster neutrophil granule content differs from mice and rats. Hamster blood smear neutrophils will be stained with alkaline phosphatase, myeloperoxidase/peroxidase, Sudan black B, acid phosphatase, alpha-naphthyl acetate esterase, naphthol AS-D chloroacetate esterase, periodic acid-Schiff, and Luna's eosinophil granule techniques to better characterize these cells.

A3 – Cho 1
Project Title: Development of a vaccine against human immunodeficiency virus (HIV-1).

Principle Investigator(s): Michael Cho

Collaborating Investigator(s):

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

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

Since the start of the pandemic nearly four decades ago, AIDS has claimed 33 million lives. About 1.7 million people have been newly infected just in 2019, and nearly 38 million are currently living with AIDS. To date, there is neither a vaccine nor a cure. A vaccine is urgently needed against HIV-1, the virus that causes AIDS. Although neutralizing antibodies (nAbs) can provide effective prophylaxis against the virus, eliciting those that are broadly reactive against many antigenically diverse HIV-1 isolates has been a major scientific challenge and it remains a critical roadblock for the AIDS vaccine development. In my laboratory, we use multidisciplinary approaches to generate immunogens, characterize their biochemical, antigenic and immunogenic properties, and evaluate their ability to induce broadly neutralizing antibodies (bnAbs). We are currently evaluating a number of novel immunogens based on HIV-1 glycoproteins gp120 and gp41 and testing a few vaccine strategies in rabbits and mice. Through participating in these research projects, students will gain better understanding of virology, molecular biology, protein biochemistry, vaccinology and immunology. Although HIV-1 is not a veterinary pathogen, students can apply the learned knowledge to develop vaccines against many veterinary pathogens.

A4 – Cho 2

Project Title: Generating novel immunogens to enhance induction of neutralizing antibodies against SARS-CoV-2.

Principle Investigator(s): Michael Cho

Collaborating Investigator(s):

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

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

A novel coronavirus (SARS-CoV-2) that causes severe pneumonia emerged through zoonosis in late 2019. SARS-CoV-2 is transmitted efficiently from human-to-human and it has been spreading rapidly world-wide. The disease, referred to as COVID-19, has an alarming mortality rate and it is having a devastating effect on the global economy and public health systems. During the past several months, we evaluated our first-generation COVID-19 vaccine candidate based on the receptor binding domain (RBD) of SARS-CoV-2 spike (S) glycoprotein. The immunogen was able to induce potent neutralizing antibodies (nAbs) against the virus in mice. The overarching goal of this proposal is to develop second-generation RBD-based immunogens to induce even more potent nAbs. Specifically, we will develop immunogens that will force the immune system to mount antibody responses towards the receptor binding motif (RBM) within the RBD. To achieve this, we will design immunogens that will mask non-neutralizing epitopes. Although there are already two FDA-approved COVID-19 vaccines, our goal is to generate new vaccine candidates that could be used to boost nAb responses more effectively. Successful completion of proposed studies will significantly impact global health.

Project Title:

Does social buffering enhance animal welfare and performance when beef calves are commingled in feedyard environments?

Principle Investigator(s):

Suzanne Millman, Grant Dewell, Renee Dewell,

Collaborating Investigator(s):

Anna Johnson, Derek Haley, Becky Parsons

Would the proposed project be in-person or virtual?

In-person

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

This project was 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. We are exploring preferential relationships among beef feeder cattle, and impacts of social buffering on animal welfare, health and performance outcomes. In summer 2022, we will examine impacts of social buffering on behavior, health and performance of comingled lightweight cattle on a commercial feedlot. "Familiar" calves, sourced as groups from the same farm, and "Solitary" calves sourced singly from farms, 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. The student working on this project will primarily assist with collecting behavior data from videorecordings and live observations, cattle handling, blood draws, data management, and contribute to scholarly works through literature review and technical writing. The ideal candidate is curious, curious, organized, interested in animal welfare/behavior research, and familiar with or keen to learn about beef production medicine. We will have some long hot days in feedyard/farm conditions, so enthusiasm and ability to work independently and collaboratively in a team structure are valued.

A6 – Mooyottu

Project Title: Clostridium difficile infection: pathogenesis, epidemiology, and novel microbiome-based control strategies

Principal Investigator(s): Shankumar Mooyottu

Collaborating Investigator(s): Dr. Andy Lowe, Dr. Brett Sponseller, Dr. Chandru Charavaryamath, Dr. Andy Lowe, and Dr. Morgan Murphy

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

Veterinary Scholar Focused Abstract: (300 words or less): Veterinary Scholar Focused Abstract: (300 words or less):
Clostridium difficile (CD) is a spore-forming, strictly anaerobic bacterium that causes a toxin-mediated enteric disease in humans and animals. CD infection has been associated with the use of antibiotics that results in disruption in normal enteric microflora (gut-dysbiosis), subsequent pathogen colonization and severe toxin-mediated colitis. Despite the fact that a majority of the currently used antibiotics can predispose CD infection by disrupting the normal gut flora, antibiotics are still used as the primary line of treatment against infection. Moreover, the Centers for Disease Control and Prevention recently listed CD as one among the three urgent threats in their report on emerging pathogens with antibiotic resistance. Since the toxins are the major virulence factors for CD infection, a search for an alternative, non-antibiotic therapeutic agents, which can reduce CD virulence without causing gut-dysbiosis opens a new research area.

My research focuses on the mechanism of CD pathogenesis and non-antibiotic gut-microbiome based strategies for preventing gut-dysbiosis and CD virulence. We are currently testing such anti-CD strategies in a novel swine surgical in situ ileal loop model. Additionally, we investigate potential zoonotic transmission of CD and genetic and evolutionary relationship between human and animal (more importantly pets) isolates of CD. In parallel, we investigate extraintestinal effects of clostridial metabolites with special reference to gut-brain and gut-liver axis in laboratory mice models. The results from this research could help the medical and scientific community to develop and validate new strategies to control CD infection in humans and animals. The prospective research scholar will have ample opportunities to obtain hands-on experience in experimental surgeries (swine), animal autopsies, anaerobic laboratory operations, mice studies, and molecular biology and genomics techniques

A7 - Quinn

Project Title: Pharmacokinetics of orally administered isavuconazole in healthy dogs

Principal Investigator(s): Erin McQuinn

Collaborating Investigator(s): Jean-Sebastien Palerme, Karin Allenspach, Jonathan Mochel, Andrew Hanzlicek

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

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

Invasive fungal infections (IFIs) are growing in importance in veterinary and human medicine. The main reasons for this are expanding endemic geographic ranges, emerging antifungal resistance, and increasing immunocompromised populations. Isavuconazole has an expanded spectrum of activity as compared to currently used azoles such as itraconazole, and may exhibit less side effects, such as liver toxicity. This drug has recently been shown to be effective against molds in humans and is FDA approved for the prevention or treatment of invasive mold or candidiasis in humans. However, no information on the pharmacokinetics of this drug is currently available for small animals but is critically needed before the drug can be routinely used in clinical practice. In this pilot study, we will therefore assess the pharmacokinetics of orally administered isavuconazole in healthy dogs. We plan to give the medication to healthy, research dogs in order to evaluate pharmacokinetics of the drug for eventual clinical use in dogs with invasive fungal infections. The student will help with performance of the clinical trial in healthy Beagle dogs, compile the data, and contribute to writing a manuscript by the end of the summer scholar project. This will be an excellent opportunity for a veterinary student to learn more about experimental study design, pharmacology of drugs as well as practical skills such blood collection, data analysis and scientific writing.

A8 – Singh

Project Title: Mechanism of therapeutic molecules for the treatment of genetic disorders.

Principal Investigator(s): Dr. Ravindra Singh, Professor
Department of Biomedical Sciences; 2034 Vet Med Building
Phone: 515-294-8505; Email: singhr@iastate.edu

Collaborating Investigator(s): Dr. Natalia Singh, Adjunct Associate Professor
Department of Biomedical Sciences; 2060 Vet Med Building
Phone: 515-294-2451; Email: natalias@iastate.edu

Would the proposed project be in-person or virtual? Could be either or hybrid.

Veterinary Scholar Focused Abstract: (300 words or less): Gene function is intimately linked to the production of coding and/or non-coding RNAs. In most instances, a single gene produces multiple RNAs due to alternative splicing, alternative transcription start and/or stop sites. Antisense oligonucleotides (ASOs) and small molecules that modulate transcription and/or splicing are becoming powerful tools to treat genetic diseases. The appropriate application of ASOs and small molecules for therapeutic application requires the target identification and characterization. It is also important that the off-target effects of ASOs and small molecules are properly understood before their use in clinics. Summer scholar in Singh lab will learn how to identify therapeutic targets and off-target effects of ASOs and small molecules. This collaborative project will employ a variety of techniques, including high throughput sequencing, bioinformatics, RT-PCR, molecular and cellular biology techniques. Findings of the successfully completed project by the summer scholar will be published in a peer-reviewed journal and summer scholar will have opportunity to earn co-authorship in the publication.

Project Title: Vaccination against Tritrichomonas foetus

Principal Investigator(s): Matt Brewer

Collaborating Investigator(s):

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

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

Tritrichomonas foetus is a protozoan pathogen that causes early embryonic death in cattle. This project investigates T. foetus epitopes that could be used as vaccines against the pathogen or for diagnostic ELISA testing. The student will be responsible for culturing the parasite and conducting ELISA testing. Lead candidate peptides will be use to vaccinate calves, and the student will detect antibodies against these epitopes in cervicovaginal mucus.