

Project #1

Mentor's Name and Email: Mohamed Abouelkhair mabouelk@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Exploring Novel Proteins in Staphylococcus Pseudintermedius: Towards a Better Canine Vaccine

Project Description/Area of Research: Staphylococcus pseudintermedius is associated with superficial pyoderma and a leading cause of skin infections in dogs. Over the last decade, the incidence of methicillin resistant Staphylococcus pseudintermedius (MRSP) from canine skin infections have increased from 4% in 2003, up to 35% in 2012. In one study, MRSP isolates were resistant to eight of the nine conventional antibiotics used for treatment of skin infections with 86% of MRSP demonstrating multi-drug resistance. This issue has severely compromised the therapeutic options available to veterinary dermatologists for treatment of canine pyoderma. A therapeutic intervention that induces an immunologic response to MRSP could reduce the severity of canine pyoderma and potentially enable resolution of cases with conventional antibiotic therapy. Our research team has successfully developed a promising vaccine against S. pseudintermedius, demonstrating efficacy in preliminary studies. However, recognizing the evolving nature of bacterial pathogens, we performed a comprehensive pangenome analysis, examining approximately 5000 isolates from diverse geographical locations worldwide. This analysis discovered a set of conserved proteins within the S. pseudintermedius genome that demand further investigation. These proteins, while intriguing, remain poorly understood in terms of their role in bacterial pathogenesis, transmission dynamics, and potential utility as vaccine candidates.

Our proposed research seeks to delve deeper into the characterization of these hypothetical proteins through in vitro studies. We are excited about the potential impact of this research on the field of veterinary medicine and the well-being of our four-legged companions.

Student's Role in the Project: Label S. pseudintermedius strains with green and red fluorophores for visualization and tracking. Microscopic analysis of labeled bacteria to track their movements and interactions with primary cells lines. Implement CRISPR-Cas9 to knockout specific genes in bacterial strains. Verify knockout efficiency through molecular techniques such as PCR and sequencing. Utilizing flow cytometry, Western blotting, ELISA for assessing the impact of knockout mutations on bacterial characteristics. Collaborate with team members on experimental design and troubleshooting. Maintaining a detailed laboratory notebook with accurate and organized records of experiments.

Special Skill Requirements: n/a

Project #2

Mentor's Name and Email: Julie Albright jalbrig1@utk.edu

Co Mentor's Name and Email: Kimberly Gwinn; kgwinn@utk.edu

Project Title: Mycotoxins in Cannabis: Implications for One Health

Project Description/Area of Research: Cannabis sativa is cultivated worldwide for medicinal, therapeutic, and recreational properties, as well as for grain, seed, and fiber. CBD and other hemp-derived products have been used in the treatment of humans and companion animals for epilepsy and other neurological disorders, for addressing behavioral problems (anxiety and aggression) and for relieving pain. Fusarium mycotoxins and other toxins have been isolated from some hemp and cannabis products and may be involved in cannabis-related illnesses such as Cannabis hyperemesis syndrome (CHS). Hemp-related illness has yet to be explored in animals. The goal of the study is to evaluate the prevalence of mycotoxin produced by Fusarium spp. in animal CBD or hemp products intended for animal use. A secondary objective is to assess clinical signs of toxicity after hemp product ingestion in companion animal species.

Student's Role in the Project: Students will have the opportunity to work in the lab of Dr. Kimberly Gwinn in Plant Pathology helping develop immunoassay screening tools for mycotoxins in commercial hemp and CBD products. In addition, the student will conduct a survey regarding the use of hemp products in companion animals. This may be tailored to the student's specific interest (equine, small animal, or zoologic companion animal). Clinical exposure may also be arranged.

Special Skill Requirements: n/a

Project #3

Mentor's Name and Email: Elizabeth Collar ecollar@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Equine Thoracolumbar Anatomy and Pathology Investigation

Project Description/Area of Research: The objective of the project is to investigate the thoracolumbosacral vertebrae of horses of different breeds. Specimens will be collected from horses humanely euthanized for reasons unrelated to the study, and computed tomographic (CT) imaging will be acquired of all specimens. Specimens and CTs will be analyzed to look for anatomical variances and signs of pathology. Findings will be compared between horses of different ages and between breeds, and compared to previously acquired findings of lumbosacral specimens from Quarter Horses and Thoroughbreds.

This project will be completed in collaboration with the University of Melbourne, who will be performing Finite Element Modeling with the CTs and some specimens to be able to virtually analyze the consequences of anatomic variability and forces that are playing a role during fracture occurrence and formation of impingement of the dorsal spinous processes (kissing spines). The objectives are to characterize thoracolumbosacral anatomy while documenting pathologic abnormalities as this area is hard to access and has not been investigated in non-racing breeds.

Student's Role in the Project: The student will assist in specimen collection including communication with necropsy, dissection and collection of equine spines, and CT imaging of the specimens. The student will aid in CT analysis of the equine spines. This is a tremendous way to get very comfortable with the equine back, sacroiliac region, pelvic anatomy, etc. For anyone interested in equine practice, this could significantly aid them in future practice. Additionally, the PI's lab has other ongoing studies for the summer during which the student could gain experience with lameness/physical exams, IV injections, and gastroscopies. Student will be acknowledged on manuscript. Depending on the level of student effort through final data analyses and manuscript preparation, opportunities for abstract presentation at conferences and authorship on the manuscript exist.

Special Skill Requirements: n/a

Project #4

Mentor's Name and Email: Elizabeth Collar ecollar@utk.edu

Co Mentor's Name and Email: Melissa Hines mhines8@utk.edu

Project Title: Investigation of Esomeprazole Effects in Horses During Concurrent Administration of Common Horse Show Medications

Project Description/Area of Research: The objective of the project is to investigate the effects of intravenous and oral esomeprazole on stomach pH in horses during concurrent administration of common horse show medications like bute and dexamethasone. A total of six adult horses will be utilized in a crossover study design. The first phase of the study has been completed. Two additional phases will be completed this summer. Horses will first undergo a control week to assess the effects of schedule and housing change on the stomach pH. Horses will have physical examinations, gastroscopy, and gastric fluid pH analysis performed prior to a change in their routine. Horses will undergo a 14-30 day washout period. Repeat gastroscopy and gastric fluid pH analyses will be performed every 24 hours for 7 days. During the next phase, horses will have physical examinations, gastroscopy, and gastric fluid pH analysis performed prior to treatments. Horses will receive bute for 2 days, bute/dexamethasone for 2 days, and bute/dex/esomeprazole for 2 days. Repeat gastroscopy and gastric fluid pH analyses will be performed every 24 hours and at 1 hour post first bute administration, first bute/dexamethasone administration, and post first esomeprazole administration.

Student's Role in the Project: The student will perform IV drug administration, physical examinations, and assist in gastroscopy. The student will be mentored in and expected to perform a literature search. Student will be acknowledged on manuscript. Depending on the level of student effort through final data analyses and manuscript preparation, opportunities for abstract presentation at conferences and authorship on the manuscript exist. Additionally, the PI's lab has other ongoing studies for the summer during which the student could gain experience with lameness/physical exams as well as thoracolumbosacral anatomy and disorders.

Special Skill Requirements: n/a

Project #5

Mentor's Name and Email: Elizabeth Collar ecollar@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Subchondral Bone Disease Diagnosis and Outcome in Non-Racing Horses

Project Description/Area of Research: The objective of the project is to investigate the subchondral bone injury in pleasure and sport horses. Subchondral bone injury goes by many names, including subchondral bone disease, bone marrow lesions, and osteochondral disease. Palmar osteochondral disease of the third metacarpal/metatarsal bone in thoroughbred racehorses is a debilitating disease that can lead to condylar fracture and long-term lameness. There are no current treatments with high success rates. MRIs of equine distal limbs are commonly performed at UTK. A number of cases have had subchondral bone disease diagnosed on MRI. This study will retrospectively analyze records to identify cases of subchondral bone disease, treatments pursued, and outcome of the cases, including follow up client phone calls where appropriate. This will significantly add to the literature as there is little described about subchondral bone disease in non-racing horses.

Student's Role in the Project: The student will assist with recording and organizing data collected from the hospital record system. The student will assist in reviewing MRI and MRI reports, gaining valuable experience in MRI interpretation. The student will help develop a questionnaire consisting of standardized questions, and gain experience talking to owners about cases under the guidance of the PI. Additionally, the PI's lab has multiple other ongoing studies for the summer during which the student could gain experience with lameness/physical exams, gastroscopies, and as well as thoracolumbosacral anatomy and disorders. Student will be acknowledged on manuscript. Depending on the level of student effort through final data analyses and manuscript preparation, opportunities for abstract presentation at conferences and authorship on the manuscript exist.

Special Skill Requirements: n/a

Project #6

Mentor's Name and Email: Andrew Cushing acushin1@utk.edu

Co Mentor's Name and Email: Michelle Dennis mdenni12@utk.edu

Project Title: A RETROSPECTIVE REVIEW OF PANCREATIC ISLET CELL NEOPLASIA IN TIGERS (PANTHERA TIGRIS)

Project Description/Area of Research: Published reports of pancreatic neoplasia, specifically islet cell neoplasia, in non-domestic felids are scarce in the literature. Despite this, we have seen a number of cases in tigers (*Panthera tigris*), and have communicated with other institutions about other instances of this pathological process. A comprehensive review of the disease, with correlations between antemortem diagnostics, clinical signs, gross and histopathological characteristics and immunohistochemical staining to determine hormone production, would be a useful addition to the literature.

Student's Role in the Project: Identification and categorization of non-domestic felid pancreatic neoplasia within the records system of UTCVM. Creation of a spreadsheet to include signalment, clinical signs, hematological and biochemical changes, and pathological findings. Completion of requests to share medical records and organization of sample shipment. Slides will be retrieved from the archives by the student and reviewed, where required, with Dr Dennis. Arrange immunohistochemistry of suitable cases, performed at an outside laboratory. The student will then use the final dataset for submission of an abstract to a national zoo or pathology conference in 2025. Following that, the student may assume first authorship of the manuscript assuming submission is completed before commencing clinical responsibilities in year 4. Failure to meet this deadline will forfeit first authorship rights to Dr Cushing or Dr Dennis. The student will be welcome to participate in clinical services with the pathology and zoo / exotic department as time allows during the study period.

Special Skill Requirements: A strong interest in zoological medicine and pathology is preferred, with a desire to strengthen research attributes.

Project #7

Mentor's Name and Email: Andrew Cushing acushin1@utk.edu

Co Mentor's Name and Email: Julie Sheldon, Christopher Smith

Project Title: A RETROSPECTIVE REVIEW OF ANESTHESIA AND SEDATION IN NON-DOMESTIC FELIDS

Project Description/Area of Research: For over 20 years, UTCVM Zoological Medicine Service has worked with a non-domestic felid sanctuary. Sedation and anesthetic events occur routinely, and may involve over 2000 cases in numerous species, of varying durations and quality. A large, retrospective review of the protocols, monitored parameters and clinical utility would be of benefit to the zoological medicine community working with these species.

Student's Role in the Project: Identification and categorization of non-domestic felid anesthesia and sedation events, performed over the last 20 years. Following that, creation of a spreadsheet to include signalment, anesthetic protocol, monitoring parameters and other pertinent information. Records will be retrieved from the archives by the student and reviewed, where required, with Dr Cushing and Dr Sheldon. The student will then use the final dataset for submission of an abstract to a national zoo or pathology conference in 2025. Following that, it may be possible, depending on the dataset achieved, for publication as a manuscript. In this case the student may assume first authorship of the manuscript assuming submission is completed before commencing clinical responsibilities in year 4. Failure to meet this deadline will forfeit first authorship rights to Dr Cushing, Dr Sheldon or Dr Smith. The student will be welcome to participate in clinical services with the pathology and zoo / exotic department as time allows during the study period.

Special Skill Requirements: A strong interest in zoological medicine and anesthesia is preferred, with a desire to strengthen research attributes.

Project #8

Mentor's Name and Email: Michelle Dennis mdenni12@utk.edu

Co Mentor's Name and Email: Amy Webb, awebb21@vols.utk.edu

Project Title: Investigation of unusual mortality events affecting aquatic invertebrates in the Caribbean

Project Description/Area of Research: In recent years, there have been numerous reports of unusual mortality events occurring in marine invertebrates leading to widespread ecosystem deterioration throughout the Caribbean. Coral reefs around St. Kitts experienced an unusual mortality event beginning in 2018 characterized by brown pigmented lesions that progressed over time. In 2023, iconic barrel sponges on the neighboring island St. Eustatius were affected by an unusual mortality event that followed a mortality event in corals around the island as well. The cause(s) of these mortality events has never been identified. Our previous work has suggested abnormalities in coral symbionts may explain brown pigmented lesions, and comparison of symbiont quantification between affected and unaffected tissue is an important step in exploring this hypothesis. A description of the histopathologic changes present in affected sponges would be useful in determining the pathologic basis for disease in sponges, and serve as the basis for hypotheses around potential causes.

Student's Role in the Project: Process fixed sponge samples for histology. Help collect and compile field data for sponge samples. Review slides with Dr. Dennis and/or Dr. Webb and describe histopathologic characteristics. Analyze and interpret histological data. Process fixed coral samples for symbiont quantification. The student will then use the final dataset for submission of an abstract to a wildlife or pathology conference in 2025. Following that, the student may assume first authorship of the manuscript assuming submission is completed before commencing clinical responsibilities in year 4. Failure to meet this deadline will forfeit first authorship rights to Dr. Dennis or Dr. Webb. The student will be welcome to participate in clinical services with anatomic pathology as time allows during the study period.

Special Skill Requirements: A strong interest in marine wildlife and pathology is preferred, with a desire to strengthen research attributes.

Project #9

Mentor's Name and Email: Cassio Ferrigno cferrign@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Comparison of Patellofemoral contact mechanics after Semi-Cylindrical Recession Trochleoplasty and Trochlear Block Recession for the Treatment of Canine Medial Patellar Luxation

Project Description/Area of Research: The aim of this study is to describe the differences in Patellofemoral contact mechanics after two different methods for Trochleoplasty; semi-cylindrical recession trochleoplasty (SCRT) and trochlear block recession (TBR)

Student's Role in the Project: Collect the hind limb from the cadavers and help in the surgical technique and biomechanical testing.

Special Skill Requirements: n/a

Project #10

Mentor's Name and Email: Rick Gerhold rgerhold@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Investigation of fertility rates in wild turkey eggs

Project Description/Area of Research: The project will use a combination of DNA staining and fluorescent microscopy to determine the fertility rates of wild turkey eggs collected from multiple states. In addition, we will investigate causes of early embryonic death via histology, molecular testing and other diagnostics. This is a very important aspect that has not previously been investigated in turkeys which are declining in many states.

Student's Role in the Project: The student will participate in all aspects of the research. We will train the students on all techniques and supervise them throughout the study. There is also potential for some field work associated with this project.

Special Skill Requirements: n/a

Project #11

Mentor's Name and Email: Rick Gerhold rgerhold@utk.edu

Co Mentor's Name and Email: Michelle Dennis mdenni12@utk.edu

Project Title: Histological and molecular investigation of lesions from various wildlife species from Virginia

Project Description/Area of Research: This project will be working with a wildlife rehab facility in VA that has collected formalin fixed tissues from various wild animals (mainly mammals and birds) for histological evaluation. Depending on histology results, further special stains or molecular work may be performed to determine causes of morbidity and/or mortality. The results will be sent back to the facility and used to compose a manuscript for publication.

Student's Role in the Project: The student will perform trimming in of tissues for histology as well as performing initial histology review of the slides to determine if there is any evidence of infectious or non-infectious diseases. The student will be trained in all methods and will be supervised and assisted by the mentors. Depending on student's time and interest, the student can compose a manuscript to be submitted for publication and the student will be co-author on the paper.

Special Skill Requirements: Have completed microanatomy and introduction of pathology courses by the start of the project.

Project #12

Mentor's Name and Email: Luca Giori lgiori@utk.edu

Co Mentor's Name and Email: Alex Vico aestelle@utk.edu and Michelle Larsen
michelle.larsen@zoetis.com

Project Title: Method comparison for a new point of care assay measuring thyroid hormones in dogs and cats.

Project Description/Area of Research: Thyroid testing at the time of patient appointment has become important part of senior screening for cats and for dogs with clinical signs. In addition, it enables quick modifications to medication versus sending to a reference lab.

The objective for this study is to evaluate a new point-of-care assay for canine TSH and canine and feline fT4 and T4 by comparing results with the UTCVM Diagnostic Endocrine Service. The student will learn about method validation and instrument method comparison. In addition, a reference interval study will be conducted using healthy and diseased cats and dogs to determine reference intervals for the analytes on the new device.

Student's Role in the Project: Student will become familiar with different methodologies for endocrine testing, reference lab and point-of-care assays. Student will conduct sample precision testing and method comparison study and design a reference interval validation study. They will also conduct a literature review, prepare research reports, presentations and manuscripts from the work completed. Publication and potential sponsorship to ASVCP student forum will be supported by Zoetis if abstract accepted.

Special Skill Requirements: Interest in clinical pathology and laboratory quality testing a plus.

Project #13

Mentor's Name and Email: Luca Giori lgiori@utk.edu

Co Mentor's Name and Email: Julia Albright jalbrig1@utk.edu & Alex Esteller-Vico a.esteller-vico@utk.edu

Project Title: Does serum cortisol concentration vary based on venipuncture site in healthy dogs?

Project Description/Area of Research: Assessing adrenal function, particularly in relation to conditions like hypoadrenocorticism, commonly involves the evaluation of basal serum cortisol concentration. Additionally, this method is employed to gauge the response to acute stressors. While the impact of venipuncture site on various biochemical and hematologic parameters is known, its influence on serum cortisol levels remains unexplored. In this summer project, we will recruit healthy dogs. A sufficient blood sample will be obtained from one site, such as the cephalic vein, followed immediately by collection from another vein, like the jugular vein (or vice versa). The study aims to analyze potential differences in serum cortisol concentration arising from distinct venipuncture sites.

Student's Role in the Project: The student's responsibilities include recruiting canine participants, coordinating sample organization, and collaborating with the statistician for data analysis. There is a possibility of exploring additional combinations of sample sites. The student will actively participate in sample analysis and gain insights into the operation of the IMMULITE analyzer utilized in the Diagnostic Endocrinology lab. Furthermore, student will engage in tasks such as conducting a literature review, preparing research reports, and presenting findings for the final COE presentation. The work conducted may lead to the development of a manuscript or poster, with potential opportunities for publication or presentation at an ASVCP conference.

Special Skill Requirements: Students should have an interest in clinical pathology, laboratory medicine and hormones.

Project #14

Mentor's Name and Email: Ashley Hartley ahartle2@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Retrospective study evaluating blastomycosis in canine patients.

Project Description/Area of Research: Blastomycosis is a common fungal infection that infects both humans, dogs, and cats in eastern Tennessee. This project aims to explore the clinical presentation and outcomes associated with canine blastomycosis in eastern Tennessee. Records will be reviewed to identify dogs that tested positive for *Blastomyces* sp. during the last 10 years. Cases with presentation to UTCVM and those with completed medical records will be further identified to characterize the current signalment, presentation, clinicopathological and imaging abnormalities associated with infections identified in referral practice. Where available, treatment protocols and outcomes will be collected to define treatment protocols chosen and treatment responses. Follow-up information from owners may be obtained via telephone interviews with owners.

Student's Role in the Project: The student will be involved with recording and organizing data collected from the UTCVM hospital record system as well as data analysis. If needed, the student will be involved in developing a questionnaire for standardized questions for interviewing owners regarding treatment outcomes. Depending on the interest and effort level in data analysis and/or manuscript preparation, opportunities for formal abstract presentation and/or manuscript authorship exist and are encouraged.

Special Skill Requirements: Enthusiasm and good organizational skills are preferred! Experience with Excel is a plus but not required.

Project #15

Mentor's Name and Email: Ashley Hartley ahartle2@utk.edu

Co Mentor's Name and Email: Rick Gerhold rgerhold@utk.edu

Project Title: Characterizing Cytauxzoon felis in cats of eastern Tennessee

Project Description/Area of Research: Cytauxzoon felis is a parasitic infection of cats that is transmitted by ticks. A recent study revealed that approximately 2.8% of Amblyomma americanum ticks found in eastern Tennessee were positive for C. felis DNA (data unpublished, Wilkinson et al). Cats with C. felis infection present to veterinary practices with a range of clinical signs, from fever, lethargy, and icterus, to acute death in severe cases. Interestingly, a subset of cats have been found to be asymptomatic carriers of the C. felis parasite. In endemic regions (such as eastern Kansas), the overall C. felis infection prevalence in asymptomatic cats was 26% (Wikander et al., 2020). The prevalence of C. felis infection in cats in Tennessee is unknown. The objective of this study is to characterize the prevalence of C. felis in cats living in eastern Tennessee using convenience blood samples from hospitalized and feral cats using a PCR assay. Location, seasonal time, and other information extracted from the history and medical records will be investigated to identify risk factors.

Student's Role in the Project: The student will be involved in all aspects of DNA extraction and PCR assay testing of collected blood samples. Additional literature search and data collection from medical records will be necessary to analyze data and prepare presentations. Students involvement in article preparation is encouraged but not required for participation.

Special Skill Requirements: Enthusiasm and organization are pluses.

Project #16

Mentor's Name and Email: Silke Hecht shecht@utk.edu

Co Mentor's Name and Email: Emi Knafo sknafo@utk.edu Danielle Tarbert dtarbert@utk.edu Linden Craig linden@utk.edu

Project Title: Incidence and radiographic appearance of the os clitoridis (baubellum) in female domesticated ferrets (*Mustela putorius furo*)

Project Description/Area of Research: The os clitoridis (baubellum) is a cartilaginous or osseous structure that is present in a variety of mammalian and other species. The domesticated ferret (*Mustela putorius furo*) has been classified as polymorphic in a previous study, with some females possessing a baubellum while others of the same age class did not. Ferrets are popular pets, and are frequently presented in veterinary practices for routine health care and the diagnostic work-up of various medical conditions. An osseous baubellum may be visible on abdominal radiographs and may be mistaken for pathology (foreign material or urethral calculus) by veterinarians unfamiliar with its radiographic appearance. The goal of this study is to evaluate the incidence and radiographic appearance of the baubellum on abdominal radiographs of female ferrets presented to UTCVM.

Student's Role in the Project: The student will function as Co-PI for this project under direct mentorship of the faculty mentors. With faculty guidance, he/she will be performing the literature review, the retrospective evaluation of abdominal radiographs in ferrets, data evaluation, and initial draft of a manuscript intended for submission to either *Veterinary Radiology and Ultrasound* or the *Journal of Zoo and Wildlife Medicine*.

Special Skill Requirements: Prior experience is not required, but a strong documented interest in radiology/diagnostic imaging is desirable.

Project #17

Mentor's Name and Email: Emi Kanfo sknafo@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Hematologic and biochemical parameters in Mexican axolotls (*Ambystoma mexicanum*)

Project Description/Area of Research: This project aims to establish normal hematologic and biochemical parameters for Mexican axolotls, as there are no normal hematology ranges published for this species, and the previously published biochemical ranges were collected using heparinized syringes, which have been shown to dilute samples and affect results in other reptile and amphibian species. This research colony of axolotls will also be used in future studies looking at fecal microbiome and metabolism of clinically significant medications (antimicrobials, analgesics).

Student's Role in the Project: The student will be responsible for checking on tank equipment functionality, feeding, and cleaning. Additionally, the student will be trained in handling and venipuncture of axolotls. Blood samples will be submitted and processed routinely, and students will assist in every step of sample collection, result evaluation, and data collation. If the student is motivated to lead manuscript writing and statistical analysis, then they will be supported in this endeavor.

Special Skill Requirements: Ideally some knowledge or amphibians and experience with venipuncture.

Project #18

Mentor's Name and Email: Stephanie Kleine skleine@utk.edu

Co Mentor's Name and Email: Rebekah DeBolt bdebolt@utk.edu Jennifer Weisent jweisent@utk.edu

Project Title: The effect of gabapentin on stress and pain in cats presenting to a low cost spay/neuter facility for ovariohysterectomy

Project Description/Area of Research: The majority of cats entering shelters require ovariohysterectomy (OVH) prior to adoption. Transportation, handling, surgery, and anesthesia can be sources of stress in this population of cats, which can result in illness and numerous physiologic and behavioral changes that decrease the chance of a successful outcome. Additionally, there is a link between post-operative pain and anxiety in people. Therefore, stress reduction prior to and during OVH is of paramount importance in shelter cats. Gabapentin is used in humans as an anticonvulsant but has known anxiolytic effects. It has been shown to reduce stress during veterinary visits in client-owned cats and shelter cats undergoing behavioral modification. The purpose of this randomized, masked, placebo-controlled trial is to evaluate the efficacy of preoperative gabapentin on stress, tolerance to handling, and pain in shelter cats undergoing OVH. Thirty-five healthy female cats will be randomized to receive gabapentin (20 mg/kg) or an equal volume of placebo orally, 2-4 hours prior to anesthesia. A standardized anesthetic and surgical protocol will be followed for each cat. Cats will be scored for stress, tolerance to handling, and pain using the cat stress score, a previously published handling score and the feline grimace scale, respectively. All scores will be assigned by a masked observer prior to the first dose of medication upon arrival to the surgical facility, at anesthetic induction, and 30, 60, 90, 120, and 180 minutes following recovery. Data will be analyzed with a mixed-effects ANOVA to evaluate the effect of treatment, time and the treatment by time interaction.

Student's Role in the Project: Stress and pain scoring cats, assisting with handling of shelter cats and anesthetic management

Special Skill Requirements: n/a

Project #19

Mentor's Name and Email: Andi Lear alear@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Biomarker discovery in pregnant cattle infected with bovine viral diarrhea virus

Project Description/Area of Research: The placenta is a transient organ, critical for the growth and protection of the developing fetus. Trophoblasts from the fetal placenta produce a variety of products, including pregnancy associated glycoproteins (PAGs) and extracellular vesicles (EV) that can function as cellular messengers. EVs are released from various types of cells and can serve as communication channels between the dam and fetus. EV cargo is comprised of proteins, lipids, and nucleic acids. Once released from the parent cell, EVs can cause a functional change in recipient cells dependent on their content. In both pregnant humans and ruminants (i.e. sheep and cattle), the production of EVs is associated with progesterone production, with higher numbers of vesicles isolated during pregnancy compared to non-pregnant cohorts. Studies in human pregnancy have linked EV content with placental dysfunction, leading to health complications for the fetus and mother. Examination of EV content in livestock is limited, thus far only evaluating normal, uncomplicated pregnancies. In susceptible, pregnant cattle exposed to bovine viral diarrhea virus (BVDV), fetal infection is common can result in an array of fetal consequences while the pregnant dam remains asymptomatic.

The overall goal of this work is to identify non-invasive circulating biomarkers in maternal blood that are associated with fetal BVDV infection. We will aim to (1) identify specific fetal and placental markers and (2) compare those markers between healthy and virally infected pregnancies thus establishing a signature of fetal health in maternal circulation.

Student's Role in the Project: The student will participate in all aspects of the continuation of this research project, initially started summer 2023, with emphasis on in-vitro work, data analysis, and manuscript preparation. The student will participate in weekly journal clubs and bi-weekly lab meetings throughout the summer.

Special Skill Requirements: In-vitro experience with immunoprecipitation, extracellular vesicle isolation, and flow cytometry

Project #20

Mentor's Name and Email: Andi Lear alear@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Assessing the nutritional and parasite management benefits of native grass as forage for small ruminant livestock

Project Description/Area of Research: Grazing native warm season grasses has the potential to enhance habitat for at-risk avian wildlife and pollinators through working lands conservation and increased resiliency of small ruminant operations through increased drought/heat/flood tolerance and soil health. To date, no studies have evaluated the nutritional and health outcomes of grazing small ruminants on native warm season forages. This study will provide a better understanding of issues important to small ruminant production in pasture settings including the role native grasses can play in small ruminant production and improved animal welfare through reduced parasite loads. This work has the potential to disproportionately benefit under-served/small/minority producers who represent a large share of small ruminant production.

The primary objectives are to 1. Document parasite load and associated health effects of sheep grazing native forages vs. traditional forages; and 2. Assess impacts of grazing switchgrass on sheep health and animal performance.

Throughout the summer, animal handling and sampling collection to achieve these objectives will be performed. Data to be collected include health parameters (i.e. body weights, FAMACHA scoring), fecal analysis, blood biochemical analysis, and liver biopsies with histopathology.

Student's Role in the Project: The student will participate in all animal work required to meet study objectives outlined above. With direct supervision and training from the principal investigator and veterinary nurse the student will become proficient with sheep procedures including FAMACHA scoring, jugular blood collection, fecal collection, and percutaneous liver biopsy collection. Laboratory work will consist of fecal floatation and fecal egg counts with associated data management. The student will be expected to participate in weekly journal clubs and laboratory meetings. The student will be encouraged to present the data collected over the summer at the CVM research day and national meeting of interest.

Special Skill Requirements: No previous experience is required. An interest in small ruminants and previous sheep handling experience would be beneficial but not necessary.

Project #21

Mentor's Name and Email: Sarah Linn-Peirano slinn2@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Retrospective Evaluation of Clinical and Pathologic Features of Canine Lyme Nephritis

Project Description/Area of Research: In dogs, Lyme nephritis is a protein-losing nephropathy due to immune-complex glomerulonephritis associated with *Borrelia burgdorferi*. Although uncommon, this disease can be rapidly progressive and fatal. Clinically, the diagnosis is reliant upon serology and the absence of other causes including absence of other infectious agents that may cause glomerulonephritis. Definitive diagnosis can be difficult as, even with clinical signs such as lameness associated with Lyme arthritis, proteinuria with positive serology does not necessarily prove cause-and-effect (2018 ACVIM Consensus Statement on Lyme disease in dogs). In fact, less than 30% of dogs with Lyme nephritis have a history of arthritis. Additionally, less than 2% of dogs that are seropositive for *B. burgdorferi* have proteinuria. To further complicate this disease, dogs can have co-infections with other vector-borne infectious diseases, there are no validated techniques demonstrating that the immune complexes are specific to *B. burgdorferi*, and there is no experimental animal model available to research this disease.

Histopathologically, previous reports have stated Lyme nephritis can be suspected in dogs when there are 3 lesions seen simultaneously: immune-complex glomerulonephritis, diffuse tubular necrosis with regeneration, and interstitial nephritis (Dambach et al, Vet Path, 1997). However, regardless of the cause, longstanding glomerular disease can predispose to tubular degeneration, necrosis, and interstitial nephritis. This can complicate the diagnosis of Lyme nephritis and these lesions may, therefore, not necessarily be specific to this disease. Furthermore, renal immunohistochemistry and PCR detection of *B. burgdorferi* in canine glomerulonephritis is variable and inconsistent. Additional research is necessary to determine if there are other predictors of Lyme nephritis such as signalment, clinical data (chemistry, urinalysis, physical exam findings), histopathologic characteristics, immunofluorescence reactivity, electron microscopy characteristics, or urine protein analysis.

The International Veterinary Renal Pathology Service (IVRPS), based out of Texas A&M University, is a comprehensive diagnostic service focused on veterinary renal and urinary tract pathology with over 4000 submissions since its initiation. This service provides histopathology, immunofluorescence, transmission electron microscopy, and urine sodium dodecyl-sulfate polyacrylamide gel electrophoresis (SDS-PAGE) analysis for patients with renal disease. In collaboration with the IVRPS, I am conducting a comprehensive retrospective study of canine glomerulonephritis to determine predictors of Lyme nephritis. From 2008-2023, the IVRPS has diagnosed immune-complex glomerulonephritis in >900 dogs with and without documented *B. burgdorferi* infection (serology or PCR). The goal of this project is to evaluate the records from these submissions to determine what factors, if any, are specific to canine Lyme nephritis. The results of this retrospective study could lead to improved diagnosis and treatment of Lyme nephritis.

Student's Role in the Project: The student involved with this project will conduct a thorough records search from the IVRPS to document the clinical and histopathologic data of canine patients with immune-complex glomerulonephritis with and without *Borrelia burgdorferi* exposure/infection. These results will be compiled to perform large scale statistics to determine if there are pathognomonic lesions of Lyme nephritis compared to non-Lyme disease associated immune-complex glomerulonephritis.

The student will learn histopathologic, immunofluorescence, and electron microscopic features of canine immune complex glomerulonephritis. They will also gain exposure to and understanding of clinicopathologic data associated with canine glomerulonephritis. The student will learn how to interpret urine SDS-PAGE protein analysis to determine if proteinuria is secondary to glomerular disease, tubular disease, or both.

The student will be expected to have routine check-ins with me and will have the opportunity to attend various pathology-focused rounds throughout the summer.

When completed, the results and conclusions of this large-scale study will be submitted for publication and, at minimum, the student will be considered a co-author. Depending on their level of interest, the student can draft the manuscript under my mentorship, resulting in first authorship.

The student would also have the opportunity to present their findings at an external academic conference, such as the American College of Veterinary Pathologists meeting.

Additionally, separate from this proposed project and not mandatory, if the student is interested in basic science techniques, there are opportunities available through my laboratory to develop that skill set. Examples of techniques performed in my lab include sterile tissue culture, bacterial culture, PCR, Western blotting, and/or ELISA.

Special Skill Requirements: A basic understanding of renal microanatomy is desired.

Project #22

Mentor's Name and Email: Danae LoBato dlobato@utk.edu

Co Mentor's Name and Email: Wesley Sheley, wsiniard@utk.edu

Project Title: Retrospective evaluation of cutaneous and subcutaneous plasmalipomas in dogs

Project Description/Area of Research: Both cutaneous and subcutaneous plasmacytomas and lipomas are common, benign neoplasms in dogs. However, few reports exist describing single tumors (plasmalipomas) made up of both neoplastic lineages. Recently, our biopsy service has noted a subjective increase in the diagnosis of plasmalipomas. We wonder if this distinct entity has historically been misdiagnosed, or if this subjective increase in cases represents a true increased frequency in the occurrence of these neoplasms. This proposed retrospective study would include a search for cases in the University of Tennessee College of Veterinary Medicine database over the last 10 years to identify and reevaluate potential cases of cutaneous and subcutaneous plasmalipomas, and determine associated signalment and anatomic distribution. In doing so, we hope to be able to characterize the salient features of these historically under-recognized neoplasms to increase awareness and diagnostic accuracy within the pathology community.

Student's Role in the Project: The chosen student will be involved in the project at every stage. They will construct and perform a search of the UTCVM database to identify potential cases of plasmalipomas. They will then collect slides from the histology archives, and evaluate them microscopically. For the neoplasms that they identify as plasmalipomas, they will compile the corresponding signalment and anatomic distributions. Statistical analysis will be performed to identify correlations or predisposing risk factors for the development of these tumors. Students will gain knowledge and experience in crafting a database search, in interpreting microscopic slides, conducting statistical analyses, and presenting research.

Special Skill Requirements: Just a lot of enthusiasm!

Project #23

Mentor's Name and Email: Debra Miller dmille42@utk.edu

Co Mentor's Name and Email: Samantha Kuschke skuschke@vols.utk.edu

Project Title: Investigating Sea Turtle Health

Project Description/Area of Research: There are three major areas of this project, one is to participate in an investigation into the presence of the fungi response sea turtle egg fusariosis in Boca Raton and Juno Beach Florida. The second is to aid in the establishment of reference intervals for packed cell volume (PCV), total protein (TP), and agarose gel electrophoresis in 4–5-week-old loggerhead sea turtles. Lastly, the student will participate in a long-term investigation of the pathology observed in dead-in-nest leatherback hatchlings.

Student's Role in the Project: Assist with nest inventory, data analysis, sample collection, and possibly husbandry of hatchling sea turtles. Perform necropsies on dead-in-nest turtles and analyze necropsy findings in conjunction with temperature data. The student will also have the opportunity to perform hatchling blood collection for the blood analyte analysis and DNA extractions on sand samples.

Special Skill Requirements: Must be willing and able to live near the field site (Boca Raton, FL) for the duration of the program. A strong desire to work with sea turtles and perform field work is also necessary.

Project #24

Mentor's Name and Email: Debra Miller dmille42@utk.edu

Co Mentor's Name and Email: Matthew Gray mgray11@utk.edu Danielle Galvin dgalvin2@utk.edu

Project Title: Evaluating the toxicity of the plant-derived fungicide, curcumin, in freshwater invertebrates, fish, and amphibians.

Project Description/Area of Research: Previous research in the UT Amphibian Disease Laboratory has identified that curcumin can inhibit the growth of *Batrachochytrium salamandrivorans* (Bsal), a novel fungal pathogen of amphibians. Our future work will evaluate the toxicity of curcumin to a suite of target and non-target invertebrate, fish, and amphibian species through a series of EC50 and LC50 studies.

Student's Role in the Project: The student will lead controlled experiments to evaluate the toxicity of curcumin in target and non-target species. The student will participate in designing and implementing the experiments. The student will learn invertebrate, fish, and amphibian husbandry and how to monitor for signs of acute toxicity, perform humane euthanasia, prepare tissues for histological examination, and identify microscopic signs of acute toxicity. The student will participate in data collection, statistical analyses, and manuscript writing. It is anticipated that at least one peer-reviewed journal article will be produced.

Special Skill Requirements: Previous experience with animal husbandry is preferred. The student should have a strong interest in performing research, ideally with wildlife species. The student must be comfortable with performing euthanasia and necropsying animals used in the experiment.

Project #25

Mentor's Name and Email: Darryl Millis, dmillis@utk.edu

Co Mentor's Name and Email: Cassio Ferrigno cferign@utk.edu

Project Title: Biomechanics evaluation of VetWelding resorbable pin and plate system on cadaveric simulated metatarsal bone fractures

Project Description/Area of Research: This project will evaluate a new resorbable pin and plate system in veterinary medicine. This may be of benefit to toy and miniature dogs with metacarpal and metatarsal fractures. Challenges in small dogs include bones that are too small for conventional plates and screws, and the lack of a medullary canal to place intramedullary pins. The new VetWelding system uses resorbable plates and pins which begin resorption within 60 days and are available in small sizes. An additional potential of a resorbable system is placement of pins in the fracture line. Traditional plates and screws should not have screws placed in the fracture line because it may result in delayed healing. However, placement of resorbable pins in a fracture line may be acceptable. Initial assessment suggests that placement of resorbable pins in the fracture line significantly increases construct strength and stiffness in cadaveric rabbit metatarsal bones. The specific aims of this project are to evaluate the biomechanical properties of VetWelding resorbable plates and pins placed in traditional fashion (avoiding the fracture line) with pins placed within the fracture line of cadaveric rabbit metatarsal bones. Sixty rabbit metatarsal bones have been harvested and frozen. Bones will be thawed, kept moist with saline-soaked gauze, and 4-point biomechanical testing will be performed to determine strength, stiffness and elastic modulus of bones using an Instron materials testing machine. Repair will be performed using different lengths of resorbable plates, and with pins placed in conventional fashion and within the fracture line. Groups will be 1) 6 pins and plate placed in conventional fashion (n=10); 2) 6 pins and plate placed with 3 pins in the distal bone segment, 2 pins placed in the proximal bone segment, and 1 pin placed in the fracture line (n=10); 3) 7 pins and plate placed with 3 pins in the distal bone segment, 3 pins placed in the proximal bone segment, and 1 pin placed in the fracture line (n=10); 4) 10 pins and plate placed in conventional fashion (n=10); 5) 10 pins and plate placed with 5 pins in the distal bone segment, 4 pins placed in the proximal bone segment, and 1 pin placed in the fracture line (n=10); 6) 11 pins and plate placed with 5 pins in the distal bone segment, 5 pins placed in the proximal bone segment, and 1 pin placed in the fracture line (n=10). This experimental design will address concerns regarding differences in pin numbers when pins are placed in the fracture line, and the number of stabilizing pins to determine if more pins provide greater biomechanical performance. 4-point biomechanical testing will be repeated to determine strength, stiffness and elastic modulus of the constructs using an Instron materials testing machine. Strength, stiffness, and elastic modulus results will be assessed for normality. Assuming normality, one-way ANOVA testing will be used to assess for treatment differences using treatment as the variable.

Student's Role in the Project: The student will perform biomechanical testing, with appropriate instruction and guidance, and placement of implants after training provided by the company and under supervision. The student will enter data and work with the statistician to evaluate the results. Development of a first draft of the manuscript is expected, and with appropriate progress, the student would be first author on a manuscript submitted to a journal for publication. It is also likely that presentation of the results at a national meeting is possible.

Special Skill Requirements: An interest in orthopedic surgery.

Project #26

Mentor's Name and Email: Maryanne Murphy mmurph30@utk.edu

Co Mentor's Name and Email: Phil Myer pmyer@utk.edu

Project Title: Investigation of bacterial growth in conventional water bowls and water fountains used for companion animals

Project Description/Area of Research: Small animal pet feeding practices, such as water bowl hygiene have important health concerns for both pets and humans. This aspect gains particular significance in light of the "One Health" principle, emphasizing the interconnected health relationship among humans, animals, and the environment. Indeed, neglecting proper water bowl hygiene can create conditions conducive to microbial contamination in domestic environments, including areas where human food is prepared and stored. Additionally, pet water bowls may serve as a vector for bacterial transmission. Notably, a study by Donofrio et al. [1] identified pet toys and pet water dishes as having the highest bacterial counts (median total mesophilic aerobic bacteria counts, TMABc ranging between 10² and 10³ cm²), indicating that pet-related items could potentially be a source of microbiological contamination. Therefore, the overall objective of the current study is to determine de novo microbial growth potential and microbial colonization of inoculated bacterial strains of conventional pet water bowls, conventional pet water fountains, and a novel fountain.

This project is a joint study with Radio Systems Corporation to determine bacterial growth in conventional water bowls, both plastic and stainless steel, vs. the bacterial growth in both submersible pump and centrifugal force fountains. The hypothesis is that moving water in a pet fountain reduces bacterial growth, and therefore, is better for domestic pet use and safety. The objectives of the study include:

1. Determine de novo bacterial growth in conventional plastic and stainless-steel bowls, submersible pump drinking fountains, and centrifugal force fountains.
2. Identify differences in de novo bacterial growth and growth of inoculated bacterial strains in conventional plastic and stainless-steel bowls contrasted to submersible pump drinking fountains, and centrifugal force fountains.

The results of this study will help support the hypotheses that the use of pet drinking fountains will improve domestic pet use and safety than drinking from conventional water bowls, and that fountain types will impact water quality.

Student's Role in the Project: The student's role in this project will include experimental design/setup/implementation using the pet fountains and bowls supplied by the manufacturer. The student will be responsible for bacterial counts resulting from de novo bacterial growth, DNA sequencing of bacteria identified from de novo bacterial growth using the 16S rRNA gene, bacterial culture of inoculated bacterial strains, and all sampling procedures. For both objectives, all water receptacles will be tested using five replicates and the results of each sample will be recorded and then plotted over time to determine de novo bacterial growth time or inoculated growth time for each receptacle.

The student will be responsible for all statistical analyses to be completed at the conclusion of the experiment. The student will learn how to design and run a laboratory experiment, culture bacteria, sequence bacterial DNA, produce results ready for peer-reviewed journal publication, and statistically

analyze results. A published peer-reviewed journal article in a veterinary journal will ultimately result as the primary research output from the study.

Special Skill Requirements: Prior bench laboratory experience is recommended. Although experience with bacterial culture is beneficial, it is not required.

Project #27

Mentor's Name and Email: Girish Neelakanta gneelaka@utk.edu

Co Mentor's Name and Email: n/a

Project Title: Identification of pathogens in ticks collected from animals in Tennessee

Project Description/Area of Research: Ticks transmits various pathogens such as Lyme disease agent, Anaplasma phagocytophilum, Babesia microti and others to animals and humans. We have a collected ticks from deer. Previous COE student has isolated DNA from these samples and has done some PCRs and analysis. The incoming COE student will continue performing molecular analysis to detect and identify various pathogens in these samples. These findings will help us to identify pathogens in ticks collected from deer in Tennessee.

Student's Role in the Project: The student will learn techniques related to basic molecular biology such as DNA extractions, Quantitative PCR, Agarose gel electrophoresis, gel imaging, DNA sequencing, sequence analysis and bioinformatics.

Special Skill Requirements: N/a - This is wet-lab research. DVM students will be exposed to various molecular techniques that are essential in their future academic/research career.

Project #28

Mentor's Name and Email: Charity Owings cowings1@utk.edu

Co Mentor's Name and Email: Richard Gerhold rgerhold@utk.edu

Project Title: Using blow flies as biological drones to remotely detect wildlife pathogens and parasites in Tennessee

Project Description/Area of Research: One of the toughest challenges in wildlife disease research is detecting real-time threats in animal populations. Often, we don't know that an outbreak is even occurring until the damage is done. These challenges are exacerbated by the difficulty in locating carcasses of animals that have succumbed to deadly diseases, due to natural decomposition processes and vertebrate scavenging. When diseased carcasses cannot be recovered, it becomes almost impossible to assess mortality in a timely manner and determine the causative agent of population declines, which negatively impacts the chances of mitigating the situation to prevent disease spread. However, there is a way to easily and efficiently locate and sample carcasses using the insect scavengers that have evolved to do that very thing. Blow flies can quickly find and utilize carrion while simultaneously acquiring important biological and chemical information from the tissues. Furthermore, given their small dispersal radius and ease of capture, information contained within their bodies reflects the resources present in the local environment. Therefore, we propose using this insect as a non-invasive, cost- and energy-efficient method to track and mitigate wildlife disease outbreaks. This research will significantly improve the ability of wildlife biologists to assess mortality resulting from disease outbreaks, as well as the ability to detect pathogens circulating in the environment that are not "on the radar". As blow flies are found everywhere on Earth except Antarctica, this method can be used worldwide with nearly all terrestrial animal species.

Student's Role in the Project: The student will be performing both field and laboratory work. Fieldwork will include using an aged chicken liver bait to capture wild blow flies at several locations in Eastern TN, which will be replicated throughout the summer semester. The student will then be trained in basic fly identification and dissection to determine the species, sex, and reproductive status of each fly. The fly guts will then be used for molecular and diagnostic screening. The student will be trained in basic molecular benchwork in order to screen the wild flies for targeted pathogens (e.g., *Histomonas meleagridis*), as well as host DNA (i.e., the carcass fed on by the fly). This will include DNA extraction and purification, PCR amplification at specific loci, gel electrophoresis, and preparation for sequencing. The student will also gain basic skills in bioinformatics and phylogenetic analysis to apply to sequencing results. In addition to the pathogen and host DNA screening, the student will be trained by Dr. Gerhold to use flotation to extract parasite eggs, followed by slide preparation and microscopic examination to identify the parasites on board. The student will use data obtained in this project to build a map of host, pathogen, and parasite incidence in Eastern TN. They will also statistically examine the relationship of fly species, fly reproductive status, geographic location, timepoint, and other abiotic factors (e.g., temperature, precipitation) on detection of host/pathogen DNA and parasites in flies. In addition to examining wild flies, the student will also gain experience in basic insect husbandry by maintaining a laboratory colony of blow flies throughout the length of this project. Time permitting, the student will have the opportunity to assist Dr. Owings with controlled experiments using these flies.

The student will also be required to attend weekly meetings in the Owings lab where they will give an update about the progress of their research and participate in discussions of the primary literature. The student will also be required to give a practice presentation to the lab at the end of the semester summarizing their research in order to prepare them for their final presentations to the CVM.

Special Skill Requirements: No experience is required. The student should have a strong stomach and be excited to perform both field and lab work.

Project #29

Mentor's Name and Email: Sree Rajeev srajeev@utk.edu

Co Mentor's Name and Email: Liana Barbosa, lbarbos2@utk.edu

Project Title: Developing a Point of Care Diagnostic test for leptospirosis

Project Description/Area of Research: Leptospirosis is one of the most widespread zoonotic diseases that can cause fatal disease in humans and animals. Leptospira, the spirochete bacteria that causes this disease is harbored in the kidney of reservoir animals and are excreted to the environment through urine. Our laboratory works on various aspects of Leptospirosis including epidemiology, microbiology, diagnostics, host pathogen interaction, and vaccine development. Successful treatment depends on timely diagnosis. Leptospirosis is an underdiagnosed disease and development of sensitive and specific diagnostic tests to perform patient side diagnosis is urgently needed. This project will focus on developing a Point of Care antigen detection assay for timely diagnosis of Leptospira infection in animals and humans.

Student's Role in the Project: The student will be trained in Leptospira detection methods and specific techniques needed to the project. The student will participate in weekly lab meetings, prepare lab reports, presentations and manuscript preparations. Based on the outcome of the project, student may get an opportunity to present the study in a national meeting such as VSS, CRWAD or AAVLD

Special Skill Requirements: No, we will teach you everything!

Project #30

Mentor's Name and Email: Joe Smith jsmit604@utk.edu

Co Mentor's Name and Email: Pierre-Yves Mulon; pmulon@utk.edu

Project Title: The pharmacokinetics of transdermal flunixin in domestic sheep

Project Description/Area of Research: Flunixin meglumine is a non-steroidal anti-inflammatory that has been a component of analgesia and animal welfare in many domestic species. Several years ago, a new formulation that could be applied to the skin was released for cattle. The bioavailability of this formulation in alpacas and meat goats has been investigated, and was low at approximately 25%. However, due to the differences encountered in the skin of the sheep this formulation should be more likely to be absorbed, and as such, could be a useful tool for improving animal welfare and expanding pain mitigation species. The goal of this project will be to determine pharmacokinetic parameters such as maximum concentration, time to maximum concentration, elimination half-life, clearance and volume of distribution that will allow for the clinical use of this product in sheep. This projects area will be primarily clinical pharmacology.

Student's Role in the Project: The student will be involved in all aspects of the study. Physical examination, daily assessments, as well as training on intravenous catheter placement will occur. The student will also participate in sample collection, pharmacokinetic data modelling, as well as conducting a literature review. The student will also have the ability to observe the analytical chemistry processes associated with plasma drug quantification. If mutually agreeable to both parties, the student will also be able to assist with other COE projects.

Special Skill Requirements: An open mind and willingness to work with sheep (or learn to work with sheep) would be desirable. The mentors anticipate on the job training for the technical aspects of this project.

Project #31

Mentor's Name and Email: Nora Springer nspringer@utk.edu

Co Mentor's Name and Email: n/a

Project Title: The effect of overweight and obesity on canine adult stem cell pro-angiogenic function

Project Description/Area of Research: Regenerative medicine treatments are becoming more popular in veterinary medicine and aim to repair or replace damaged tissues through biologic therapies such as adult stem cells. Adipose tissue is a common source of adult stem cells, adipose stromal cells (ASC), used in regenerative therapies. ASC can be isolated from the patient (autogenous) or a donor (allogenic) and autogenous ASC are currently preferred to minimize risk of an adverse reaction. In people, there is strong evidence that ASC collected from individuals with overweight or obesity have reduced regenerative capabilities, such as reduced angiogenic function. Whether the body condition of canine donors negatively impacts pro-angiogenic capabilities of ASC is unknown.

We will test the pro-angiogenic function ASC cell lines derived from lean, overweight, and obese dogs on canine endothelial cells. Assays to be performed include transwell migration assays and tube formation assays. We expect that ASC isolated from overweight and obese dogs will have reduced stimulation of angiogenesis, versus ASCs isolated from lean dogs. This knowledge is critical to refine best practices for regenerative medicine, such as using allogenic ASCs from lean donors versus autologous ASCs from overweight and obese patients.

Student's Role in the Project: The student will learn cell culture techniques and be responsible for maintaining canine ASC and endothelial cell cultures. The student will learn about in vitro study design, including selecting appropriate control samples. The student will learn immunofluorescence staining, fluorescence microscopy, and image analysis. Basic statistical analysis and data presentation will also be covered. This project is expected to result in a publication and there is potential for the student to be included as a co-author on that manuscript.

Special Skill Requirements: N/a

Project #32

Mentor's Name and Email: Hameeda Sultana hsultana@utk.edu

Co Mentor's Name and Email: Daniel Mathew and dmathew@utk.edu

Project Title: Surveillance of emerging tick/mosquito-borne pathogens in farm cows

Project Description/Area of Research: In this research project, we will carry out the surveillance of bovine samples collected at the local slaughter house in Knoxville, TN. We will screen for tick-borne and mosquito-borne pathogens in these farm cows' tissues. In collaboration with Dr. Mathew, we have collected and stored tissues and we will continue collecting more tissues to add to our repository. The hypothesis of this work is to screen farm cows (tissues collected from slaughter house) for carrying tick/mosquito-borne diseases in Knox County farms. We believe that the project goals are very straight forward and will address if any local farm cows are targets of tick/mosquito-borne diseases. If we find any cow tissues being positive for a panel of tick/mosquito-borne microbes, we will prepare a consolidated report and will expand this study with the TN public health department to enhance our knowledge on vector-borne diseases presented in our local farm cows.

Student's Role in the Project: The summer research student working on this project will lead and assist in isolation of total RNA, cDNA synthesis, and performing real-time Quantitative analysis (QRT-PCR). The student will also be learning and then designing primers for a panel of tick/mosquito-borne microbes. The primers will be used for preparing amplified products of these microbial genes of interest that will be used as standards in the QRT-PCR analysis. The student will also be responsible for running DNA agarose gels, documentation of gels in imager and for analyzing the correct product sizes for each of these microbial genes of interest. The student will be also involved in going to slaughter house to collect additional tissues samples, when needed. The student will be analyzing data and interpretations of the results and will be presenting the project results and outcomes to different groups (PI's lab members, at UTCVM presentation, and if given the Boehringer Ingelheim (BI) award at the National Veterinary Symposium conference August 8-10th in St. Paul Minnesota. In addition, the student will be encouraged to present the research at any veterinary conference.

Special Skill Requirements: None (the student needs to be self-motivated to be leading this study).

Project #33

Mentor's Name and Email: Brian Whitlock bwhitloc@utk.edu

Co Mentor's Name and Email: Chiara Hampton champ14@utk.edu

Project Title: Integrated Multimodal Approach for Understanding and Diagnosing Mild Traumatic Brain Injury Using a Porcine Model

Project Description/Area of Research: The project aims to develop a multi-disciplinary approach to understanding the mechanism and diagnosing traumatic brain injury (TBI), particularly mild TBI (mTBI). The current diagnostic methods, such as the Glasgow Coma Scale and Military Acute Concussion Evaluation, have limitations in providing conclusive diagnoses or clear classification of TBI severity. The project focuses on an integrated multimodal team science approach to gain new insights into the mechanism of mTBI, damage to the brain, neurochemicals produced, and new methods for detection.

Major Goals and Specific Aims:

Aim 1: Build and test a custom-made pressure wave blast device to induce mTBI in swine. The device aims to mimic blast induced TBI in humans.

Aim 2: Induce mild TBI in swine using the pressure wave blast device and collect biofluids for biomarker identification. The study involves examining physical, neurological, behavioral, and clinical parameters before and after treatment administration.

Aim 3: Collect biomechanical data before, during, and after mTBI induction. This includes, pressure wave and accelerometer data, and 2D kinematic data to understand the impact on the swine model.

Aim 4: Identify mTBI biomarkers through assays and NMR and develop a multiplexed plasmonic point-of-care sensor. The goal is to synthesize nanoparticles, functionalize them, and conjugate with antibodies for target analytes. The developed sensor will be characterized, and biomarkers will be measured in biofluids.

Student's Role in the Project: We are seeking a student to actively contribute to a multidisciplinary research project aimed at understanding the mechanisms of mild traumatic brain injury (mTBI) and developing diagnostics. The project involves collaboration between the Chemistry Department, Department of Kinesiology, Recreation & Sport Sciences, and Large Animal Clinical Sciences.

The student will work with and assist Drs. Whitlock and Hampton and the graduate student working on this study. The student will primarily focus on the analysis of pig behavior in the study, utilizing Behavioral Observation Research Interactive Software (BORIS), accelerometry data, T-maze, Open Field, and Inclined balance beam. The student may also work with other aspects of the study, but the behavior related portion of the study will be their focus. The student will learn about normal pig behaviors and how to evaluate animal behaviors.

Special Skill Requirements: n/a