

Summer Opportunities CCVM

1. BASIC RESEARCH:

What to do: Go over the possibilities, choose what interest you and then contact the faculty. Once you both agree on the project, fill out the application (found it this e-mail).

- a. Dr. Jean Hall: Pregnant cow Se supplementation project.
- b. Dr. Brianna Beechler: Transmission of Disease in free-ranging wildlife.

Summary of projects:

My research focuses on transmission of disease in free-ranging wildlife. I am currently working with a variety of wildlife species including bighorn sheep, african buffalo, walrus, bobcats, and garter snakes. All research opportunities involve lab work and data analysis. Very few involve direct animal handling, as the samples have been collected and are stored. If you are interested in a summer research opportunity in wildlife please come talk to me to hear the options so we can match one to your interests. Several specific options include (but are not limited to):

- 1) Working with an undergraduate honors student, me and Dr. Justin Sanders to help understand links between changes in walrus diet (due to climate change) and impacts on walrus parasites and intestinal microbiome. The samples are being collected from St. Lawrence Island hunters this winter/spring, so will need to be processed over the summer. If the student is interested there is the ability to lead a publication out of this work.
 - 2) Evaluating blood smears from hundreds of garter snakes to understand links between kidney function and breeding success. This work will likely result in co-authorship on a publication led by co-investigators in Australia.
 - 3) Evaluating blood smears from hundreds of bighorn sheep, along with performing fecal chlorophyll analysis, to understand links between immunity and nutrition at a population level. If the student is interested there is the ability to lead a scientific publication out of this work.
 - 4) Analyzing disease data from more than 40 years of captures of desert bighorn sheep in the Mojave desert. This project is all data analysis and will result in a publication to be led by the student. This can begin during the academic year if one wishes.
 - 5) Additionally Dr. Jolles and I have one shared project, evaluating the role of hedgerows in free-range chicken production. This project would involve running an experiment in Corvallis with chickens, conducting the data analysis and may result in a publication if the student wishes.
- There are other options so if you have specific interests in free-ranging wildlife research please come talk to me.

- c. Dr. Michael Kent: Molecular taxonomy of *Neorickettsia* spp from *Nanophyetus salmincola* and dogs with salmon poisoning.

Summary of the Project:

Salmon poisoning in dogs, caused by *Neorickettsia helminthoeca*, is very common in Oregon, and most dogs will die if not treated with antibiotics following infection by this bacterium. Most, but not all, dogs show some level of resistance to reinfection following recovery. The trematode *Nanophyetus salmincola* is known as the carrier of *Neorickettsia helminthoeca*. The bacteria are maintained through the complex life cycle of *N. salmincola* that involves snails *Juga plicifera* as the first intermediate host, salmonid fishes as the second

intermediate host and fish-eating mammals as definitive hosts. *N. salmincola* was also found to harbor a second species of *Neorickettsia* that causes the Elokomin fluke fever disease (EFF) which has clinical signs similar to SPD in bears, but only low grade illness in dogs. More importantly, we recently identified *N. salmincola* as the vector of yet additional species of *Neorickettsia* known as *Stellanchasmus falcatus* (SF) agent using DNA sequencing. This was based on screening metacercariae of this fluke from local salmon. Importantly, this novel *neorickettsia* for Oregon also causes disease in dogs. Hence, dogs that show a second bout of salmon poisoning, which is usually milder, may be a result of infection by the SF agent. Or vis versa, their first infection was due to SF and hence were not protected by the original agent.

Working with our colleague Dr. Vasyl Tkach, Univ N. Dakota (the world's expert on *Neorickettsia*) the student will screen *Nanophyetus* from snails and salmon, and blood from dogs afflicted by salmon poisoning for *neorickettsia* in attempt to expand our knowledge of these bacteria in Oregon and their roles in salmon poisoning. The above will be first be screened with our general *neorickettsia* primers, a real-time PCR protocol targeting a 152-bp portion of the 3' end of the heat shock protein coding gene, GroEL, described by Greiman et al. (2014). Samples that test positive for *neorickettsial* DNA will be verified using a nested PCR protocol amplifying a 1370 bp fragment of the 16S rRNA gene as described by Greiman et al. (2014) with subsequent sequencing of PCR products for molecular taxonomy.

I have already identified a 1st year student for this project, Ms. Shawn LaBelle, and she is enthusiastic about the project. She has worked in local vet clinics as a technician and hence has direct connections to obtain dog blood samples. Moreover, I know her from taking my BHS329, and I am confident that she is a mature, intelligent and dedicated student.

d. Dr. Stephen Ramsey: Cancer -Related projects

e. Dr. Dan Rockey: Ovine Enzootic Abortion (OEA)

Summary of the Project:

Ovine Enzootic Abortion (OEA) is a disease associated with infection of pregnant ewes by the bacterial pathogen *Chlamydia abortus*. This pathogen is present in sheep flocks in most countries and can be a very significant burden both in terms of sheep health and economic productivity. Vaccines are available but there are significant concerns both about their efficacy and, in the case of the live attenuated vaccine, their safety to sheep and to pregnant farm workers. We are developing a long-term program that will examine vaccine strains and their specific antigenic profile, with an overarching goal of identifying antigens that may be different in the native organisms (i.e. the pathogen in the sheep), as compared to the organism grown for production of vaccine. We hope that this can lead to the development of a more commonly useful vaccine for protection against OEA. Over the past several years, my research group has worked to develop collaborations with diagnosticians, veterinarians, and producers that have an interest in this disease. This has led to both a very useful knowledge base that stretches from individuals working directly with lambing ewes, through laboratory researchers that have expertise in the molecular biology and growth of the bacterium. We have interacted with individuals at diagnostic laboratories in Oregon and Idaho and large-scale producers in Oregon to acquire placental samples from over 15 field abortions. Infected tissues have from several of these samples, as well as the purified bacteria that were collected from the tissue, have been aliquoted and stored for analysis. We have genome-sequenced all of these bacteria, either directly from the placental sample or following serial passage in the laboratory. The overarching, long-term goal of this work is to understand why *C. abortus* can persist within sheep

populations in the face of both vaccine-based immunity and natural immunity following an abortion. We hypothesize that antigenic variation by these bacteria *in vivo* may play a role in this persistence. We are interested in having summer students explore this hypothesis and conduct research that will allow a deeper analysis of the problem.

- f. Dr. Carla Schubiger: Marine and freshwater aquaculture pathogens and the innate immune response of aquatic animals.
- g. Dr. Kathy Magnusson: The Magnusson lab's research is focused on cognitive abilities, such as memory and flexibility, and the mechanisms underlying alterations in these functions due to aging, Alzheimer's disease or gut microbiota. We are currently engaged in examining synaptic transmission in brain slices with the use of electrophysiology, immunohistochemistry and Western blotting to study Alzheimer's disease in mouse models, examining the effects of military experience or the effects of multivitamins on brain aging in humans with the use of cognitive testing, and the role of specific bacteria in the gut on anxiety.
- h. Dr. Luiz Bermudez: Three possible projects for the Summer are:
 - 1. Research on the mechanisms of disease (infection or dissemination) of the *Mycobacterium paratuberculosis* in the bovine host.
 - 2. Research on the testing of an airway vaccine against *Mycobacterium bovis* infection.
 - 3. Study the aspects of quinolone resistance in pathogens infection small animals.
- i. Dr. Sreekanth Puttachary: "My laboratory investigates the effect of drugs that target the endocannabinoid system to slow down/prevent the progression of epilepsy using rodent models. In these models, we use a long-term continuous wireless video-EEG acquisition, brain slice electrophysiology, immunofluorescence and molecular biological techniques to determine the effectiveness of the candidate drugs".
- j. Dr. Patrick Chappell: The Chappell lab focuses on the role of the intracellular circadian clock on neuronal activity, reproduction, and cancer initiation.

Potential Student Projects:

The neuropeptide Kisspeptin is crucial for pubertal progression and normal reproductive function, in females allowing ovarian estrogen (E2) to exert both positive and negative feedback. We have recently created two novel immortalized neuronal cell lines derived from female mouse brain, which are highly similar to native Kisspeptin neurons conserved across mammals. Using these representative *in vitro* models, we have gathered RNA-seq data suggesting important E2-responsive changes. Students will use real-time qRT-PCR to confirm differential changes in gene expression of proteins involved in cell-cell communication, neuronal excitability, and neuropeptide reception.

Our lab has also been exploring the effects of inappropriate light at night (LAN) exposure and subsequent circadian clock disruption in the initiation of mammary cancer, using mouse *in vivo* models. Preliminary studies have shown profound effects of LAN exposure on clock rhythms within mammary tissue, as measured by *in vivo* bioluminescence rhythms in transgenic mice, as well as significant epigenetic changes in cancer pathway genes. Students will have the opportunity to probe how components of the circadian clock are interacting with tumor suppressors to modulate their expression and activity, as well as quantifying changes in DNA damage in mice exposed to LAN.

- k. Dr. Christiane Loehr: My research interests fall into three areas: 1. Diagnostic pathology, especially development of diagnostic assays, pathology of aquatic animals and new world camelids, and forensics; 2. Cancer biology and diagnostics; and 3. Pedagogy and instructional technology. Examples of past projects in each of the three areas follow: Alkaline phosphatase staining in canine osteosarcoma cells *ex vivo*; Mycobacteriosis in a seahorse colony; Placental insufficiency in alpacas and llamas; The microbiome of healthy rabbits in the early postmortem interval; Effect of bioactive compounds from foods on viability of feline sarcoma cells; Atlas of the octopus. Summer projects are available in each of the three areas of interest.

l. Dr. Natalia Shulzhenko: Biobank of Microbiota of Dogs and Cats

In the last decade, we learned about the importance of gut commensal microorganisms (collectively called microbiota) in health and disease of humans and different animal species. Several studies have established that there are many alterations in the gut microbiota that accompany chronic inflammatory disorders, infectious diseases and cancer. Importantly, the disease (or protection from it) can be frequently transferred with microbiota to a new host supporting the idea that these microbes are not just bystanders but are active participants in the disease process.

At the Carlson College of Veterinary Medicine, we have started a biobank of microbiota of dogs and cats that will include different breeds on different diets, healthy and diseased, to capture most of the variability among pets.

Collected samples will include nasal, oral, rectal swabs and fecal material. Animals attending small animal hospital at OSU will have samples collected (with the owner consent), stored and information recorded in the chart.

Samples will be preserved in the way appropriate for DNA isolation for microbiota analysis.

m. Dr. Kathy O'Reilly:

1. Enterococci. are the second most common cause of urinary tract infections (UTI) and third most common cause of bacteremia from human hospital acquired infections. Enterococcus infections are currently identified only to genus in the OVDL Bacteriology

Laboratory. Using our cryo-library, *Enterococcus* sp. would be identified to species using traditional biochemical testing and/or sequencing. Results would then be compared to archival clinical histories and antibiotic sensitivity results to determine if identification to species is important in predicting clinical outcome.

2. Good antibiotic stewardship requires testing for antibiotic sensitivity as soon as possible, preferably before initiation treatment. The OVDL Bacteriology Laboratory uses the Kirby-Bauer (KB) disk diffusion test for antibiotic sensitivity testing. Unfortunately, KB cannot be used to determine sensitivity of slow-growing or fastidious organisms. In this project, we would examine the feasibility of implementing broth MIC testing for commonly isolated slow-growing and/or fastidious organisms for which KB cannot be used.

- n. Dr. Brian Dolan: Research in the Dolan lab focuses on immune responses in vertebrate animals. Several projects examine the cellular biology of antigen presentation, the process by which cells of the body alert cytotoxic T cells to the presence of intracellular diseases. We use cutting edge technologies such as Cas9 gene deletions and flow cytometry to examine how cells ensure appropriate antigens are presented at the cell surface. Other projects in the lab attempt to develop new methods for studying immune responses in non-model species. Most of this work has focused on wild and domestic ungulates.

Clinical Research:

a. Dr.Susanne Stieger-Vanegas

I would be excited working with a highly motivated summer student interested in a project related to 3D modeling. My areas of interest are in 3D modeling of anatomically complex disease processes e.g. vascular or cardiac abnormalities or creating 3D models for planning complex surgical procedures. The projects usually require a good anatomic understanding and a high interest in working with a computer performing segmentations on computed tomography images. The process of segmentation is the process of color coding structures of interest. These structures are then processed into a 3D model. This segmentation process can be time consuming and requiring a high level of attention to detail. Please, let me know if this would interest you and if you would like to gain more information.

b. Dr.Katie Curran, medical oncologist

My research is primarily focused on answering important clinical questions in dogs and cats with cancer. I oversee and implement clinical trials in companion-animal patients at the OSU veterinary teaching hospital. Additionally, I seek to answer questions about rare cancers through retrospective case reviews. Summer research projects may involve clinical trial work, patient sample collection and/or retrospective research.

c. Cardiology Service (Drs. Zellmer and LeBlanc)

The CCVM cardiology service is actively engaged in research involving three-dimensional imaging of the heart of various species using 3D echocardiography and computed tomography (CT). In addition we have projects investigating arrhythmia assessment and management in

dogs and cats and also pharmacokinetics and pharmacodynamics of cardiac and non-cardiac medications.

d. Dr. Katja Zellmer, Large Animal Surgery

Dr. Zellmer is interested in utilizing kinesiology electromyography to detect horses' predisposition to musculoskeletal injury, followed by defining rehabilitative strategies that will prevent those injuries. Currently, we are performing preliminary studies to validate kinesiology electromyography as a research tool by measuring muscle activation with 2 different core strengthening exercises. This summer, we hope to receive funding to determine whether arthrogenic muscle inhibition exists in horses: We will be modeling stifle joint inflammation in horses by injecting IL-1 into the joints and measure muscle activation before and after this. The clinical significance of this work is that if arthrogenic muscle inhibition exists in horses, horses with stifle inflammation may benefit from physiotherapy interventions that restore more normal muscle activation patterns. Such interventions may decrease lameness or improve medical and/or surgical treatment outcomes in horses with clinical stifle disease.

e. Dr. Christopher Cebra, Large Animal Medicine

Dr. Cebra mainly does projects related to New World camelids. Areas of particular interest and previous studies include energy metabolism and metabolic diseases, gastrointestinal disorders, internal parasites and various diagnostic modalities.

2. Opportunity to Travel to India and be exposed to clinical cases and do research

Six students (usually 4 from the second year and 2 from the first year) will be selected. The opportunity is for the month of July 2019.

What to do next: If you are interested to apply to the opportunity, fill out an application and send by email.

3. Opportunity to travel to Toulouse, and work at the Veterinary School.

One student will be selected. Research opportunities are several and the selected applicant will be able to select among the possibilities.

What to do next: If you are interested to apply to the opportunity, fill out the application and send it by e-mail.

4. Opportunity to Evidence Base Medicine. Work in a clinic in Portland focusing in evidence-base medicine.

What to do next: If you like the opportunity, fill out the application and send it by e-mail.

5. Research in Costa Rica. One Health Program.

Two veterinarian students will have the opportunity to travel to Costa Rica and work in a project involving animal, human and environment components. The two students will be joined By a undergraduate student from the one health course in the Spring and a public health student.

What to do next: Fill in the application form, and send it by e-mail.

6. Summer at a Veterinary Clinic in Oregon. Program in partnership with OVMA.

Three students will be selected to the opportunity. They will meet their mentors during the OVC in Corvallis in March. The students will work in the Veterinary clinic and be mentored by an OVMA member.

What to do next: if you like the opportunity, fill out the application and send it by e-mail.