

2018 Summer Program – Biomedical Sciences Interested Faculty

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Dr. Luiz Bermudez Project Description: Veterinary Student Opportunity

1. John's Disease. Identify antigen of Mycobacterium paratuberculosis associated with inflammation of the intestine, by applying molecular techniques in a recently developed disease model.
2. Intestinal microbiome and lung immunity. Different types of diet may impact the innate immunity in the lung. Learn how to work with cells, prepare DNA and work with mice and immune cells.
3. Mycobacterium avium disease: *M. avium* is an animal and human pathogen. We plan to study the relationship of the bacterium with neutrophils and differentiated macrophages and differentiate bacterial strategies of survival.
4. Monitoring the environment and patients in the Veterinary Hospital. Epidemiological and bacteriological techniques.

Brianna Beechler, D.V.M., Ph.D.

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Dr. Brianna Beechler Project Description: Veterinary Student Opportunity

Understanding the role nutrition plays in disease transmission is often unexplored. Bighorn sheep in southern Oregon have recently experienced a pneumonia outbreak due to *M. ovipneumonia* - yet only some populations experience die offs. Populations that experience poor nutritional quality may be more susceptible to death due to disease. We propose to ask whether there is variability in 9 populations of bighorn sheep in southern Oregon and northern Nevada in metrics of nutrition (fecal chlorophyll and nitrogen) and whether this variability reflects in health parameters (chemistry panels). We will then ask whether nutritional variability in populations links to population level variance in Leptospirosis, blue tongue, PI-3 and Protostrongylus seroprevalence. The interested student will split their time between fieldwork in Southern Oregon and lab work at OSU for fecal chlorophyll and nitrogen detection.

Dr. Brianna Beechler Project Description: Undergraduate Student Opportunity

Agricultural landscapes are ubiquitous worldwide with the Willamette Valley being no exception. Despite being heavily managed landscapes, land cover dominated by agriculture still contains habitat, albeit modified, for many organisms including aquatic macroinvertebrates. Farm ponds are common features of agricultural landscapes as they are used for watering crops and livestock and stocking fish for recreational purposes. These ponds vary in size, hydroperiod, and management regime, and create habitat for a myriad of organisms from diatoms to dragonflies. One common group found in ponds is mosquitoes (Diptera: Culicidae). Of the species that occur in the Willamette valley, there are numerous that are known disease vectors. Current knowledge on the distribution and

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movement of disease vectors in the working landscape of the Willamette valley is lacking. In order to better predict disease presence and spread to protect both livestock and human populations, we need to document the distribution of vectors and evaluate their dispersal abilities. We propose to sample aquatic habitats across the valley for the presence of disease-competent vectors and study their ability to disperse from their natal ponds in search of a blood meal and to complete their life cycles. This work is in collaboration with Leiden University and involves experimental and field work throughout the Willamette Valley. The involved student will join an active group of Ph.D. and Masters students from Oregon, the Netherlands and South Africa all researching similar topics.

Rob Bildfell, D.V.M.

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Dr. Rob Bildfell Project Description: Veterinary Student Opportunity

Toxoplasmosis in black bears: Toxoplasmosis is a disease of worldwide importance which affects a wide array of species, including bears. The prevalence of this infection in black bears in the western US is poorly documented but one serosurvey found as many as 45% of bears in California and Oregon had titers. It has been speculated that this parasite may cause behavioral changes in infected intermediate hosts by virtue of its ability to cause encephalitis. Cases examined at the OVDL have confirmed that some seropositive bears have foci of gliosis in the brain. Biologists in California and Nevada have a large repository of serum samples acquired from black bears over the past 10 years. The dataset includes information on the time of year collected, reason/circumstances of collection, and geographic location. The proposed study would involve blinded analysis of samples to determine titers, followed by statistical analysis to see if there are associations with behavior (nuisance bears vs others), geographic location, and time of year (hyperphagic = post hibernation, vs. other times of the year). The goals of the study would be to establish baseline seroprevalence figures for this region of the country, and to determine if there are correlations between demographic/behavior variables and seropositivity.

(Dr. Bracha and Dr. Ramsey are interested in jointly supervising a DVM summer student

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Shay Bracha, D.V.M., M.S., DACVIM (Oncology)

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Dr. Stephen A. Ramsey and Dr. Shay Bracha Project Description: Veterinary Student Opportunity

Dr. Bracha and Dr. Ramsey are interested in supervising a DVM summer student who would study the transcriptome of canine osteosarcoma (COS). In this project we seek to understand and quantify the effect of tumor proximity on immune cell type abundances in bone marrow, both within-tumor, peritumoral, and distal to the tumor. The proposed research project connects to cell biology work to investigate findings from the transcriptome profiling. The student will also leverage molecular pathway databases in analyzing the mRNA-seq data, to identify molecular signaling pathways that are dysregulated in COS. COS-derived cell lines are available for testing specific molecular hypotheses from the mRNA-seq analysis.

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Dr. Lia Danelishvili Project Description: Veterinary Student Opportunity

Mycobacterium avium subsp. *paratuberculosis* is the etiological agent of Johne's disease effecting 68% of ruminant animals in the United States. Unfortunately, current serodiagnostic tests fail to detect asymptomatic- infected cattle because there is no single *M. avium* subsp. *paratuberculosis*-specific antigen that is recognized by all infected cattle in early and subclinical stages of disease. DVM student working during the summer will identify the antigenic make-up and the metabolic states of *M. avium* subsp. *paratuberculosis* within the mammary gland and milk environments. This study will fill gaps in knowledge on how different environments encountered in the host influence bacterial phenotypic changes and will provide the blueprint on the antigenic composition of *M. avium* subsp. *paratuberculosis* in the biologically relevant environments. This research will aid to discovery of right biomarkers for development of accurate diagnostic tests for Johne's disease.

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Dr. Brian P. Dolan Project Description: Veterinary Student Opportunity

Research on the lab focuses on two broad areas of immunological research. One interested is how cells present peptides via the MHC class I antigen presentation pathway to activate T cells. Possible student projects include genetic manipulation of tumor cell lines and developing reagents to examine MHC class I expression. The second area of research is comparing immune responses in animal species not-often studied by immunologists. Most often students develop new assays for measuring immune responses applicable to a variety of animals such as wild ungulates. Sometimes opportunities arise to take part in sample collection.

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Dr. Jean A. Hall Project Description: Veterinary Student Opportunity

Feeding Weaned Beef Calves Se-Biofortified Hay: Effects on Health and Disease. The goal of this project is to demonstrate that feeding Se-biofortified forages for 8 weeks to weaned beef calves in a background feeding program decreases gastrointestinal parasite load, increases the diversity of the nasal microbiota, reduces disease, and optimizes performance during the first month in the feedlot. The project is geared for the end of summer/ fall and will involve working with weaned beef calves to collect blood samples, feces for parasite analysis, nasal swabs, etc.

Deidre M. Johns, Ph.D.

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Dr. Deidre M. Johns Project Description: Veterinary Student Opportunity

Johns Lab Summer 2018 Research Project

We are optimizing a chemical series for the treatment of Leishmaniasis, a spectrum of neglected tropical diseases caused by protozoan parasites. We have a series of compounds that shows *in vitro* and *in vivo*

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efficacy against *Leishmania* parasites, yet needs further optimization of potency and physical properties to be clinically useful. We prepare novel new molecules to understand which functional groups provide optimal anti-*Leishmania* activity and mammalian safety. The compounds are prepared using cutting-edge synthetic organic chemistry techniques.

Jennifer Johns D.V.M., Ph.D., Dipl ACVP (Clinical Pathology)

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Dr. Jennifer Johns Project Description: Veterinary Student Opportunity

Our work focuses on the various roles that mesenchymal stem cells (MSC) play in diseases of domestic animals. Our current main area of interest is the function(s) of bone marrow MSC in naturally occurring osteosarcoma in dogs, particularly in altering anti-tumor immunity. We are starting some work on use of MSC in regenerative medicine applications, and on interactions between MSC and infectious agents. We also have ongoing work studying granulocytic anaplasmosis in goats on the west coast, and this work may be active next summer depending on funding.

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Dr. Mike Kent and Dr. Shay Bracha Project Description: Veterinary Student Opportunity

1) Molecular Taxonomy of *Neorickettsia* spp. from *Nanophyetus salmincola* and dogs with salmon poisoning.

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

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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 vice versa, their first infection was due to SF and hence were not protected by the original agent.

Working with our colleague Dr. Vasyly 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.

Greiman, S.E., Kent, M.L., Betts, J., Cochell, D., Sigler, T., Tkach, V.V. 2016. *Nanophyetus salmincola*, vector of the salmon poisoning disease agent *Neorickettsia helminthoeca*, harbors a second species of pathogenic *Neorickettsia* species. *Vet. Parasitol.* 229:107-109.

Greiman, S.E, Tkach, V.V., Pulis, E., Fayton, T.J., and Curran, S.S., (2014). Large scale screening of Digeneans for *Neorickettsia* endosymbionts using real-time PCR reveals new *Neorickettsia* genotypes, host associations and geographic records. *PLOS ONE* 9, e98453.

Dr. med. vet. Christiane V. Löhr, Ph.D.

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Dr. Christiane V. Löhr Project Description: Undergraduate or Veterinary Student Opportunity

My work focuses on research driven by diagnostics especially pathology. My primary areas of interest are all aspects of Cancer including Pathogenesis, Diagnosis, Prevention, Intervention, and Treatment, diseases of New World Camelids, Goats, and Aquatic Animals, and disease of the Skin, Special Senses and Liver. Cellular and molecular mechanisms leading to disease have intrigued me throughout my career, particularly when examined in the context of tissues and whole organisms. I have two specific projects, but am open to entertaining other research ideas within the above mentioned areas. A few specific neoplastic entities I am currently examining are feline injection site sarcoma, oral squamous cell carcinoma, ovarian carcinoma and canine acanthomatous ameloblastoma

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Kathy Magnusson, D.V.M., Ph.D. - Neuroscience

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Dr. Kathy Magnusson Project Description: Undergraduate or Veterinary Student Opportunities

Declines in brain functions during aging, including memory and cognitive flexibility, affect almost half of the human population over 65 years of age, interfering with quality of life and independent living. The Magnusson lab has the overall goal of determining how aging affects cognitive function and how we can prevent that decline. We have three projects planned for this summer:

Effects of multivitamins/minerals on cognitive function in elderly men. We will be testing cognitive function before and after a 6-month period of multivitamin/mineral supplementation. You would receive training in working with human subjects and help administer the tests (NIH Toolbox and virtual Morris water maze) and analyze the data.

Effects of combat exposure on cognitive aging in veterans. We will be testing cognitive function in younger and older veterans who experienced combat versus those who did not. You would receive training in working with human subjects and help administer the tests (NIH Toolbox and virtual Morris water maze) and analyze the data.

Improvement of memory in aged animals. The GluN2B subunit of NMDA receptors shows declines in synaptic expression during aging that influence memory. You will be trained in working with mice and will perform stereotaxic surgery for viral vector delivery to the brain and behavioral testing for memory in order to determine whether enhancing GluN2B could improve memory as we age.

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Dr. Hong Moulton Project Description: Veterinary Student Opportunity

The Moulton Lab is accepting applications for a student to assist with research aimed at improving delivery of nucleic-acid-based therapeutics. The student will be primarily using cell culture systems to test various strategies to enhance delivery of morpholino antisense oligomers into cells. Some background in cell biology and the ability to carry out aseptic technique in a reliable manner are requirements to be considered for this job. Background in molecular biology, biochemistry and experience in laboratory setting are desirable.

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An estimated 5 million people in the US suffer from Alzheimer's disease (AD). The cause is still not known and treatment is only symptomatic. Glutamate receptors in the hippocampus may have a role to play in the early onset of AD. This project is designed to assess the role of glutamate receptor related excitotoxicity, with the use of presenilin mutant AD model mice.

Dr. Fikru Nigussie Project Description: Veterinary Student Opportunity

Effect of NMDA receptor (GluN2B) on transient hyperexcitability. Presenilin mutants show a period of transient hyperexcitability before the onset of pathological signs or impaired function. We propose to manipulate the NMDA receptor in order to determine if it changes this hyperexcitability. You will be examining responses of NMDA receptors and early long-term potentiation (LTP) in hippocampal slices, with the use of multielectrode electrophysiology, and examining protein expression of glutamate receptor subunits using Western blot in presenilin mutant AD mice models.

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Dr. Justin Sanders and Dr. Rob Bildfell Project Description: Veterinary Student Opportunity

Toxoplasma gondii is arguably the most successful parasite in the world. Infecting virtually all mammals, it is a major cause of abortion in small ruminants, is responsible for widespread deaths of marine mammals and is zoonotic, resulting in severe disease particularly in congenitally infected and immunosuppressed people. Felines are the definitive host for *Toxoplasma gondii* responsible for the shedding of resistant oocysts in the environment, therefore it is assumed that feral and stray cats are significant contributors to the spread of *T. gondii*. However, the prevalence of *Toxoplasma* oocyst

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shedding by feral and stray cats in Oregon is not well known. Another important group of parasites, the lungworms, have been diagnosed with increasing frequency in felids in recent years. Identification of these worms is problematic and yet important in understanding the epidemiology of these parasites. The goals of this study are to: A. Determine the prevalence of *T. gondii* infection in feral/stray cat populations in Oregon and B. Identify species of lungworms in the same populations.

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Dr. Carla B. Schubiger Project Description: Veterinary Student Opportunity

Probiotics are successfully used in humans and animals throughout the last century. Probiotics are live microorganisms, which, when consumed in adequate amounts, confer a health benefit for the host [WHO]. In the previous 20 years, probiotics have also been applied to aquaculture. However, in aquaculture, the use of a probiotic can be expanded to conditioning the immediate environment around an organism, i.e., the surrounding water. Therefore, a more inclusive definition of probiotics would be any microorganism that has a beneficial effect by altering the host-associated or ambient microbial community, ensuring improved growth via more efficient feed use or enhanced nutritional value, improving the response of the host against infectious diseases, or improving the quality of the environment. Currently, probiotics for aquaculture are bacteria that produce bioactive compounds that inhibit the growth of pathogens in the surrounding water or colonize the host animal and subsequently prevent pathogen colonization. The student working with us will be able to work with the aquaculture species oysters, shrimp or trout/salmon and run infection/protection assays with commercially important fresh/saltwater pathogens and probiotics as well as genetically modified variants. Further aims are to discover bioactive compounds by using bioinformatic tools and molecular techniques.