Summer Program – Biomedical Sciences Interested Faculty

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Dr. Luiz Bermudez Project Description: Vet Student Opportunity

1. John's Disease. Improve the understanding of the disease 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.
4. Monitoring the environment and patients in the ICU. Involves microbiological techniques, PCR and gel/enzymes digestion.

Brianna Beechler, DVM, Ph.D.
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Dr. Brianna Beechler Project Description: Vet 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 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.

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Dr. Rob Bildfell Project Description: 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 is 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 virtual 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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Summer Program – Biomedical Sciences Interested Faculty

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Dr. Stephen A. Ramsey and Dr. Shay Bracha Project Description:

Dr. Bracha and Dr. Ramsey are interested in supervising a DVM summer student who would investigate gene regulation in canine bladder cancer. We have previously obtained paired-end mRNA-seq data from eleven dog bladder samples (8 transitional cell carcinoma (TCC) of the bladder, 3 normal bladder). The student will use the tools of bioinformatics to analyze the mRNA-seq data to identify microRNAs and transcriptional regulators that underlie the transcriptome differences between normal bladder and TCC. The student will also leverage molecular pathway databases in analyzing the mRNA-seq data, to identify molecular signaling pathways that are dysregulated in TCC. TCC-derived cell lines are available for testing specific molecular hypotheses from the mRNA-seq analysis.

Lia Danelishvili, Ph.D.
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Dr. Lia Danelishvili Project Description:

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. Jean A. Hall Project Description: Vet 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 back-ground 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.

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

My research aims to discover new medicines for infectious diseases. We use synthetic organic chemistry to prepare molecules with medicinal properties, and optimize these medicinal properties by modifying the chemical structures. I have two projects available. The first one is to discover a new medicine for Leishmaniasis, a parasitic tropical disease that infects 3 million new people each year. The second project is to prepare a natural compound that has interesting medicinal properties for treating bacterial and fungal infections. Students will learn purification techniques such as chromatography, NMR spectroscopy, and how to run a chemical reaction.

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

Undergraduate student research:

My research aims to discover new medicines for infectious diseases. We use synthetic organic chemistry to prepare molecules with medicinal properties, and optimize these medicinal properties by modifying the chemical structures. I have two projects available. The first one is to discover a new medicine for Leishmaniasis, a parasitic tropical disease that infects 3 million new people each year. The second project is to prepare a natural compound that has interesting medicinal properties for treating bacterial and fungal infections. Students will learn purification techniques such as chromatography, NMR spectroscopy, and how to run a chemical reactions (depending on their coursework completed).

Summer Program – Biomedical Sciences Interested Faculty

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Dr. Jennifer Johns Project Description:

Work in the laboratory currently centers around mesenchymal stem cells (MSC) in domestic animals. Specific areas of interest include the role of MSC in mesenchymal neoplasia in the dog; use of MSC in regenerative medicine applications; and interactions between MSC and infectious agents and subsequent effects on MSC immunomodulatory ability. Additionally, there is ongoing work on granulocytic anaplasmosis in small ruminant species on the west coast, and this work may be active next summer.

I would love to have both an undergraduate student and a veterinary student. I have two projects in Oregon they could participate in.

Kathy Magnusson, D.V.M., Ph.D. - Neuroscience
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Dr. Kathy Magnusson Project Description: Undergraduate Student Opportunity

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 4-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.

Developing healthspan measures in a short-lived aging model, the killifish. The killifish have a lifespan of only 6-8 months, but show similar aging changes to longer-lived species. This summer we will be establishing behavioral measures of healthspan in the lab, for functions such as movement and memory, in order to assess the effectiveness of intervention on expanding healthspan.

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. Kathy Magnusson Project Description: Vet Student Opportunity

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 4-month period of multivitamin/mineral supplementation. We will administer a battery of tests from the NIH Toolbox, which will assess attention, processing speed, working and episodic memory and cognitive flexibility. We will also be using a virtual Morris water maze to assess long-term spatial memory. You would receive training in working with human subjects and help administer the tests and analyze the data.

Developing healthspan measures in a short-lived aging model, the killifish. The killifish have a lifespan of only 6-8 months, but show similar aging changes to longer-lived species. We plan to use the killifish to screen combinations of micronutrients or drugs that could extend the healthspan of an individual. This summer we will be establishing behavioral measures of healthspan in the lab, for functions such as movement and memory.

Improvement of memory in aged animals. The GluN2B subunit of NMDA receptors shows declines in synaptic expression during aging that influence memory. We have viral vectors and other tools that could enhance GluN2B expression in the synaptic environment of aged animals in order to improve memory and vectors that can reduce GluN2B expression in middle-aged animals in order to demonstrate causality. You will be trained in working with mice and will perform stereotaxic surgery for vector delivery to the brain and behavioral testing for memory.

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Dr. Michelle Steinauer and Dr. Kathy Magnusson Project Description:

Pathogen mediated reduction in cognitive ability through changes in the microbiome.

Recent studies have shown important links between the gut microbiome, brain development, and cognitive function. Thus, the factors that influence the composition and function of the gut microbiome are of great interest. One overlooked factor is the presence of pathogens, especially those that cause chronic infections and thus have the potential to manipulate the host microbiome over long periods of development. Schistosomes are trematode parasites that cause chronic infections and have important health impacts on humans, livestock, and wildlife. “Intestinal” schistosomes live in the vasculature surrounding the intestine of their hosts and their eggs create micro-lesions in the intestinal wall as they move through the tissue to be excreted into the lumen. We hypothesize that schistosomes significantly alter the microbiome of their hosts via creation of the lesions, the inflammatory response of the host, and parasite-derived excretory products. Through these changes in the microbiome, we further hypothesize that infection with schistosomes will lead to impaired cognitive function. Over the summer, students will test this latter hypothesis. Mice will be infected with various doses of schistosome parasites and then will be tested for cognitive function using a variety of established tests. The performance of the infected mice will be compared to that of control mice. Throughout the course of the study, samples of the mouse microbiome will be taken and reserved for future analysis. For this project a veterinary student from OSU will be paired up with a medical student from COMP-NW.

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Dr. Hong Moulton Project Description: Vet 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 asceptic 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: Vet 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.