Adams Laboratory

(1) Malaria is one of the most deadly diseases in the world affecting vast areas of tropical and sub-tropical countries of the world. The causative agent is a parasite (Plasmodium) and disease is caused by a parasite (Plasmodium) and spread by the female Anopheles mosquito. Of the five species of Plasmodium that cause human malaria, Plasmodium vivax is the major cause of clinical disease outside of Africa. There are increasing reports of widespread drug resistance and clinical severity of disease due to emerging virulent forms of the parasite, but no vaccine exists that protects humans from infection. This emphasizes the need to create alternative prophylactic and therapeutic strategies including the development of a vaccine against this disease. Immunity to erythrocyte invasion ligands plays a critical role in controlling blood-stage infection of P. vivax. Invasion of human erythrocytes by the parasite is dependent on the interaction between the Duffy binding protein region II (DBPII) on the parasite surface and the Duffy blood group antigen (DARC) expressed on the surface of human erythrocytes. This makes DBPII an ideal vaccine target. A major obstacle in developing DBPII as a vaccine is that this region is highly polymorphic and these polymorphisms can compromise vaccine efficacy, creating a bias towards development of strain-specific immunity. The objective of this project is to overcome this obstacle by developing a vaccine that focuses immune response to conserved functional epitopes and boost immunogenicity. A student could join this project to work on developing antibody reagents to define and characterize the immunoreactive surface of DBPII to optimize an effective vaccine for P. vivax malaria. Techniques involved include PCR, recombinant DNA, expression and purification of recombinant proteins and ELISA.

(2) MS of exosomes collected from maturing RBC to identify reticulocyte receptor

The worldwide malaria strain Plasmodium vivax infects immature red blood cells (RBC) known as reticulocytes. It is important to determine the receptor/receptors which are involved in P. vivax attachment and invasion of reticulocytes. One of the possible approaches to clarify this process is to study exosomes, which are small vesicles (30-150 nm) that are secreted by maturing RBCs. It is one of the most reasonable ways for the RBCs to lose receptors on the surface, which aren’t necessary and/or could cause a negative effect on function of mature RBC. These receptors could be CD36, CD44, and CD71, which may be involved in parasite invasion into reticulocytes. In contrast, mature RBCs are missing these receptors and are resistant to P. vivax invasion. These work include isolation of exosomes and studying interaction with parasite. The line of methods for this research includes ultracentrifugation, electrophoresis of proteins, Western blotting, immunofluorescence, microscopy and related ones.

Students interested in either of the rotation opportunities above should contact Samantha Barnes (Adams Lab Project Coordinator) at sjones@health.usf.edu to set up an appointment to discuss the project.
Kyle Laboratory

Chemotherapy and Drug Resistance Research: The research in the Kyle lab focuses on the discovery and development of new drugs to prevent or treat malaria and leishmaniasis, two of the most important parasitic diseases of man. Both of these diseases are major public health problems and cause significant mortality and morbidity in many tropical and temperate regions of the world. New drugs are urgently needed to combat malaria, primarily due to the emergence of drug resistance to one or more drugs - a phenomenon known as multidrug resistance. Elucidating mechanism(s) of resistance and discovering new drug treatment regimens, combinations, or strategies to overcome resistance is a second major research focus. The overarching objectives of our research is to develop new tools to prevent disease, to train a new generation of global health research scientists, to foster multidisciplinary research on tropical diseases, and to implement our findings to reduce the burden of disease in endemic countries.

Interested MSPH students should contact Melissa Bayley (mbayley@health.usf.edu) to schedule an appointment with Dr. Kyle.

Novak Laboratory

The Novak Laboratory specializes on the ecological and integrated management (control) of arthropod-borne infectious diseases, especially mosquitoes and black flies. Field ecological techniques including taxonomy and systematics, sampling technology and methods, life history models, arthropod and vector transmission models and monitoring and surveillance for malaria, onchocerciasis, US arboviruses, Rift valley fever, integrated Disease Management and control are currently being investigated in the laboratory. Location based detection of key transmission and life cycle variables (vector, pathogen, reservoir hosts and definitive host) and environmental factors employing GIS are coupled with sub meter remote sensing satellite data to develop near real time models for several arthropod borne infectious diseases both locally, and at international locations in Africa.

Please contact Dr. Novak at (rnovak@health.usf.edu) to explore potential project opportunities.

Seyfang Laboratory

Medical Microbiology and Molecular Parasitology:
Biochemistry and pharmacology of potential drug targets in opportunistic microbial pathogens, including protozoan parasites (Leishmania, trypanosomes) and pathogenic fungi (Candida albicans). Methods include protein biochemistry, recombinant protein expression, molecular biology, gene expression analysis (qRT-PCR), bioinformatics for protein structure-function analysis and drug design, and drug assays in vitro with recombinant protein and in cell culture of various parasite life cycle stages. Please contact Dr. Seyfang (aseyfang@health.usf.edu) to explore potential project opportunities.
Unnasch Laboratory

The Unnasch lab is directed by Dr. Thomas R. Unnasch, Ph.D., Professor and State of Florida World Class Scholar. Research in the Unnasch lab focuses upon arthropod borne infectious diseases, ranging from the human filarial infections to arboviruses. Projects range from basic biochemistry and molecular biology (studies of gene regulation and drug discovery in filarial parasites) to domestic field research (ecology of Eastern Encephalitis virus) to applied international research (remote sensing, development of novel insect traps and assisting international control programs in certifying elimination of onchocerciasis). Rotation projects are available in all of these areas.

Please contact Dr. Unnasch or Hassan Hassan (hassan@health.usf.edu) in the Unnasch lab to explore potential project opportunities.

van Olphen Laboratory

1. Discovery and evaluation of synthetic and natural antiviral compounds against dengue virus. We are using cell base screening assays for the identification of antivirals with the initial objective of identifying novel molecular targets of the dengue virus life cycle using classic and reverse-genetic approaches. My laboratory is also participating in the toxicity screening of newly discovered antiparasitic drugs as part of the MMV marine natural product discovery project lead by Drs. Baker and Kyle.

2. Development of methods for transporting and analyzing clinical samples for detection of arthropod born viruses. Of particular interest to my laboratory is the development of low-cost and efficient methods of cold-free transport of clinical samples for the comprehensive evaluation of clinical samples suspected and as follow-up to dengue virus infections. We are also working in the development and implementation of diagnostics for dengue and the tick born disease Theileria microti in donor’s blood in collaboration with Florida Blood Services.

3. Development of an oral vaccine for influenza, arboviruses, dengue and other flaviviruses. We are utilizing recombinant viruses (baculovirus and adenovirus), DNA vaccine and proteins to design and evaluate novel multivalent microencapsulated oral vaccines in an attempt to identify the best priming-boost combination that would elicit robust and balanced protective immune response.

Please contact Dr. van Olphen (avanolph@health.usf.edu) in the van Olphen lab to explore potential project opportunities.