

Center for Comparative Medicine

The UC Davis Center for Comparative Medicine (CCM) embraces the concept of “One Medicine” through interdisciplinary comparative medical research, teaching, and model development. Composed of faculty members from both the School of Veterinary Medicine and the School of Medicine, the Center investigates the development of human disease, using experimental animal models and naturally-occurring animal diseases.

Translational discovery - Diseases in one species often translate to other species. From experimental models, research scientists can better understand a particular disease process that occurs in both animals and humans, with the goal of designing preventative therapies, diagnostics, and treatment strategies to help both species.

Lyme disease – Lyme disease has recently been classified as an “emerging epidemic” by Centers for Disease Control. The most common vector-borne disease of humans in the U.S., Lyme disease also affects a number of domestic animals. Research scientists at the CCM are investigating the development and process of Lyme disease, the immune response to infection, the persistent nature of the disease and the impact of antibiotics as a treatment.

Tuberculosis - Several mycobacterial species that infect and cause disease in humans are designated the Mycobacterium tuberculosis complex. This bacteria causes disease in lungs as well as other organs. More than one-third of the world's population is infected with M. tuberculosis. Annually, 10 to 20 million of these individuals develop clinical symptoms, and about 1.7 million die of the disease. Studies at the CCM are focused on investigating the development of the diseases and potential vaccines for M. tuberculosis.

Helicobacter pylori - Helicobacter pylori is a bacterial pathogen that infects the stomach of half the world's population. Although most infected people will have no clinical signs or symptoms, about 10% will develop peptic ulcer disease or gastric cancer, which is the second most common cause of cancer death in the world. CCM investigators are exploring the use of immunization with H. pylori outer membrane proteins as a preclinical approach to primary and secondary prevention of H. pylori infection.

AIDS/HIV – Human immunodeficiency virus (HIV) is a lentivirus that causes acquired immunodeficiency syndrome (AIDS). This disease, first recognized in the early 1980s, is now a world-wide pandemic, with over 33 million people infected with HIV and over 1.8 million deaths per year. Effective, licensed vaccines against HIV are not yet available. The Center for Comparative Medicine has pioneered breakthrough studies in explaining how HIV is transmitted; and in the discovery of “reservoirs” where HIV hides out and replicates when people are on highly active, retro viral heart therapy. Other studies being conducted include mechanisms of entry in the female genital tract, approaches to prevention, mucosal immunity, and vaccine development.

Chlamydia trachomatis – Chlamydia trachomatis is the single most important infectious agent causing blindness worldwide, and it also causes sexually transmitted infections. The CDC estimates that 4.2% of all young adults are now infected with Chlamydia, making this one of the most prevalent bacterial infections in the U.S. Currently no vaccine exists to prevent these diseases. Greater understanding of immunity to Chlamydia infection is required to achieve the goal of vaccine development. Studies at the CCM attempt to directly examine the protective role of T cells in genital infection in order to understand the requirements for developing a vaccine; and exploring how the virus manipulates the host immune system to persist and cause disease.

CMV – Human cytomegalovirus (HCMV) is a prevalent herpes virus that produces lifelong persistent, but asymptomatic, infections in healthy humans. However, it causes substantial morbidity and mortality in immunocompromised patients, including AIDS patients and immunosuppressed transplant recipients. HCMV is also a leading cause of birth defects following congenital infection of fetuses. A vaccine to protect against the congenital transmission of cytomegalovirus (CMV) is a top public health priority. Efforts to develop novel vaccine strategies are in progress at the Center for Comparative Medicine.

Cancer - CCM faculty are leaders in the field of mouse models of human cancer. These animal models have contributed key insights into the genetic makeup of specific cancers. In particular, research scientists have developed a sophisticated system using mouse models of human breast cancer which have led them to a better understanding of the disease's progression and metastasis.

Salmonella – Salmonella typhi causes typhoid fever, a serious disseminated infection in many developing nations. Other Salmonella infections typically cause gastroenteritis, but can also cause life-threatening infections in young children and adults with HIV. Current typhoid vaccines are only moderately effective or unsafe for use by the very young or the elderly. Research at CCM focuses on developing a basic understanding of immune responses to Salmonella, with a view to the development of novel vaccines for Salmonella infections; and understanding how the virus manipulates the host immune system, particularly at mucosal surfaces, to persist and cause disease.

Influenza – Currently licensed influenza vaccines are difficult to produce and provide less than optimal protection, especially against a mismatched virus. Research scientists at the CCM are utilizing influenza infection models to better understand how a host stimulates immune protection via the induction of pathogen-specific antibodies. They are also working to define the nature of protective antiviral immunity, and are testing vaccines and immunotherapeutic strategies to prevent influenza.