

2016 Webb-Waring Biomedical Research Awards Investigator Research Profile



Rushika Perera, Ph.D.



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Dr. Perera is currently an assistant professor in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University. She was previously a research scientist in RNA virology and systems biology at Purdue University (West Lafayette, IN) and completed postdoctoral training in RNA virology at the University of California at Irvine. Dr. Perera earned her Ph.D. in RNA virology and structural biology at Purdue University.

Select Honors

Dr. Perera was the recipient of a Future Faculty Career Development Award (Postdoctoral) from the University of California at Irvine.

Medical Focus

The World Health Organization estimates that more than three billion people in over 100 countries are at risk of being infected with Zika, dengue, chikungunya and yellow fever viruses. These viruses are spread by the same mosquito vector, *Aedes aegypti*, which has become resurgent throughout regions where it was previously controlled. *A. aegypti* has expanded into new areas and is hyper-abundant in the tropical and subtropical world. Historically, mosquito control programs established by public health authorities have focused on eliminating larval breeding sites (source reduction), combined with implementing measures to control adult mosquito populations through the use of insecticides. Unfortunately, insecticide resistance has exploded worldwide and has become a public health catastrophe. A newer approach has been to develop methods that interfere with amplification of the virus within the tissues of the living mosquito, preventing viral transmission to humans. This approach is still early in its development, but has significant promise to be more effective in the long term. However, for this novel approach to be successful, it will be critical to understand how these viruses establish infection in the mosquito, and what biological factors influence successful virus amplification in the mosquito prior to transmission to a human.

Research Proposal

Dr. Perera's lab studies the specific metabolic processes in mosquitos that are required for successful viral replication. Her team has found that these essential processes differ between viral pathogens. Mosquito-borne viruses are obligate parasites that must infect and replicate within the midgut of the mosquito to be effectively transmitted to humans. Dr. Perera has hypothesized that the virus must therefore compete for nutrients and/or resources within the midgut, either with the mosquito itself, co-infecting pathogens or co-habiting symbiotic organisms. That competition is likely to define the ability of a specific viral species to replicate and reach a threshold capable of transmitting to humans. Such nutrients—specifically the repertoire of lipids, amino acids, nucleotides, sugars and vitamins—are represented in the mosquito's "metabolome," or the sum total of an organism's metabolic resources, their interactions and fates over time. Metabolomics is an approach that can measure the concentration of these metabolites in a given system, and Dr. Perera's research will use cutting edge metabolomics and transcriptomic approaches to identify metabolic pathways that condition infection of *Ae. aegypti* with Zika, dengue and chikungunya viruses and their subsequent transmission to humans. These studies will identify metabolic "choke-points" that can be exploited to develop interventions to block or limit amplification of the virus in the mosquito, and thus block mosquito-human viral transmission. Her findings will have a significant impact not only on viruses that are transmitted by the *Aedes* mosquito species, but may also provide data to help develop methods to prevent the spread of malaria, West Nile virus and other important pathogens that are transmitted by insect vectors.

Additionally, approaches developed to prevent mosquito-human viral transmission will impact the transmission to other vertebrates, thus reducing pathogen burden in the environment.