May 19th, 11:30 AM - 12:00 PM

Simulating Within-Vector Generation of the Malaria Parasite Diversity

Lauren M. Childs
Virginia Polytechnic Institute and State University, lchilds@vt.edu

Simulating Within-Vector Generation of the Malaria Parasite Diversity

Plasmodium falciparum, the malaria parasite causing the most severe disease in humans, undergoes an asexual stage within the human host, and a sexual stage within the vector host, *Anopheles* mosquitoes. Because mosquitoes may be superinfected with parasites of different genotypes, this sexual stage of the parasite life-cycle presents the only opportunity in the full life cycle to create genetically novel parasites. To investigate the role that mosquitoes' biology plays on the generation of parasite diversity, we constructed a stochastic model of parasite development within-mosquito, generating a distribution of parasite densities at five parasite life-cycle stages: gamete, zygote, ookinete, oocyst, and sporozoite, over the lifespan of a mosquito. We then coupled a model of sequence diversity generation via recombination between genotypes to the stochastic parasite population model. Our two-part model framework shows that bottlenecks entering the oocyst stage decrease diversity from the initial gametocyte population in a mosquito's blood meal, but diversity increases with the possibility for recombination and proliferation in the formation of sporozoites. Furthermore, when we begin with only two distinct parasite genotypes in the initial gametocyte population, the probability of transmitting more than two unique genotypes from mosquito to human is over 50% for a wide range of initial gametocyte densities.