

Effect of Host Movement on the Prevalence of Vector-borne Diseases

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Various spatial vector-borne disease models have been proposed and analyzed in the past two decades. Many of them focus on establishing a sharp threshold result between disease persistence and extinction in terms of the basic reproduction number. In reality, it is difficult or even impossible to achieve disease eradication. Thus, it could be vital to understand how human movement affects the total number of host infections and its distribution across the environment. In this talk, based on a multi-patch Ross-Macdonald model, we present the effect of host dispersal on the local and global host disease prevalence. In particular, for the two-patch submodel, we completely answer the questions of (1) when dispersal causes higher or lower global host disease prevalence than no dispersal and (2) how the global host disease prevalence varies with dispersal rate. One fascinating finding is that a more uneven distribution of hosts and vectors in a homogeneous environment generally leads to lower host prevalence but higher vector prevalence and stronger disease persistence. This is joint work with Dr. Yuan Lou (SJTU).

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