Mathematical Biology Seminar

Monday, December 5, 2022

3 pm MDT (In person)

3-25 SAB

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Spatial segregation in patch epidemic models

In this talk, I will introduce an SIS patch endemic model with cognitive dispersal. When $\mathcal{R}_0>1$, I give a sufficient condition for the uniqueness of endemic equilibrium. At the unique endemic equilibrium, I prove that the disease prevalence of each patch is bounded, which depends on the patch reproduction number. I also establish the asymptotic profiles of total infection number in sufficiently small and large non-cognitive dispersal rates, respectively. Theoretical results are applied to random dispersal and symmetric dispersal. Symmetric dispersal drives the local disease prevalence to the global level and thus always enlarges the total infection number, but the role of random dispersal is complicated. Furthermore, I explore the segregation phenomenon between susceptible individuals and infected individuals. The first example shows that cognition can enhance segregation for low dispersal rates. The second example reveals that cognition always enhances segregation induced by random dispersal, and large dispersal rates can exclude the segregation induced by cognitive symmetric dispersal as shown in the third example. Moreover, the cognitive random dispersal-driven segregation is weakened first and then strengthened as the dispersal rate increases in the third example, while segregation is always weakened in the first two examples.