Mathematical Biology

Outbreak analysis of an SIS epidemic model with rewiring

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Abstract   This paper is devoted to the analysis of the early dynamics of an SIS epidemic model defined on networks. The model, introduced by Gross et al. (Phys Rev Lett 96:208701, 2006), is based on the pair-approximation formalism and assumes that, at a given rewiring rate, susceptible nodes replace an infected neighbour by a new susceptible neighbour randomly selected among the pool of susceptible nodes in the population. The analysis uses a triple closure that improves the widely assumed in epidemic models defined on regular and homogeneous networks, and applies it to better understand the early epidemic spread on Poisson, exponential, and scale-free networks. Two extinction scenarios, one dominated by transmission and the other one by rewiring, are characterized by considering the limit system of the model equations close to the beginning of the epidemic. Moreover, an analytical condition for the occurrence of a bistability region is obtained.

Keywords   Pair approximation · Network epidemic models · Rewiring ·
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