Branching process model of the early phase of a bacterial insertion sequence invasion

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Abstract

Bacterial insertion sequences (ISs) are short DNA segments that can proliferate on
their own inside a bacterial genome and can spread in a host cell population through
horizontal gene transfer. With the help of a continuous-time, multitype Markov bran-
ching process model we examine the population dynamics of the early phase of an
IS invasion into an uninfected cell population at carrying capacity. In particular, we
are interested in the probability of a successful IS invasion depending on the rate of
horizontal gene transfer, in the distribution of IS counts per cell over the host cell
population and in the time needed to reach a certain threshold number of infected
cells.