
Spreading speeds for a fox rabies model with infection-age dependent diffusion

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Abstract

An epidemic outbreak is considered for rabies in a spatially distributed fox population where the susceptible foxes do not move but infected foxes diffuse with diffusion coefficients that depend on their infection-age (time since infection). This takes into account that foxes in an early phase of the latency period would hardly diffuse while foxes with full-blown rabies may diffuse considerably. Since an outbreak situation is considered, the population turnover of the fox population is ignored. This allows to transform a system consisting of an ODE for the susceptible foxes and an age-dependent diffusion equation for the infected foxes to a single space-time integral equation of Volterra form for the cumulative number of infected foxes and to find an implicit formula for the spreading speed of the rabies epidemic. As implicit as it is, it still allows to study the dependence of the spreading speed on the diffusion coefficients, the length of the latency period, the per capita infection and disease death rates and other demographic or epidemiologic parameters.

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