

# Modeling the Early Stages of a Within-Host Viral Infection

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## Abstract

Influenza, Ebola virus and Hantavirus are some of the many viral infections of major public health concern. Each virus replicates within specific target cells. Hantavirus replicates within the lung microvascular endothelial cells. A well-known target cell model for the early stage of infection is a system of ODEs which includes healthy target cells, latent cells, infected cells, and free viruses. The ODE model provides information about stages of infection and serves as a framework for new stochastic models. A continuous-time Markov chain model and includes variability in the birth, death, and transmission process. An estimate of the probability of a successful infection is obtained from a branching process approximation of the Markov chain. This estimate depends on the initial concentration of virions, latent cells, and infected cells. A sensitivity analysis for probability of infection with respect to model parameters is performed for an in vitro model of influenza infection.