

Resonance of periodic combination antiviral therapy and intracellular delays in virus model

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There is substantial interest in detailed models of viral infection and antiviral drug kinetics in order to optimize treatment against viruses such as HIV. In this talk, we consider within-viral dynamics under general intracellular distributed delays and periodic combination antiviral therapy. The basic reproduction number R_0 is established as a global threshold determining extinction versus persistence, and spectral methods are utilized for analytical and numerical computation of R_0 . We derive the optimal maturation delay for virus and optimal phase difference between sinusoidally varying drug efficacies under various intracellular delays. Furthermore, numerical simulations are conducted utilizing realistic pharmacokinetics and gamma-distributed viral production delays for HIV. Our results demonstrate that the relative timing of the key viral replication cycle steps and periodic antiviral treatment schedule involving distinct drugs all can interact to critically affect the overall viral dynamics.

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