
WENJING ZHANG, York University

Recurrent viral infection may need no exogenous trigger

Recurrent infection is characterized by short episodes of high viral reproduction, separated by long periods of relative quiescence. This recurrent pattern is observed in many persistent infection, including the “viral blips” observed during chronic infection with the human immunodeficiency virus (HIV). Previous models of the dynamics of these viral blips used either stochastic components or forcing terms as the triggers to simulate the phenomenon. We present an established 4-dimensional HIV antioxidant-therapy model which exhibits viral blips, take advantage of dynamical systems theory and bifurcation theory to reinvestigate the 4-dimensional model, and show that an increasing, saturating infectivity function contributes to the recurrent behavior. The four conditions for the existence of viral blips in a deterministic in-host infection model is proposed, and employed to derive the simplest (2- and 3-dimensional) infection model which produces viral blips. The complete parameter range is identified for the 3-dimensional model in which blips are possible. Further, we find that a 5-dimensional immunological model satisfies the conditions and exhibits recurrent infection even with constant infectivity. Thus, the increasing, saturating infectivity is not necessary if the model is sufficiently complex. This is a joint work with Dr. Lindi Wahl and Dr. Pei Yu.