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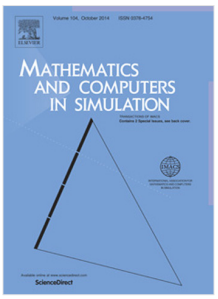

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Modeling the Role of Acquired Immune Response and Antiretroviral Therapy in the Dynamics of HIV Infection

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Abstract

This paper deals with the study of a virus dynamics model in order to get better insights into HIV infection within the body. The model incorporates therapeutic modalities such as reverse transcriptase inhibitors (RTIs) and protease inhibitors (PIs). RTIs prevent viral replication/entry within the infected $CD4^+$ T cells while PIs block the virus assembly and thus further propagation and production of new virions. The proliferation of uninfected $CD4^+$ T cells has been assumed to be as full logistic growth term to capture the dynamics of HIV virus. The model also considers two important components of the acquired immune response, namely the cytotoxic T lymphocyte (CTL) immune response (self stimulation due to infection and stimulation due to infected cells have been considered) and antibody immune response. Critical threshold conditions for the existence of equilibrium points have been determined. We studied the analytical behavior of these equilibrium points locally as well as globally using Lasalle's invariance principle and Lyapunov's direct method. We explored the sensitivity of the therapeutic drugs on the model system. Further, the behavior of the proposed model system has been studied numerically through simulation tools.

Keywords: Virus dynamics model, reverse transcriptase inhibitors, protease inhibitors, antibody immune response, HIV virus.

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