

Mathematical modelling of in-vivo dynamics of HIV subject to the influence of the CD8+T-Cells

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Abstract:

There have been many mathematical models that analyses in-vivo dynamics of HIV. However, in most cases the attention has been on the interaction of the HIV virions and the CD4+T-cells. This paper brings in the intervention of the CD8+T-cells in seeking, destroying and killing the infected CD4+T-cells. The paper presents and analyses a non-linear ordinary differential equations model and applies the results in investigating the in-vivo dynamics of HIV in presence of the CD8+Tcells. It is assumed that the CD8+T-cells are activated by presence of the infected CD4+T-cells. Both the disease-free and endemic equilibria are established and their stability investigated. In addition, the basic reproductive number is determined and its sensitivity with respect to the parameters of the model established. The results show that in acute infection the CD8+T-cells play a paramount role in reducing HIV viral replication. We also observe that the model exhibits backward and trans critical bifurcation for some set of parameters implying the existence of multiple endemic equilibrium when basic reproductive number is less than unity. The results therefore, suggest the need for more study on how to eliminate backward bifurcation.