Stability and Bifurcation analysis of Hepatitis B-type virus infection model

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Abstract

The objective of the present paper is to investigate the dynamics of Hepatitis B-type virus (HBV) infection through mathematical model. Distinct to the existing mathematical models on HBV, the present model considers the various factors such as immune impairment, the maximum number of T-cells (total carrying capacity), logistic growth term. Besides, for more accuracy, the role of antiretroviral therapies are also involved in the analysis. In addition, time delays are inevitable during the activation of immune response and during the antiretroviral therapy. Considering these factors while formulating the mathematical model which helps to gain insights into the disease progression. With the derived model, the qualitative analysis such as stability analysis, bifurcation analysis and stabilization analysis can be performed to investigate the performance of the model over the period of time. The significance of the model parameters are revealed through Hopf-type bifurcation analysis and the global stability analysis of the proposed model. With the help of dataset values that are extracted from the literature the efficiency of the derived theoretical results are explored.

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