On Effectiveness of an Optimal Antiviral Bitherapy in HBV-HDV Coinfection Model

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Abstract

In this work, dynamics between uninfected cells, HBV infected cells, HDV infected cells and HBV-HDV coinfected cells are studied, based on two systems of four ordinary differential equations. The two pre-validated differential systems which are considered in this paper, are respectively associated to the case when there is no infected cell proliferation of HBV, HDV and HBV-HDV coinfected populations, and to the case when there is an infected cell proliferation. Optimal control theory is applied to these two systems. Seeking to reduce the infected groups and increase the number of uninfected hepatocytes, two control functions are introduced in the two mathematical models, representing two types of treatments. In fact, the main goal of this work is to discuss the effectiveness of an antiviral bitherapy that could include any inhibitor for HDV infection such as lonafarnib, with other classical treatments often used against HBV infection such as interferons, lamivudine, adefovir and entecavir. The optimal controls are characterized in terms of the optimality system, which is solved numerically using an iterative method with a progressive-regressive Runge-Kutta fourth order scheme with a change of several parameters.
References

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