**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
**SHORT ABSTRACT OF THESIS**

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Thesis Title: Dynamics and analysis of models for chronic hepatitis B virus infection

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**SHORT ABSTRACT**

This thesis investigates several models for hepatitis B virus (HBV) infection including the incorporation of the dynamics of intracellular HBV DNA-containing capsids. Firstly, we analyze a model for infected hepatocytes, capsids and virions along with the homeostatic mechanism of the liver and incorporating a discrete time delay in the production of mature capsids. We then present and analyze a modified model where the dynamics of both uninfected hepatocytes and capsids (along with infected hepatocytes and virions) are included. This is followed by the incorporation of one and two discrete delays in this modified model and its dynamical analysis. A pharmacokinetic model with the combination therapy of pegylated interferon and lamivudine is proposed and a critical drug efficacy in terms of model parameters is derived. A control problem is also formulated and solved numerically to obtain the optimal therapeutic regimen, accounting for both the biomedical goals and cost constraints. Finally, a diffusion driven HBV infection model is presented taking into account the spatial mobility of both capsids and virions. The analysis is carried out for global stability as well as on a discretized version of the model. A non-standard finite difference scheme for this model is introduced and the dynamic consistency of this scheme is analyzed.