Narendra Dixit
Indian Institute of Science, Bangalore, India
e-mail: narendra@chemeng.iisc.ernet.in
Pranesh Padmanabhan
Indian Institute of Science, Bangalore, India

Modelling HCV kinetics in vitro yields estimates of the number of E2-CD81 complexes necessary for viral entry into target cells

Interaction between the hepatitis C virus (HCV) envelop protein E2 and the cell surface receptor CD81 is necessary for HCV entry into target cells. Blocking this interaction is therefore a promising strategy for therapeutic and preventive intervention. The minimum number of E2-CD81 complexes that must form across a virus-cell interface to facilitate virus entry, however, remains unknown. The recently developed cell culture systems that allow persistent HCV infection in vitro present data of the dependence of the susceptibility of cells to virus entry on the CD81 expression level on cells. We develop a mathematical model that quantitatively describes several independent experimental observations of viral kinetics in vitro and of the frequency of virus entry as a function of the CD81 expression level. Comparisons of model predictions with experiments yield estimates of the threshold number of E2-CD81 complexes necessary for virus entry. The threshold number depends on the affinity of the E2-CD81 complex and presents guidelines for the design and optimal usage of entry inhibitors and vaccines that target the E2-CD81 interaction.