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Global dynamics of a diffusive SEICR HCV model with nonlinear incidences

Considering acute and chronic infections, we propose and study the spatiotemporal dynamics of a reaction-diffusive SEICR model for hepatitis C infection. The well-posedness and boundedness of solutions are established. The model possesses a threshold dynamics characterized by the basic reproduction number $\mathcal{R}_0$. When $\mathcal{R}_0 < 1$ the disease free equilibrium is globally asymptotically stable while the system is uniformly persistent when $\mathcal{R}_0 > 1$. In the special case of homogeneous space with heterogeneous diffusion, the explicit expression of $\mathcal{R}_0$ is derived. Moreover, if $\mathcal{R}_0 > 1$, the system has a unique homogeneous endemic equilibrium, which is globally asymptotically stable. The theoretical results are illustrated with numerical simulations. Sensitivity of $\mathcal{R}_0$ on the parameters is also carried out.