Stability and Hopf bifurcation analysis of an SIS epidemic model with latency and nonlinear incidence rate

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Abstract. In this paper, we formulate and study a time-delayed SIS epidemic model with latency and nonlinear incidence rate, where the susceptible host population satisfies the logistic equation and the incidence rate is of saturated form with the susceptible. A threshold value which determines whether the disease dies out or remains endemic is derived. By regarding the time lag as bifurcation parameter, the local stability of the endemic equilibrium is investigated and sufficient conditions for occurrence of stability switches through Hopf bifurcations are obtained. Further, the direction of Hopf bifurcation and the stability of bifurcating periodic solutions are determined by using the center manifold reduction and the normal form method. Numerical simulations are carried out to illustrate theoretical results.

Keywords: SIS model, Stability switch, Hopf bifurcation

Scope of Abstract: Applied Mathematics/Interdisciplinary Mathematics