

Applied Dynamical Systems seminar

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Monday, October 21, 2013

HH-3017@ 3 p.m.

Threshold Dynamics in an SEIRS Model with Latency and Temporary Immunity

Abstract:

A disease transmission model of SEIRS type with distributed delays in latent and temporary immune periods is discussed. With general/particular probability distributions in both of these periods, we address the threshold property of the basic reproduction number R_0 and the dynamical properties of the disease-free/endemic equilibrium points present in the model. More specifically, we a. show the dependence of R_0 on the probability distribution in the latent period and the independence of R_0 from the distribution of the temporary immunity, b. prove that the disease free equilibrium is always globally asymptotically stable when $R_0 < 1$, and c. according to the choice of probability functions in the latent and temporary immune periods, establish that the disease always persists when $R_0 > 1$ and an endemic equilibrium exists with different stability properties. In particular, the endemic steady state is at least locally asymptotically stable if the probability distribution in the temporary immunity is a decreasing exponential function when the duration of the latency stage is fixed or exponentially decreasing. It may become oscillatory under certain conditions when there exists a constant delay in the temporary immunity period. Numerical simulations are given to verify the theoretical predictions.

Coffee and cookies will be served.

Seminar website: <http://www.math.mun.ca/~shuz/seminars.html>

-----All are welcome-----