Western Science

Department of Applied Mathematics

APPLIED MATHEMATICS COLLOQUIUM

Date: Wednesday, November 19, 2014
Time: 2:30 – 3:30 p.m.
Location: Middlesex College Room 204

Rich bifurcation structure of disease transmission models in patchy environment

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Abstract:

In this talk, we show that general disease transmission models in a spatially heterogeneous environment can have a large number of coexisting endemic equilibria. We consider a class of compartmental epidemic models for the spread of infectious diseases in a human population that is distributed over several regions. When the patches are disconnected, the system may admit several steady states, including equilibria with mixed disease free and endemic components. However, many of the fixed points might disappear when mobility of individuals between the regions is introduced; the usual situation is that only fully endemic steady states and the disease free equilibrium persist with mobility. We provide a mathematical procedure and precisely describe in terms of the local reproduction numbers and the connecting network of the regions, whether a steady state of the disconnected system continues or ceases to exist for low-volume traveling. We illustrate our results on a simple vaccination model in two regions and demonstrate that such models may exhibit some unusually rich bifurcation behaviors.