

APPLIED MATHEMATICS COLLOQUIUM

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Time: 2:30 – 3:30 p.m.

Location: Middlesex College Room 204

A malaria transmission model with temperature-dependent incubation period

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Abstract: Malaria is an infectious disease caused by Plasmodium parasites and is transmitted among humans by female Anopheles mosquitoes. Climate factors have significant impact on both mosquito life cycle and parasite development. To consider the temperature sensitivity of the extrinsic incubation period (EIP) of malaria parasites, we formulate a delay differential equations model with a periodic time delay. We derive the basic reproduction ratio R_0 and establish a threshold type result on the global dynamics in terms of R_0 , that is, the unique disease-free periodic solution is globally asymptotically stable if $R_0 < 1$; and the model system admits a unique positive periodic solution which is globally asymptotically stable if $R_0 > 1$. Numerically, we parameterize the model with data from Maputo Province, Mozambique and simulate the long term behaviour of solutions. The simulation result is consistent with the obtained analytic result. In addition, we find that using the time-averaged EIP may underestimate the basic reproduction ratio. This talk is based on a joint work with Prof. Xiao-Qiang Zhao (Memorial University).