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Analysis of a dengue model with vertical transmission and application to the 2014 dengue outbreak in Guangdong Province, China. (English) Zbl 1400.92569

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Summary: There is evidence showing that vertical transmission of dengue virus exists in *Aedes* mosquitoes. In this paper, we propose a deterministic dengue model with vertical transmission in mosquitoes by including aquatic mosquitoes (eggs, larvae and pupae), adult mosquitoes (susceptible, exposed and infectious) and human hosts (susceptible, exposed, infectious and recovered). We first analyze the existence and stability of disease-free equilibria, calculate the basic reproduction number and discuss the existence of the disease-endemic equilibrium. Then, we study the impact of vertical transmission of the virus in mosquitoes on the spread dynamics of dengue. We also use the model to simulate the reported infected human data from the 2014 dengue outbreak in Guangdong Province, China, carry out sensitivity analysis of the basic reproduction number in terms of the model parameters, and seek for effective control measures for the transmission of dengue virus.

MSC:

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Keywords:

dengue; vertical transmission; mathematical model; basic reproduction number; disease-free and disease-endemic equilibria

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