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Hopf bifurcation analysis for the models of pathogen-immune interaction dynamics with kernels

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The aim of this paper is to study the steady states of the mathematical models with delay kernels which describe pathogen-immune dynamics of many kinds of infections diseases. In the study of mathematical models of infectious diseases it is an important problem to predict whether the infection disappears or the pathogens and the immune system persist. The delay kernel is described by the memory function that reflect the influence of the past density of pathogen in blood, and is given by a nonnegative bounded function g, and is normated. The delay is a discrete one if the delay kernel g is a delta function at a certain time.

By using the coefficient of kernel g, as a bifurcation parameter, the models are found to undergo a sequence of Hopf bifurcation. The direction and the stability criteria of bifurcation periodic solutions are obtained by applying the normal form theory and the center manifold theorems. Some numerical simulation examples for justifying the theoretical results are also given.

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