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ABSTRACT | Maira Aguiar

Title

Rich dynamics in multi-strain models: non-linear dynamics and deterministic chaos in dengue fever epidemiology

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Abstract

Basic models suitable to explain the epidemiology of dengue fever have previously shown the possibility of deterministically chaotic attractors, which might explain the observed fluctuations found in empiric outbreak data. However, the region of bifurcations and chaos require strong enhanced infectivity on secondary infection, motivated by experimental findings of antibody-dependent-enhancement. Including temporary cross-immunity in such models, which is common knowledge among field researchers in dengue, we find bifurcations up to chaotic attractors in much wider and also unexpected parameter regions of reduced infectivity on secondary infection, realistically describing more likely hospitalization on secondary infection when the viral load becomes high. The model shows Hopf bifurcations, symmetry breaking bifurcations of limit cycles, coexisting isolas, and two different possible routes to chaos, via the Feigenbaum period doubling and via torus bifurcations.