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Stability analysis in a two-strain epidemic model with two vaccinations and time delays in complex networks

Communication Info

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Abstract

A new two-strain epidemic model with vaccination and time delay on directed complex networks is introduced. First, we prove the non-negativity and ultimate boundedness of the solutions. We then determine three equilibrium points, including the disease-free equilibrium and two single-strain equilibria. The existence of these equilibria depends on the basic reproduction numbers of each strain. Using persistence theory, we prove the existence of a coexistence equilibrium under appropriate threshold conditions. Moreover, we analyze the global stability of all equilibria using Lyapunov functions. Numerical simulations are carried out on directed scale-free networks generated by an adapted Barabási–Albert method to confirm the theoretical results.

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