Apparent paradoxes in disease models with horizontal and vertical transmission

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Abstract:

The question as to how the ratio of horizontal to vertical transmission depends on the coefficient of horizontal transmission is investigated in host-parasite models with one or two parasite strains. In an apparent paradox, this ratio decreases as the coefficient is increased provided that the ratio is taken at the equilibrium at which both host and parasite persist. Moreover, a completely vertically transmitted parasite strain that would go extinct on its own can coexist with a more harmful horizontally transmitted strain by protecting the host against it. Several stability results are presented for the coexistence equilibrium (host and two parasite strains). Under standard incidence, undamped oscillations may occur.