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Herpes and Chlamydia co-infection in humans

Bornali Das

Bolyai Institute, University of Szeged, Hungary
das.bornali19@gmail.com

A mathematical model was formulated to investigate *Chlamydia trachomatis* (*C. trachomatis*) and herpes simplex virus (HSV) co-infection in a population; taking into account that HSV can induce a viable but non-cultivable state of *C. trachomatis* in a host. A complete description of the global dynamics is given for the sub-systems where only one of the diseases is present. For the co-infection model, we show that the extinction or persistence of HSV is determined solely by the basic reproduction number of HSV, regardless of *C. trachomatis* prevalence. On the contrary, *C. trachomatis* can not always invade a HSV-endemic population even when it could invade a susceptible one, and this is determined by a newly introduced threshold parameter. By a limiting system approach, the existence of a co-infection steady state is shown when all reproduction numbers are greater than one. Applying the theory of asymptotically autonomous systems, we prove global stability results for the disease free and the boundary equilibria. Finally, we calibrate the model to estimate the prevalence of both diseases in the population, and compare it with epidemiological observations. Joint work with Gergely Röst.