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Ephraim Agyingi
Rochester Institute of Technology, eoasma@rit.edu

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A generalized model of the transmission dynamics of leishmaniasis with multiple time delays

Ephraim Agyingi and Tamas Wiandt

School of Mathematical Sciences, RIT, NY 14623, USA

Leishmaniasis is a zoonotic disease transmitted to humans by sandflies. This paper presents a generalized SI model that accounts for all available animal reservoirs, human host and sandflies vector within a given community. Discrete delays that represent the time between inoculation and infectiousness are incorporated into all population groups. The reproduction number of the model is computed and used to study the equilibriums of the system. Analytic results establishing local asymptotic and global stability of the disease free equilibrium are provided. The existence of a unique endemic equilibrium of the model is ascertained and numerical results that exhibit bifurcation as the time delays pass through a set of critical values is demonstrated for a special case of the model.