On the Spread of Rabies in Humans and Dogs

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Rabies is a fatal disease in dogs as well as in humans. In this work we present a simple model representing rabies transmission dynamics in human and dog populations. Mathematical analysis based on the basic reproduction number, $\mathcal{R}_0$, which is the average number of new infective individuals produced by one infective individual introduced into a completely susceptible population, is presented. It is observed that the disease-free equilibrium is globally asymptotically stable if $\mathcal{R}_0 < 1$, while it is unstable and there exists a locally asymptotically stable endemic equilibrium when when $\mathcal{R}_0 > 1$. A nonstandard finite difference scheme that replicates the dynamics of the continuous model is proposed. Numerical tests to support the theoretical analysis are provided.