Mathematical modelling of the transmission dynamics and control of the rift valley fever virus

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Rift Valley Fever is a vector-borne disease mainly transmitted by mosquitoes. With the aim of obtaining deeper insight or understanding on the transmission dynamics of the disease, a deterministic model with mosquito, livestock and human populations is formulated as a system of non-linear ordinary differential equations and analysed. The study considered a problem of interaction of population of human, livestock and mosquito each divided into susceptible and infected classes. By introducing interventions in the model the classes are expanded to include classes of treated humans, livestock and trapped mosquitoes. The main focus of this study was to evaluate the effect of control strategies (treatment and trapping) on the spread of the disease. Conditions for the clearance or prevalence of Rift valley fever infection were derived through the determination of the model equilibria and analysis of their stability. Simulations and sensitivity analysis have been carried out to illustrate analytical results and determine key factors influencing the behaviour of the disease. Numerical results revealed that rift valley fever epidemic can be reduced when both interventions, treatment of infected human and livestock and trapping the mosquito, are implemented if $R_{eff} < 1$. The existence of the phenomenon of backward bifurcation, however, suggests that the disease may fail to clear even under the conditions that R_e, reproduction is less than one.