An extended Ross-Macdonald model for Malaria incorporating vector demography

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Malaria is a vector-borne disease that has affected humans and other animals for a long time and which has shown high prevalence among different populations. During the beginning of the 20th century, Sir Ronald Ross and George Macdonald developed a model that represents the spread of malaria through the interaction of human and mosquito populations [1]. In this work we analyze the vector-host dynamics of Malaria with respect to a model based on the work of Ross and Macdonald. Our proposed model has been modified to include the demography of susceptible mosquitoes. We use both classic and modern techniques of dynamical systems to study the different characteristics of the proposed model and its connection to corresponding biological scenarios. Among the different features of this model are the existence of a unique endemic equilibrium if the basic reproduction number is larger than 1; the global asymptotic stability of this equilibrium, provided a sector condition for the function describing the vector demography holds; and the persistence of Malaria [3] when the basic reproduction number is larger than 1. It is also shown that the endemic equilibrium can be unstable under certain conditions [2].

References

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