A schistosomiasis model with an age-structure in human hosts and its application to treatment strategies ☆

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Abstract

We study a system of partial differential equations which models the disease transmission dynamics of schistosomiasis. The model incorporates both the definitive human hosts and the intermediate snail hosts. The human hosts have an age-dependent infection rate and the snail hosts have an infection-age-dependent cercaria releasing rate. The parasite reproduction number $\mathscr{R}$ is computed and is shown to determine the disease dynamics. Stability results are obtained via both analytic and numerical studies. Results of the model are used to discuss age-targeted drug treatment strategies for humans. Sensitivity and uncertainty analysis is conducted to determine the role of various parameters on the variation of $\mathscr{R}$. The effects of various drug treatment programs on disease control are compared in terms of both $\mathscr{R}$ and the mean parasite load within the human hosts.
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