Differential drivers of intraspecific and interspecific competition during malaria-helminth co-infection

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Abstract

Various host and parasite factors interact to determine the outcome of infection. We investigated the effects of initial infectious dose and co-infection with a red blood cell-limiting helminth on the within-host dynamics of murine malaria. Using a time-series approach to model the within-host "epidemiology" of malaria, we found that increasing initial dose reduced time to peak cell-to-cell parasite propagation, but also reduced its magnitude, while helminth co-infection delayed peak malaria propagation, except at the highest malaria doses. Using a mechanistic model of within-host dynamics, we identified dose-dependence in parameters describing host responses to malaria infection and uncovered a plausible explanation of the observed differences during co-infections: in co-infections, our model predicted a higher background death rate of RBCs combined with greater influx of new RBCs. Such interactions are key to understanding variation in disease severity, and could inform field studies of malaria, where co-infection and low doses are the norm.

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