



2014 Summer Research Experiences (SRE) for Undergraduates and Teachers

Abstract

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Quantifying limits on replication, death, and quiescence of *Mycobacterium tuberculosis* in mice.
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According to the World Health Organization, an estimated 2.3 billion people are infected with *Mycobacterium tuberculosis* (Mtb). Despite decades of research, the physiology of tuberculosis remains poorly understood. Current models for Mtb hold that the total bacterial burden approaches a static equilibrium during chronic infection. A recent study of Mtb-infected mice by Gill et al. (2009) used a mathematical model to show that bacterial replication and death rates do not necessarily remain constant. In our study, we extend this model by investigating the effects of a time-dependent segregation rate and the inclusion of quiescence to find limits on growth rates that are consistent with bacteria counts. We find that there are alternative hypotheses to tuberculosis pathogenesis that lead to lower predictions of Mtb replication and death rates. We also show that replication and death rates of Mtb may be higher than initially predicted when bacterial quiescence is added into the model.