A Mathematical Model for Within-host Toxoplasma gondii Invasion Dynamics

Adam Sullivan
Department of Mechanical, Aerospace, and Biomedical Engineering
University of Tennessee, Knoxville, TN 37996

Folashade Agusto
Department of Mathematics and Statistics
Austin Peay State University, Clarksville, TN 37044

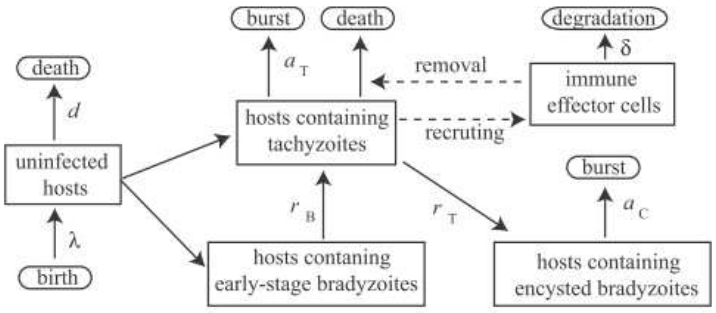
Sharon Bewick
National Institute of Mathematical and Biological Synthesis
University of Tennessee, Knoxville, TN 37996

Chunlei Su
Department of Microbiology
University of Tennessee, Knoxville, TN 37996

Suzanne Lenhart
Department of Mathematics
University of Tennessee, Knoxville, TN 37996

Xiaopeng Zhao, Assistant Professor
Department of Mechanical, Aerospace, and Biomedical Engineering
University of Tennessee, Knoxville, TN 37996

Toxoplasma gondii (T. gondii) is a protozoan parasite that infects a wide range of intermediate hosts, including all mammals and birds. Up to 20% of the human population in the US and 30% in the world are chronically infected. This paper presents a mathematical model to describe intra-host dynamics of T. gondii infection. The model considers the invasion process, egress kinetics, interconversion between fast-replicating tachyzoite stage and slowly replicating bradyzoite stage, as well as the host's immune response. Analytical and numerical studies of the model can help to understand the influences of various parameters to the transient and steady-state dynamics of the disease infection.



A compartmental model representing the dynamics of T. gondii.