Quantification of Uncertainty in Parameters Characterizing Within-Host West Nile Virus Infection

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Abstract

West Nile virus (WNV) is a neurotropic flavivirus that has emerged globally as a significant cause of viral encephalitis. Currently, little is known about the within-host viral kinetics of WNV during infection. We used a series of mathematical models of increasing complexity to examine WNV dynamics in mice and birds. To the best of our knowledge, this is the first effort to model within-host dynamics of WNV. We use a computationally intensive method to quantify the uncertainty in parameter estimates given uncertainty in input parameters. We set up a framework to explore really large search spaces after imposing constraints from biology. Our method of quantifying uncertainty estimates of model parameters in terms of uncertainty in input parameters could be more generally applicable to modeling of other diseases where precise estimates of input parameters are hard to obtain.