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Necibe Tuncer, Hayriye Gulbudak, Vincent Cannataro and Maia Martcheva*
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Issues of Immuno-Epidemiological Vector-Host Models with Application to Rift Valley Fever.*

We discuss the structural and practical identifiability of a nested immuno-epidemiological model of arbovirus diseases. We fit this multi-scale model to multi-scale data. For an immunological model, we use Rift Valley Fever Virus (RVFV) time-series data obtained from livestock under laboratory experiments, and for an epidemiological model we incorporate a human compartment to the nested model and use the number of human RVFV cases reported by the CDC during the 2006-2007 Kenya outbreak. We show that the immunological model is not structurally identifiable for the measurements of time-series viremia concentrations in the host. Thus, we study a scaled version of the immunological model which is structurally globally identifiable. After fixing estimated parameter values for the immunological model, we fit observable RVFV epidemiological data to the nested model for the remaining parameter. Monte Carlo simulations indicate that only three parameters of the epidemiological model are practically identifiable. Alternatively, we fit the multi-scale data to the multi-scale model simultaneously. Monte Carlo simulations for the simultaneous fitting suggest that the parameters of the immunological model and the parameters of the immuno-epidemiological model are practically identifiable. (Received September 02, 2017)