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T-CELL MEDIATED ADAPTIVE IMMUNITY IN PRIMARY DENGUE INFECTIONS

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Currently, dengue virus (DENV) is the most common mosquito-borne viral disease in the world, which is endemic across tropical Asia, Latin America, and Africa. The global DENV incidence is increasing day by day due to climate changing. According to a report, DENV cases increase almost five times since 1980, than the previous 30 years. Mathematical modeling is a common tool for understanding, studying and analyzing the mechanisms that govern the dynamics of infectious disease. In addition, models can be used to study different mitigation measures to control outbreaks. Here, we present a mathematical model of DENV dynamics in micro-environment (cellular level) consisting of healthy cells, infected cells, virus particles and T -cell mediated adaptive immunity. We have considered the explicit role of cytokines and antibody in our model. We find that the virus load goes down to zero within 6 days as it is common for DENV infection. We have shown that the cytokine mediated virus clearance plays a very important role in dengue dynamics. It can change the dynamical behavior of the system and causes essential extinction of the virus. Finally, we have incorporated the antiviral treatment effect for DENV in our model and shown that the basic reproduction number is directly proportional to the antiviral treatment effects.

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