

Applying a Deterministic Mathematical Model to the HIV Virus Attacking the Cd4+T Cells: A Deliberation on the Interaction

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ABSTRACT The CD4+T cells are the most abundant white blood cells of the immune system which fight viruses. The CD4+T cells are used as indicators in the laboratory for the disease stage when HIV attacks these cells and thus weakens the immune system. A deterministic mathematical model of the HIV virus attacking the CD4+T cells was studied in terms of virions, uninfected cells and infected cells concentrations. The model assumed a non-responsive immune system to the virus over a short space of time. The study used three CD4+T cells initial states viz., 1000, 500 and 300 cells per cubic mm. The default values used for the mathematical model parameters establish a reproductive ratio R_0 which is less than one indicating a non-infectious system. The mathematical model graphical solution indicates that rate of decrease of the CD4+T cells are rapid at the initial stage of the 1000 virus and relatively slow rate of increase when the cells are below 300. Furthermore the system attains equilibrium at 500. At the equilibrium rate of change of the un-infected cells is zero but the infected cells decreases rapidly in time. The study recommends administration of drugs after CD4+T cell count measures below 500. The mathematical model estimation may help guide physicians and patients in deciding when to start treatment.