A modeling approach to the impact of HIV mutations on the immune system

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A dynamical system modeling the intra-host HIV infection, coupled with a stochastic process for the mutation occurrence is used, after simplifications, to study the impact of the viral diversity on the disease dynamics. A new state function, having a biological interpretation as immunological recognition efficacy (IRE) index is defined. The existence and the stability of the endemically infected steady state of the IRE index-based model, as function of this index, are studied. It is also shown that the IRE index-based model provides bounds to the responses of the initial complex dynamical system. The biological interpretation of these mathematical results is the exhaustion of the immune system as a consequence of the continuous generation of viral mutants.