A MATHEMATICAL MODEL OF IMMUNITY

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Abstract

The purpose of the present paper is to derive a mathematical model of innate and adaptive immunity. It is an ODE model with variables $C$ for antigen, $D$ for dendritic cells, effector $T$ cells denoted $T$ and memory $T$ cells denoted $T_M$. For this mathematical model we can prove that for some values of the rate constants it is tristable in the sense that there can be (at least) two stable singular points and an unstable singular point. It is also a mathematical model of a vaccine. To apply the model you need to fit the rate constants to a vaccinated individual and also to a possibly different set of rate constants for an individual that has not been immunized. You can then compare the dynamics of the two scenarios.

Keywords and phrases: cancer, mass action kinetic system, immunity, vaccine.

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References


