A DYNAMICAL MODEL OF IMMUNE RESPONSE BY T CELLS

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ABSTRACT

We analyse a model of immune response by T cells (CD4), where regulatory T cells (Tregs) act by inhibiting IL-2 secretion. We introduced an asymmetry reflecting that the difference between the growth and death rates can be higher for the active T cells and the active Tregs than for the inactive T cells and inactive Tregs. We present an explicit formula that gives the approximate balance between the antigenic stimulation of T cells and the concentration of Tregs. Furthermore, we present an explicit formula that relates approximately the antigenic stimulation of T cells, the concentration of T cells and the concentration of Tregs. For our parameter values, the relation between the antigenic stimulation of T cells and the concentration of T cells is an hysteresis that is unfold when some of the parameters are changed. Moreover, when considering a linear tuning between the antigenic stimulation of T cells and the antigenic stimulation of Tregs, we were also able to obtain an explicit formula relating approximately the antigenic stimulation of T cells, the concentration of T cells and the concentration of Tregs. With it, we can explain the appearance of an isola and a transcritical bifurcation in the original hysteresis.