

Personalized immunotherapy treatment strategies for a system of chronic myelogenous leukemia

Paul Valle¹

¹Postgraduate Program in Engineering Sciences, BioMath Research Group, Tecnológico Nacional de México / IT Tijuana, Mexico

paul.valle@tectijuana.edu.mx

This work is devoted to exploring personalized applications of cellular immunotherapy as a control strategy for the treatment of chronic myelogenous leukemia described by a dynamical system of first-order ordinary differential equations formulated by Moore and Li in 2003. We achieve the latter by applying both the Localization of Compact Invariant Sets and Lyapunov's Direct Method. These two approaches allow us to establish sufficient conditions on the immunotherapy treatment to ensure the complete eradication of the leukemia cancer cells. These conditions are given in terms of the system parameters and we combine them with *in silico* experiments to derive a proper protocol for the treatment application that does not dangerously increase the T cells population and induces the cancer cells to go below a finite critical value in which they cannot longer persist. Numerical simulations successfully illustrate our analytical results.

Keywords: Leukemia; Immunotherapy; *In silico* experimentations; Localizing domain; Global stability; Cancer protocol design