Abstract

In this paper, we introduce delay differential equation (DDE) models of the hematopoietic system designed for the study of the effects of Granulocyte-Colony Stimulating Factor (G-CSF) administration. G-CSF is used clinically for treating subjects presenting low numbers of white blood cells, a condition referred to as Neutropenia that can result from different causes. The aim of this paper is to study alternative treatment that would minimize the use of G-CSF drug using a mathematical modeling. We propose a parameter estimation model that considers G-CSF administration for Cyclical Neutropenia (CN), a dynamical disorder characterized by oscillations in the circulating neutrophil count. The model develops the dynamics of circulating blood cells before and after the G-CSF treatment. The model develops the equilibrium solution for the DDE and a sufficient condition for the global stability. The model focuses on the effects of two compartments forms of G-CSF for the treatment of CN (Fast Fourier Transform simulations). For each model, we use a combination of mathematical analysis and numerical simulations (linear chain trick) to study alternative G-CSF treatment that would be efficient while reducing the amount of drug. This reduces the quantity of G-CSF required for potential maintenance. This model gives us good result in treatment. The changes would be analytical and reduce the risk side as well as the cost of treatment in G-CSF.
G-CSF Reduction: The Equilibrium Solution for the DDE and a Sufficient Condition for the Global Stability

References

- Adimy M., and Crauste F., "Global Stability of a Partial Differential Equation with

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