Global asymptotic stability of the periodic solution for a periodic model of hematopoiesis with linear impulses

Teresa Faria[a] and José J. Oliveira[b]

[a]Departamento de Matemática and CMAF, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal
e-mail: tfaria@ptmat.fc.ul.pt

[b]Departamento de Matemática and CMAT, Escola de Ciências, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal
e-mail: jjoliveira@math.uminho.pt

Abstract

Hematopoiesis is the process of production, multiplication, regulation and specialization of blood cells in the bone marrow, until they become mature blood cells for release in the circulation bloodstream. By one hand, this is a biological process, thus it is better modeled if the periodicity of the environment is taken into account. On the other hand, some evolutionary systems go through abrupt changes, due to predictable or sudden external phenomena such as drugs administration or radiation. These phenomena are better described by impulsive differential equations.

In this presentation, we present sufficient conditions for the global asymptotic stability of the periodic solution of the following hematopoiesis model with multiple time-dependent delays and linear impulses

$$\begin{cases} y'(t) + a(t)y(t) = \displaystyle\sum_{i=1}^{m} \frac{\beta_i(t)}{1 + y(t - \tau_i(t))^n}, \; 0 \leq t \neq t_k \\ \\ y(t_k^+) - y(t_k) = b_k y(t_k), \; k \in \mathbb{N} \end{cases}.$$

This is a joint work with Teresa Faria.