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*Modelling with stage-structure AND
variable lifespan*

Jacques Bélair

Département de Mathématiques et de Statistique

Université de Montréal

C.P. 6128, succ. Centre-ville

Montréal, Québec H3C 3J7

`jacques.belair@umontreal.ca`

Abstract

We present a general model of the regulation of erythrocytes (red blood cells), in the form of a system of stage-structured, nonlinear differential equations. Under physiologically reasonable hypothesis, the system takes the form of an integro-differential system with a state-dependent delay incorporating the negative feedback effect of the regulating hormone, erythropoietin. This model incorporates a stage-dependent destruction rate, which translates into a variable lifespan for the mature cells.

The stability of the stationary solution is determined as a function of the main parameters, and values leading to Hopf bifurcations to periodic solutions are identified as well. The possibility of higher order bifurcations is also discussed.

Joint work with Michèle Titcombe.