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Building a model of delay-differential equations with state-dependent delay for megakaryopoiesis

Since the early work of M. C. Mackey and J. Bélair in the 80s [1], the intricate multiple feedbacks of megakariopoiesis (the process along which the platelets are produced) have been the source of many investigations in the field of delay differential equations.

In this talk I describe how an emphasis on TPO regulation and progenitor cells proliferation can lead to a model describing megakaryopoiesis with system of delay differential equations, the delay being state-dependant and defined by threshold: using a tool from Smith [2], we transform this system into a fonctionnal differential equation with fixed delay, allowing us to explore wellposedness and fixed point stability.

1 Bélair J, Mackey M C (1987) "A model for the Regulation of Mammalian Platelet Production", Annals New York Academy of Sciences

2 Smith L H (1992) "Reduction of structured population models to threshold-type Differential equations and funtionnal differential equation : a case study" Mathematical Biosciences 113:1-23