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An age-structured model of erythropoiesis with dynamical destruction rate

We consider an age-structured population model of erythropoiesis including a dynamical death rate for mature cells as an attempt to understand erythrocyte lifespan distribution, a feature which may have clinical significance. The model takes the form of a system of nonlinear delay differential equations representing total circulating cells, the regulatory hormone (erythropoietin) and the moving maximal lifespan of mature cells. Linear stability of the non trivial steady states yields an intricate characteristic equation, as well as a stability chart displaying the boundary of the region of stability. Numerical simulations strongly suggest a supercritical Hopf bifurcation, and mode interactions.

Joint work with Frédéric Paquin-Lefebvre