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Modeling chemotherapy effects on hematopoiesis

The delivery of chemotherapy has, almost without exception, profound side effects on many physiological systems and the regulation of hematopoiesis is not an exception. In this talk I will outline the work that is ongoing in our attempts to minimize the hematopoietic side effects of chemotherapy. This modeling work is naturally framed within the context of functional differential equations with state dependent delays, and has revealed some of the many potential dynamical effects of forcing systems so described with external perturbations like those due to chemotherapy. The dynamic effects that the numerical solutions of these equations have revealed offer important clues about how clinicians may be able to avoid some of the side effects of chemotherapy. Specifically we find that the mathematical model for the regulation of hematopoiesis shows significant resonance effects at certain periods of chemotherapy administration that are probably associated with especially adverse reactions in patients.