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STOCHASTIC AND TIME-DELAYED EFFECTS IN AUTOIMMUNE DYNAMICS

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Among various causes of autoimmunity, a particularly important role is played by infections that can lead to a breakdown of immune tolerance. In this talk, I will discuss a model of immune response to a viral infection, and subsequent onset of autoimmunity, with particular account for cytokines and different types of T cells. Of particular biological relevance is the analysis of stochastic oscillations around deterministically stable states, as well as the effects of stochasticity on dynamics of the system in a bi-stable regime. I will show how variance of stochastic fluctuations and their coherence depend on system parameters [1]. To make the model more realistic, it is important to also consider the effects of time delays associated with various processes involved in the development of immune response. I will discuss a method for deriving stochastic delayed differential equations and a corresponding numerical simulation algorithm, and will show how it can be used to simulate stochastic dynamics in a time-delayed model of autoimmunity [2].

References

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