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Quasi-steady-state approximations in the stochastic models of enzyme kinetics

Wednesday, 11 July 2018 11:30 (30 minutes)

In this talk I will introduce several quasi steady-state approximations (QSSAs) applied to the stochastic enzyme kinetics models. Different assumptions about chemical species abundance and reaction rates lead to the standard QSSA (sQSSA), the total QSSA (tQSSA), and the reverse QSSA (rQSSA) approximations. These three QSSAs have been widely studied in the literature in deterministic ordinary differential equation (ODE) settings and several sets of conditions for their validity have been proposed. By using multiscaling techniques for stochastic chemical reaction networks, these conditions for deterministic QSSAs largely agree with the ones for QSSAs in the large volume limits of the underlying stochastic enzyme kinetic networks. I will illustrate how our approach extends to more complex stochastic networks like, for instance, the enzyme-substrate-inhibitor system. This is joint work with Wasiur Khuda Bukhsh, Heinz Koeppl, and Grzegorz Rempała.

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