

Abstract Submitted
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Understanding Dynamic Patterns of NF- κ B Signaling: Derivation and Analysis of a Minimal Model through Sensitivity Analysis JAEWOOK JOO, STEVE PLIMPTON, SHAWN MARTIN, LAURA SWILER, Sandia National Laboratories, JEAN-LOUP FAULON, Sandia National Laboratories — Understanding the pleiotropism of NF- κ B signal transduction is a challenge of clear medical importance and systems biology. Current mathematical modeling frameworks for NF- κ B signal transduction, though limited to a small signaling module located in a downstream of IKK, heavily rely on the parameterizations and the numerical studies of ODE models and doubtless lack intuitive explanations about underlying mechanisms of the dynamic patterns of the NF- κ B signaling. Here we present a systematic way to derive a minimal model from an up-to-dated and detailed NF- κ B signaling network by means of sensitivity analysis. Using analysis of the minimal model, we predict a dose-response curve shape, existence of Hopf-bifurcation, and underlying mechanisms of all possible dynamic patterns of NF- κ B signaling. Simulating the detailed ODE model for NF- κ B signaling network with large sets of the parameter values that are sampled from the biologically feasible parameter space, we present an ensemble of all possible dynamic patterns of NF- κ B signaling and verify the predictions from the minimal model.

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