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Understanding how cells respond to pathogens - mathematical modeling of a biological system.

All cells are capable of sensing pathogen and they respond dramatically and appropriately to defend themselves, and communicate with neighbors and the system-wide mine system. Constrained by detailed experimental work, we have developed a mathematical model of an intra-cellular molecular network that is critical for the cell's pathogen responses. Numerous iterations have provided new insights, and allowed for virtual experimentation and evaluation of "systems properties". A key hypothesis of this work is that dynamic control of the network constitutes a dynamical code that allows one pathway to convey multiple and distinct information about the environment and direct stimulus-specific gene expression responses. I will discuss how mathematical modeling and analysis tools have aided our understanding on how cells respond appropriately to a variety of environmental stimuli. (Received February 17, 2016)