Interpreting the signaling dynamics of innate immune cells using E-Cell

KUMAR SELVARAJOO
Institute for Advanced Biosciences
Keio University, Japan

Abstract

Our immune system is a highly sophisticated process that cannot be well understood using the wet-bench facility alone. I will focus on the innate immune system, the activation of Toll-like receptor (TLR) 4 to lipopolysaccaride stimuli that leads to the induction of typical proinflammatory cytokines such as TNF-α and IL-1β. The understanding of such complex signaling process requires i) the dynamic measurements of biological entities such as NF-κB and AP-1 transcriptional activation and ii) appropriate computational tools that will be able to interpret the temporal results. I will introduce the E-Cell simulation platform, developed at our institute, suited for this kind of analysis and show how one can successfully use such *in silico* tools to address some key issues in biology that could otherwise take a longer time to resolve. In particular, I will demonstrate the utility of my TLR4 *in silico* model of the macrophage cell-type, developed using ordinary differential equations, which predicts the existence of unknown intermediates in the TLR4 signaling system.