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Peter S. Kim* (kim@math.utah.edu), University of Utah, Mathematics Department, 155 S 1400 E, Room 233, Salt Lake City, UT 84112-0090, and **Peter P. Lee** and **Doron Levy**. *Emergent dynamics governed by regulatory cells produce a robust primary T cell response.*

The current paradigm for primary T cell responses is that each effector T cell independently commits to a developmental program. This concept is based on experimental evidence that T cells respond robustly to a wide variety of stimulation levels and initial conditions.

Various mathematical models confirm the result that programmed responses generate dynamics that are insensitive to the nature of antigen stimulation. However, our models suggest that programmed responses do not explain the robustness of T cell dynamics to variations in precursor frequency. As an alternative, we present the hypothesis that a primary T cell response may also be governed by a feedback loop involving regulatory cells. To test these hypotheses, we formulate two mathematical models based on T cell developmental programs and one mathematical model based on negative feedback from adaptive regulatory T cells.

We conclude that T cell programs by themselves do not capture the robustness of T cell responses and propose an alternative mechanism in which the primary T cell response is governed by an emergent group dynamic and rather than individual cell behavior. (Received June 27, 2009)