Emergent dynamics governed by regulatory cells produce a robust primary T cell response

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Several theories exist concerning primary T cell responses, the most prevalent being that T cells follow developmental programs. We propose the alternative hypothesis that the response is governed by a feedback loop between conventional and adaptive regulatory T cells (iTregs). By developing a mathematical model, we show that the regulated response is robust to a variety of parameters and propose that T cell responses may be governed by emergent group dynamics rather than by autonomous programs.

We extend this model to show how T cell regulation may apply to immunodominance. Immunodominance refers to the phenomenon in which simultaneous T cell responses organize themselves into clear hierarchies. We extend our model of T cell regulation to consider multiple, concurrent T cell responses. Using our model, we show that iTreg-mediated regulation leads to a hierarchical expansion of T cell responses as observed in the phenomenon of immunodominance.