

Abstract Submitted  
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**Understanding Original Antigenic Sin with a Dynamical System**

KEYAO PAN, Dept of Bioengineering, Rice Univ, MICHAEL DEEM, Dept of Bioengineering and Physics & Astronomy, Rice Univ — Original antigenic sin is the phenomenon in which prior exposure to an antigen leads to a subsequent suboptimal immune response to a related antigen. Immune memory normally allows for an improved and rapid response to antigens and is the mechanism by which vaccination works. We here develop a dynamical system model of the mechanism of original antigenic sin, clarifying and explaining the detailed spin-glass treatment of original antigenic sin [1]. The dynamical system describes the virus load as it propagates through healthy and infected cells, the naive and memory B cell concentrations, and the affinity of the immune response. Explicit correspondences between the microscopic variables of the spin-glass model and the dynamical system model will be given. The dynamical system model reproduces the phenomenon of original antigenic sin, and describes how competition between different B-cells compromises the overall effect of the immune system. The trade off between the naive and memory immune responses as a function of antigenic distance between the initial and subsequent antigens is displayed. A suboptimal immune response, the original antigenic sin, is observed for intermediate antigenic distances. [1] Deem MW, Lee H-Y. Sequence space localization in the immune system response to vaccination and disease. *Phys Rev Lett* 2003;91:068101.

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