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Modeling antibody diversity during affinity maturation in the germinal center[1] LUIS MIGUEL DE JESS ASTACIO, University of Puerto Rico, Rio Piedras, ASSAF AMITAI, MEHRAN KARDAR, Massachusetts Institute of Technology — The adaptive immune system is responsible for the construction of new antibodies capable of targeting an almost limitless repertoire of pathogens. In response to an infection, naive B cells incorporate into germinal centers and their clones undergo affinity maturation. During this stage, antibodies with higher affinity survive while those with lower affinity undergo apoptosis. Furthermore, a recent study suggests that the affinity maturation process is stochastic and akin to a rapid form of evolution. Our project focused on understanding how antibody diversity changes with respect to time during affinity maturation. A series of computational models of ascending complexity were developed and implemented in Matlab and were used to extract descriptive statistical parameters of the simulated process. It was shown that a probabilistic description of the affinity maturation process is possible by means of computational simulations and that many important statistical values can be derived from such models, including the evolution of diversity with respect to time, coexistence probability of multiple types and mean time for fixation to one type. The project represents an opportunity to understand how the adaptive immune system efficiently produces new antigen-specific antibodies.

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