A stochastic model for immune response with mutations and evolution

Fabio Marcellus Lopes - Universidad de Chile

Abstract

We propose a stochastic model for pathogen dynamics with mutations and evolution in the presence of immune response. In our model, pathogens reproduce but mutations introducing new pathogen types may occur. Beneficial mutations lead to pathogen types that have better fitness than their ancestor types and can be transmitted to all descendant types. The immune system can only eliminate a pathogen type after it has already managed to eliminate all its ancestor types with lower fitnesses. That is, it spends a random time to eliminate a pathogen type (all pathogens at once) after its ancestor types are eliminated. We show that pathogens may evade the immune system due to their mutation rate. This contrasts with the results of Schinazi and Schweinsberg for a similar non-spatial dynamics in which each pathogen type is independently eliminated after a random time. This is a joint work with Carolina Grejo and Fábio Machado.