SFB 680

MOLECULAR BASIS OF
EVOLUTIONARY INNOVATIONS

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Extinction of Bacterial Populations: A Change of Paradigm?

It is now well-established that individual bacteria of many types switch stochastically between two phenotypes: fast-growing ``normals''susceptible to antibiotics, and slowly-growing ``persisters'' hardly affected by the drug. In the competition of species during exponential growth, persisters are a burden, but they may become beneficial when introducing ``stress'' phases like drug treatment.

We suggest to shift the focus to the persistence of an established population. Due to fluctuations, the population will (after a long time) eventually go extinct; persisters act as a life insurance against this. We study a simple stochastic model of these processes. Using a WKB approximation, we find the most likely path to extinction and quantify the extinction risk under both favorable and adverse conditions. Analytical results are obtained both in the biologically relevant regime when the switching is rare compared with the birth and death processes, and in the opposite regime of frequent switching. We explain how persisters strongly reduce the extinction risk and show that rare switches are most beneficial to this end.

I. Lohmar and B. Meerson, Phys. Rev. E 84 051901 (2011)

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Conference room of the Institute of Theoretical Physics

Host: Joachim Krug

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