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Do bacteria form spores as a bet-hedging strategy in stochastic environments?

Many bacteria form spores to survive extreme conditions, such as lack of nutrients, periods of drought, or extraordinary high or low temperatures. Detailed observations by microbiologists have revealed that even in isogenic populations there is substantial intra-individual variation in the timing of sporulation initiation. This has led to the hypothesis that sporulation is a ‘bet hedging strategy’, which has evolved to cope with unpredictably varying environments. The idea behind this is that early sporulators have an advantage if the environment gets worse, whereas late sporulators can profit more quickly from improving environments. Genotypes that produce individuals of different types therefore ‘spread their risks’. We will present a model for studying the evolution of sporulation strategies in environments where new resources arrive at stochastic times. Based on this model we make predictions about the conditions under which bet hedging sporulation strategies might indeed evolve. The problem is complicated, since it involves density dependent processes (due to resource depletion) as well as environmental fluctuation.

Keywords: Evolutionary modeling; Bet-hedging strategy; Stochastic environments; Sporulation.

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