

Increased survival during famine improves fitness of bacteria in a pulsed-resource environment

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ABSTRACT

Background: Organisms may experience alternating periods of feast and famine determined by variation in both resource supply and community composition. Environments with rare and large resource pulses may select for rapid growth during resource abundance and survival during resource scarcity. However, trade-offs may prevent individuals from investing in both traits equally.

Questions: Does the selective response of rapid-growth ability, or the ability to endure resource deprivation, dominate in an environment with rare resource pulses? Does the response depend on pulse amplitude? Does it also depend on whether a species faces only intra-specific competition or both intra- and inter-specific competition?

Study organisms: Two heterotrophic bacterial species – a gleaner (*Novosphingobium capsulatum*) and an opportunist (*Serratia marcescens*).

Methods: We imposed 7-day resource renewal cycles with either high- or low-amplitude fluctuations in resource availability. We cultured the bacteria in one-species monocultures or in two-species communities. We measured the fitness of ancestor strains and evolved strains in 7-day assays that mimicked the environments of the selection experiment.

Results: Both species rapidly evolved a prudent strategy: descendants had both larger populations and better survival than ancestors. In addition, when growing with *S. marcescens*, *N. capsulatum* had an increased growth rate in environments with larger resource fluctuations. Otherwise, the maximum growth rate of neither species responded to the experiments.

Conclusion: Survival during low-resource conditions can be a key community context-dependent trait in fluctuating environments. We found no trade-off between growth rate during feast and survival during famine.

Keywords: competition, *Novosphingobium capsulatum*, population dynamics, *Serratia marcescens*, trade-offs.

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