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Quiescence, or dormancy, is a strategy for microbial survival through an environmental stress such as lack of a resource. To investigate when quiescence is a beneficial strategy, we quantify and compare fitness of a quiescence-capable population and that of a ‘sleepless’ quiescence-incapable population under various growth conditions. Fitness is defined as the top Lyapunov exponent of certain non-autonomous linear ordinary differential equations forced by resource availability. Special attention is given to the case of periodic and stochastic resource availability. Nonlinear models are also considered where resource limitation is assumed to trigger transition to and from the quiescent state. (Received February 26, 2007)