

SURPRISES IN HOW MICROBES COPE WITH UNCERTAINTY

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Populations of genetically-identical bacteria are often thought of as being homogenous. But when individual cells are examined, bacterial populations are sometimes found to be strikingly heterogeneous, consisting of cells in different states. The ability to exist in alternative states under steady-state conditions is described as bistability and is believed to be governed by noise-driven, epigenetic mechanisms resulting in the all-or-nothing activation of a regulatory protein. The current champion for cell population heterogeneity is the soil bacterium *Bacillus subtilis*. Examples of cellular states whose formation is driven by stochastic processes in this Gram-positive bacterium are: genetic competence (the best understood example of bistability in a bacterium), nomadic and sedentary cells in growing populations, sporulation, cannibalism, and, as revealed in recent work, biofilm formation. I will present an overview of the phenomenon of bistability with particular emphasis on the concept that bacteria employ cell population heterogeneity as a means to cope with uncertainty.