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Starvation-induced dormancy in E. coli EMRAH SIMSEK, MINSU KIM, Emory Univ — Isogenic bacterial populations can exhibit phenotypic heterogeneity. Phenotypic heterogeneity is often viewed as a bet-hedging strategy to cope with environmental fluctuations, and believed to be under genetic control. The experimental evidence of this view, however, is limited. Here, we report experimental evidence that prompts reconsideration of this view. Observing how starved E. coli cells resume growth upon nutrient upshift at the single-cell level in real time, we revealed that physiological and metabolic state of starved cells, as well as growth resumption kinetics, vary from cell to cell. Upon nutrient upshift, a majority of cells resume growth instantly, but a small fraction maintain a non-growth state for several hours or days (i.e., long lag time). Hence they are dormant cells. The fraction strongly depends on the duration of starvation. The dormancy does not confer resistance to starvation. Oxidative damage accumulated during starvation leads to the appearance of dormant cells. Taken together, our data suggests that a dormant subpopulation appears as an inevitable consequence of starvation, rather than cellular decision to cope with starvation. Hence, the existence of a genetic program and adaptive value as a bet-hedging strategy to cope with starvation stress may not be needed to explain the emergence of bacterial dormancy.

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