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Cellular memory in bacteria and its influence on future generations

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We study how the cellular memory influences cellular properties and restrict heterogeneity in future generations. Heterogeneity in physical and functional characteristics of cells proliferates within a population due to stochasticity in intracellular biochemical processes and in the distribution of resources during divisions. It is limited, however, in part by the inheritance of cellular components between consecutive generations. In this talk I will present our new study in which, we characterize the dynamics of (non-genetic) inheritance in the simple bacterial model organism E. coli, and reveal how it contributes to regulating the various cellular properties (size, growth rate, etc.) in future generations. This is achieved using a novel microfluidic device that enables us to measure how two sister cells become different from each other over time. Our measurements provide the inheritance dynamics of different cellular properties, and the inertia of cells to maintain these properties along time, i.e. cellular memory. We find that cellular memory is property specific and can last up to 10 generations. Our results can uncover mechanisms of non-genetic inheritance in bacteria and help develop quantitative description of cell progression and variation over time.