

Editorial

For a long time it was thought that individual bacteria from a genetically homogeneous population are also phenotypically uniform. This view has changed, and meanwhile there is substantial evidence that individuals within isogenic bacterial populations communicate, cooperate, and develop individual strategies. Phenotypic heterogeneity is closely connected to transition states of the population, e.g. during the transition of planktonic bacteria into a biofilm; during the initiation of differentiation processes, or during the colonization of eukaryotic hosts. It is conceivable that heterogeneity not only bolsters the survival of a species, but also sustains the fitness of a population by dividing work loads. Consequently, phenotypic individuality is an important issue in all fields of microbiology ranging from infection biology, through biotechnology to evolution.

This special issue “Underlying Mechanisms of Bacterial Phenotypic Heterogeneity & Sociobiology” is the result of the Priority Program (SPP1617) “Phenotypic Heterogeneity and sociobiology of bacterial populations”, which was funded by the German Science Foundation (DFG) from 2012 to 2019. This Program allowed the initiation of extremely fruitful interdisciplinary collaborations between experimentalists and theorists from the fields of biology, physics, biotechnology, chemistry, and mathematics. The core questions addressed in this Priority Program can be summarized as follows: 1. What forms of individuality of bacteria exist and under what conditions are they expressed? 2. What is the significance of phenotypic heterogeneity for

bacterial populations? 3. What are the external and intracellular factors leading to the expression of phenotypic heterogeneity and how do the molecular switches work to express different behaviors? 4. What are the advantages of individuality for bacteria so that this property has become established in the course of evolution? Answers to all these questions will be provided in the reviews and original articles of this special JMB issue. The presented work emphasizes molecular design principles of bacterial phenotypic heterogeneity, as well as the biological relevance and conservation of diverse phenotypes of one genotype in course of evolution.

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