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Investigating phenotypically aberrant E. Coli subpopulations via high-throughput 1D single-cell confinement[1] SHAHLA NEMATI, ANDREAS E. VASDEKIS, Department of Physics, University of Idaho, Moscow, Idaho 83844, USA — Recent advances in single-cell methods have greatly improved our understanding of cellular heterogeneity, namely cell-to-cell phenotypic differences. Here, we focus on a distinct form of cellular heterogeneity pertaining to phenotypically aberrant subpopulations in clonal cultures. These subpopulations often emanate from failures in DNA replication and nucleoid segregation, which in E. coli, our model system, can result in elongated cells with cell-lengths at division of at least two-fold higher than non-aberrant cells. However, our understanding of how these cells emerge, their frequency, and ramifications on culture response remains incomplete. In this paper, we discuss our approach to address this knowledge-gap using microfluidics and time-lapse microscopy. To accomplish this, we employed two different methods. First, we integrated microfluidics with agar gels and allowed cells to grow in a 2D monolayer. Second, we employed micron-scale channels enabling cellular growth strictly in 1D. Comparing these two methods, we found that 1D cell confinement improved throughput by more than three-fold. We will present our preliminary results on the frequency, growth rates, cell-cycle dynamics of aberrant phenotypes using the improved approach.

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Shahla Nemati
Department of Physics, University of Idaho, Moscow, Idaho 83844, USA

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