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Investigation of stochastic noise in the response of the external phosphate sensor in E. coli CHETAN SOOD, YI-JU HSIEH, MICHA ADLER, ALEX GROISMAN, BARRY WANNER, KEN RITCHIE — In E. coli, phosphate starvation activates a two-component regulatory system consisting of the transmembrane sensor protein PhoR and the cytoplasmic regulator protein PhoB. Near the activation threshold ($\sim$4 μM extra-cellular phosphate concentration) we expect significant variation across a population in the phenotypic response, which includes the formation of additional PhoR. To characterize this variation, we grew E. coli in a microfluidic chemostat and monitored production of a PhoR/yellow fluorescent protein (Venus) fusion in response to external phosphate concentration. The scale ($\sim$100 μm) and architecture of the growth chambers allowed for stable control of the extra-cellular environment and long-time maintenance of isolated, identical populations of cells. We will present the results of measurements of the phenotype variation due to the PhoR/PhoB sensor switch in populations of identical cells and compare these results to simulations of the expected stochastic noise in the response of this regulatory system. We will discuss the implications of these results on the fidelity of the phosphate sensor switch.

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