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Discrete-state stochastic simulation of mutant cell dynamics in different environments MERZU BELETE, Univ of Houston, GABOR BALAZSI, The University of Texas M. D. Anderson Cancer Center — Phenotypic heterogeneity among genetically identical cells was shown in a number of experiments.[1] This non-genetic variability can arise from low copies of molecular components like DNA and protein within the cell. These low copy of molecules then cause cell-to-cell variation in their gene expression.[2] Gene expression interacts with the environment to give rise to different phenotypes in the population. Thus, the population has sub-populations with different growth rates and different cellular switching rates from one sub-population to others.[3] The dynamics of mutation in such populations is not well understood. So, what is the fate of mutants in such populations? To address this problem, we developed a stochastic discrete-state model which incorporates a fixed number population, different cellular switching rates, and a different growth rate for each sub-populations. We randomly induced a single mutation in the population in various environments and measured the population fitness change and fraction of mutant cells in the population. The model predicts that the induced mutation follows the dynamics consistent with those experiments observed in our lab.

[1]E.M. Ozbudak, NATURE 427, (2004)
[2]M.B. ELOWITZ, SCIENCE 297, (2002)
[3]Nevozhay, PLoS 8,(2012)

Merzu Belete
Univ of Houston

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