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Accelerating Yeast Prion Biology using Droplet Microfluidics[1]
LLOYD UNG, ASSAF ROTEM, Harvard School of Engineering and Applied Sciences, DANIEL JAROSZ, Whitehead Institute for Biomedical Research, MANOSHI DATTA, Whitehead Institute for Biomedical Research, MIT Computational and Systems Biology, SUSAN LINDQUIST, Whitehead Institute for Biomedical Research, Howard Hughes Medical Institute, MIT Department of Biology, DAVID WEITZ, Harvard School of Engineering and Applied Sciences, Department of Physics — Prions are infectious proteins in a misfolded form, that can induce normal proteins to take the misfolded state. Yeast prions are relevant, as a model of human prion diseases, and interesting from an evolutionary standpoint. Prions may also be a form of epigenetic inheritance, which allow yeast to adapt to stressful conditions at rates exceeding those of random mutations and propagate that adaptation to their offspring. Encapsulation of yeast in droplet microfluidic devices enables high-throughput measurements with single cell resolution, which would not be feasible using bulk methods. Millions of populations of yeast can be screened to obtain reliable measurements of prion induction and loss rates. The population dynamics of clonal yeast, when a fraction of the cells are prion expressing, can be elucidated. Furthermore, the mechanism by which certain strains of bacteria induce yeast to express prions in the wild can be deduced. Integrating the disparate fields of prion biology and droplet microfluidics reveals a more complete picture of how prions may be more than just diseases and play a functional role in yeast.

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