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THE ROLE OF NON-EQUILIBRIUM RIBOSOMAL DYNAMICS IN FACILITATING NUCLEOID SEPARATION

The molecular mechanism of how the two sister chromosomes segregate and partition to two daughter cells in bacteria is not yet understood. A recent theoretical model has proposed that out-of-equilibrium processes associated with ribosome-mRNA (polysome) dynamics significantly influence the segregation of the two chromosomes. Here, we investigate the role of ribosomal dynamics on nucleoid separation using high throughput fluorescence microscopy in microfluidic devices and compare experimental results to our own reaction-diffusion model of ribosome subunits, polysomes and chromosomal DNA. Our experiments reveal that while non-equilibrium dynamics drives ribosomes to the mid-cell, as predicted by the model, the effect associated with these dynamics appears to have a much weaker effect on the segregation than predicted by the model. Instead, our data suggest that the closing division septum via steric interactions and potentially entropic forces between two DNA strands coupled to cell elongation promote partitioning of the nucleoids to two daughter cells.

Topical Area

Biology and life sciences

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