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A Compete-and-Survive Mechanism Explains the Single FtsZ-Ring Formation GANHUI LAN, LI-PING XIONG, George Washington University — Cytokinesis is a critical step in cell reproduction. In bacterial cells, this process is mediated by the cytoskeletal Z ring which is assembled from FtsZ filaments that are "anchored" to the cell membrane through ZipA/FtsA molecules. Fluorescence Recovery after Photobleaching experiments have shown that the Z ring is highly dynamic, with recovery half time of $8 \sim 30$ seconds, yet has a rather persistent overall structure. But it is unclear how a single narrow dynamic Z ring emerges from a big pool of cytoplasmic FtsZ molecules. Here, we developed a rule-based molecular model with FtsZ and ZipA/FtsA molecules, by explicitly considering the elementary assembling events of molecules and their diffusion. Our model can not only efficiently reproduce the Z ring with experimentally observed statistical properties, but provide a convenient way to combine biochemical dynamic and physical assembling processes within the same spatiotemporal modeling framework. In agreement with experiments, we showed that the spontaneous self-assembling process relies on the molecular "stoichiometry": either high or low FtsZ to ZipA/FtsA ratios would result in multiple Z rings or aggregated bundles. Our *in silico* FRAP experiment further yields a recovery half time comparable to experimental results. These results indicate that the rapid turnover dynamics prevents the FtsZ molecules from being sequestered by small FtsZ bundles dispersed over the membrane, allowing single Z ring to emerge and mature. This dynamic colocalization mechanism provides cells a simple way for spatial regulation.

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