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Dynamics of myosin II organization into cortical contractile networks and fibers WEI NIE, MING-TZO WEI, DANIEL OU-YANG, SABRINA JEDLICKA, DIMITRIOS VAVYLONIS, Lehigh University — The morphology of adhered cells critically depends on the formation of a contractile meshwork of parallel and cross-linked stress fibers along the contacting surface. The motor activity and mini-filament assembly of non-muscle myosin II is an important component of cell-level cytoskeletal remodeling during mechanosensing. To monitor the dynamics of myosin II, we used confocal microscopy to image cultured HeLa cells that stably express myosin regulatory light chain tagged with GFP (MRLC-GFP). MRLC-GFP was monitored in time-lapse movies at steady state and during the response of cells to varying concentrations of blebbistatin which disrupts actomyosin stress fibers. Using image correlation spectroscopy analysis, we quantified the kinetics of disassembly and reassembly of actomyosin networks and compared them to studies by other groups. This analysis suggested that the following processes contribute to the assembly of cortical actomyosin into fibers: random myosin mini-filament assembly and disassembly along the cortex; myosin mini-filament aligning and contraction; stabilization of cortical myosin upon increasing contractile tension. We developed simple numerical simulations that include those processes. The results of simulations of cells at steady state and in response to blebbistatin capture some of the main features observed in the experiments. This study provides a framework to help interpret how different cortical myosin remodeling kinetics may contribute to different cell shape and rigidity depending on substrate stiffness.

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