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Stochastic simulations of the growth dynamics and organization of lamellipodia-like actin networks LONGHUA HU, GAREGIN PAPOIAN, Department of Chemistry and Biochemistry, University of Maryland — Cell migration is essential to many biological processes such as embryonic development, wound healing and immune response. The crawling movement of cells is a complex process that involves the protrusion of the leading edge of a cell, adhesion to the substrate, generation of the traction force to move cell body and the subsequent release of adhesions. Lamellipodia are flat sheet-like membrane protrusions at the leading edge of the crawling cells. The dynamic remodeling of the dendritically branched actin network in lamellipodia generates force to drive the movement of cells. We have developed a simplified, three-dimensional computational model to study the growth of lamellipodia-like actin networks. Our model integrates the essential biochemical regulation processes as well as the mechanical aspect of actin polymerization, where the interactions between the semi-flexible filaments and the plasma membrane are taken into account. Using stochastic simulations, we study how membrane tension and external resistance on membrane affect the growth dynamics and organization of the actin network.

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