Polarized rearrangements of the vimentin network in migrating cells

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Abstract

Intermediate filaments (IFs) constitute one of the three major cytoskeletal components in animal cells, but the regulation of their dynamics during cellular processes such as cell migration, is still poorly characterized. IFs form an extensive and elaborate network which reaches the cell cortex, and cytoplasmic organelles such as the nucleus. IFs have recently emerged as key players in cytoplasm organization, mechano-transduction or signaling, leading us to investigate how IF organization and function are dynamically regulated during cellular movements during. Using photobleaching and photoconversion experiments as well as super-resolution imaging, we have characterized the dynamic rearrangements of the vimentin network during glial cell migration. We showed that the vimentin network reorganizes in a polarized manner during the cell protrusion and migration. We have also elucidated the molecular mechanisms underlying IF dynamics. Our study demonstrates that vimentin filaments are in constant motion. However, in contrast to the other cytoskeletal filaments, polymerization/depolymerization events do not seem preponderant in IF dynamics. In fact, the dynamic behavior of IFs involves microtubule-dependent anterograde and retrograde transports and an actin-dependent retrograde flow. These results provide new insights into the mechanism of coordination between the cytoskeleton components and pave the way for a fundamental understanding of the dynamics of IF in live cells and their regulation during cell motility. .