

The influence of vimentin on actin dynamics and force generation in RPE1 cells

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Abstract

The cytoskeleton is a network of filaments in cells, it consists of actin filaments, intermediate filaments and microtubules. Actin stress fibers are involved in force generation, cell retraction and cell protrusion during migration. The polymerization and depolymerization of actin filaments regulate cell migration and are influenced by the activity of actin binding proteins. Vimentin is also involved in cell migration, although it is not associated with molecular motors, and therefore cannot create forces directly. To better understand the mechanism of cell migration, it is important to understand how cytoskeleton filaments interplay. The roles of vimentin filaments and actin filaments in cell migration have been studied separately to date; however, their interactions remain to be defined fully. Therefore, understanding the role of vimentin on actin dynamics, and its implication in actin force generation are the two main interests of this project.

We first measured actin dynamics in vimentin depleted cells using fluorescence recovery after photobleaching [1, 2]. We showed that silencing of vimentin expression slows down actin dynamics but does not affect the fraction of actin monomers that participate. In addition, we showed that plectin as a vimentin-actin cross-linker protein does not have the same effect. Finally, we studied actin force generation using traction force microscopy [3-5]. We showed that silencing of vimentin disarranges the distribution of traction forces and adhesion sites but does not impact the magnitude of traction forces.

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