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MIGRATION, MECHANISMS AND REGULATION PRINCIPLES

Summary

Motility is a common feature of numerous cell types. In response to various stimuli, the dynamic actin cytoskeleton and contractility generate forces needed to drive the cell forward. Actin filament elongation on the barbed ends pushes the plasma membrane forward during lamellipodium formation. Stress fibers contraction and/or the contraction of the cortical network are responsible for detaching the rear part of the cell and enable cell body to follow the progressing front. In response to extracellular stimuli, multiple signaling pathways are initiated resulting in the actin filament network reorganization and contractility of acto-myosin system. The key regulators of these processes are Rho family proteins, PIP₂ and calcium ions. Nucleotide receptors P2Y₂ coupled with G-proteins regulate the level of phosphatidylinositol-4,5-bisphosphate (PIP₂), which in turn modulates a variety of actin binding proteins, is involved in calcium response, and activates Rac1 and RhoA proteins. The RhoA/ROCK signaling pathway plays an important role in contractile force generation needed for the assembly of stress fibers, focal adhesions and for tail retraction during cell migration. The Rac1 via its effector Pak1 regulates lamellipodium formation and protrusion of the leading edge.

Key words: actin cytoskeleton, migration, Rho proteins, stress fibers