

Actin as an integrator of stress-mediated signaling

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Abstract

The process of actin remodeling has been extensively studied at the surface of mammalian cells. This has resulted in a detailed understanding of the localized roles that actin plays in a host of morphogenetic processes at the cortex. Increasing evidence suggests additional roles of actin in regulating global aspects of cellular function, such as transcriptional regulation and signal transduction.

Here, we present data implicating actin as a central integrator of cell stress signaling. Upon induction of calcium influx, we found an unexpected global reorganization of actin into a cytosolic meshwork and perinuclear ring. This unique actin response was initiated within less than 30 seconds of the calcium spike and lasted for less than 2 minutes before reverting back to the typical cortical arrangement. Actin reorganization was detected in many different cell types and could be triggered by a wide range of mechanical and biochemical signals that induced extra cellular calcium influx. Interestingly, actin ring formation was accompanied by cytoplasmic freezing and nuclear constriction. Transcriptome analysis revealed that more than 30 genes were strongly up-regulated in an actin dependent manner. We are currently elucidating the mechanistic basis and physiological consequences of the observed novel link between calcium, actin reorganization and transcription.