
CYTOSKELETON

STRUCTURE, DYNAMICS,
FUNCTION AND DISEASE

Edited by Jose C. Jimenez-Lopez



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Cytoskeleton - Structure, Dynamics, Function and Disease

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Contributors

Francisco Javier Martin-Romero, Eulalia Pozo-Guisado, Aida M. Lopez-Guerrero, Carlos Pascual-Caro, Regina Pessoa-Pureur, Ariane Zamoner, Ivana Pajic-Lijakovic, Milan Milivojevic, Elsa Anes, Sukla Roychowdhury, Jorge Sierra-Fonseca, Doris Cerecedo, Stephane Gross, Galina Prokopchuk, Jacky Cosson, José Antonio Sánchez-Alcázar, Jesús Porcuna Doncel, Patricia De La Cruz Ojeda, Manuel Oropesa Ávila, Marina Villanueva Paz, Isabel De Laveria, Mario De La Mata, Mónica Álvarez Córdoba, Raquel Luzón Hidalgo, Juan Miguel Suarez Rivero, David Cotán, Yoshinobu Mineyuki, Miyuki Takeuchi, Andrew Staehelin, Jin Wang, Xuan Zhang, Zenglin Pei, Chunxia Ji, Xiaoyan Zhang, Jianqing Xu, Anca Hermenean, Aurel Ardelean, Fatima Pedrosa Domellóf, Juliana Vidal, Wanderley De Souza, Francisco Pelegri, Elaine L. Welch, Viji Draviam, Madeleine Hart, Duccio Conti, Roshan Shrestha, Asifa Islam, Naoka Tamura

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The Interplay between Cytoskeleton and Calcium

Dynamics

Francisco Javier Martin-Romero,
Aida M. Lopez-Guerrero, Carlos Pascual-Caro and
Eulalia Pozo-Guisado

Additional information is available at the end of the chapter

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Abstract

Cell motility is a complex cellular event that involves reorganization of cytoskeleton. This reorganization encompasses the transient polarization of the cell to facilitate the plasma membrane ruffling, a rearrangement of cortical actin cytoskeleton required for the development of cellular protrusions. It is known that extracellular Ca^{2+} influx is essential for cell migration and for the positive-feedback cycle that maintains leading-edge structures and ruffling activity. The aim of this review is to summarize our knowledge regarding the Ca^{2+} -dependent signaling pathways, Ca^{2+} transporters and sensors involved in cell migration. Also, we show here reported evidences that support for a crosstalk between Ca^{2+} transport and the reorganization of the cytoskeleton required for cell migration. In this regard, we will analyze the role of store-operated Ca^{2+} entry (SOCE) as a modulator of cytoskeleton and cell migration, but also the modulation of this Ca^{2+} entry pathway by microtubules and the actin cytoskeleton. As a main conclusion, this review will show that data reported in the last years support a role for SOCE in shaping cytoskeleton, but at the same time, SOCE is strongly dependent on cytoskeletal proteins, in an interesting interplay between cytoskeleton and Ca^{2+} dynamics.

Keywords: calcium, microtubules, actin, STIM1, ORAI1, cell migration, cortical cytoskeleton

1. Introduction

Calcium ions (Ca^{2+}) are essential intracellular transducers for cell signaling because of their role to bind Ca^{2+} -sensitive proteins that mediate key activities in signaling pathways. Upon cell stimulation through a variety of receptors and other types of physicochemical stimulations such as depolarization of plasma membrane, changes in osmolarity, physical distortion
