# METHODS IN MOLECULAR BIOLOGY

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# Rab GTPases

## Methods and Protocols

Edited by

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# Preface

Rab GTPases are master regulators of intracellular membrane trafficking in all eukaryotes from the last eukaryotic common ancestor (LECA) to human. In the human genome, there are 66 Rab genes some of which are ubiquitously expressed in all tissues, while others are expressed only in specific tissues. Individual Rabs target to distinct organelles and vesicles to promote vesicular transport through the exocytic and endocytic pathways, which are fundamental to cell physiology and have great impact on other cellular processes, such as hormone secretion, signal transduction, cell migration, and cell growth/differentiation. Indeed, mutations and/or altered expression of Rabs has been implicated in various human diseases ranging from neurodegenerative diseases, diabetes to cancer.

This book covers the latest technological advances in the characterization of the biosynthesis and functions of Rab GTPases and their regulation by guanine nucleotide exchange factors (GEFs) and GTPase-activating proteins (GAPs). The methods are described in detail so that beginners and experts alike can explore the general biochemical principles of Rab GTPase cycle and membrane targeting in vesicular transport and the specific functions of individual Rabs in different cell types. As such, this book should provide a valuable resource for researchers and students interested in the field.

The book consists of 28 chapters, starting with an overview of the Rab GTPase family, which represents the largest branch of the Ras superfamily of small GTPases that are essentially everywhere in the cell and function as molecular switches in regulation of diverse cellular functions by alternating between active GTP-bound and inactive GDP-bound conformations. The next group of chapters describes systematic approaches to the identification and classification of Rabs and Rab GAPs as well as the detection of Rab isoprenylation and membrane distribution. The following chapters examine the biochemical and functional properties of individual Rabs in the order of exocytic, recycling, and endocytic Rabs. The techniques range from in vitro approaches using reconstituted systems to in vivo studies in yeast, *Drosophila*, and mammalian cells. These techniques may also be useful for the study of Rabs in other organisms, especially the large number of uncharacterized Rabs identified through genome sequencing projects.

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