

Preface

Endosomes not only serve as a receiving compartment for proteins endocytosed from cell surface, but also function as a donor compartment and sorting station for cargos designated to lysosomes, Golgi, and plasma membrane. In recent years, the importance of endosomes as sorting and recycling compartments has become increasingly appreciated. However, the complexity of the endosome system also divulges the gap in our knowledge of this fascinating system. Like their sophisticated cousin Golgi, endosomes are dynamic and functionally versatile, yet they are even more elusive due to their highly elaborate and heterogeneous structures. Scientists from various fields of cell biology, membrane traffic, and beyond, see the need to communicate the methods used to study the dynamics and functions of this endo-membrane system.

The aim of this volume is to bring together specialists from the field to contribute their expertise to a broad range of biomedical researchers interested in endosomal sorting and recycling. The first part of the volume consists of chapters focusing on the Rab family of small GTPases, which are not only key regulators of different trafficking steps, but also landmarks of various endosomal compartments. Methods for biochemical, imaging, and functional studies of Rab proteins and their regulators are included (Chapters 1–5). These chapters are followed by approaches studying the Arf GTPases as they control the generation of tubular vesicular carriers from the endosomes (Chapters 6–9). In addition, methods to study the proteins and lipids that control membrane morphology and dynamics are presented (Chapters 10–12). As in most cases, vesicle budding and transport from endosomes involve the action of, and coordination with, cytoskeleton. Several chapters present methods to study the actin polymerization machinery and microtubule-based transport during endosomal trafficking (Chapters 13–15). This volume also includes studies of epithelial cells, which are characterized by their complicated sorting machinery that ensures the correct targeting of proteins to distinct apical and basolateral domains at the plasma membrane. Experimental protocols are presented to investigate the various routes of protein transport from endosomes in this polarized system (Chapters 16–18). The last part of the volume presents studies that link endosomal trafficking and signaling (Chapters 19–22). Elucidating the mechanisms of receptor recycling and degradation is essential for the understanding of the endosome function as well as signal transduction. Biochemical and microscopic imaging approaches are presented for quantitative studies of receptor internalization, recycling, and degradation.

Clearly, due to the complexity of the system and rapid progress of the field, these chapters cannot cover all aspects of endosomal sorting and recycling. It is my hope that the expertise gathered in this volume will serve as a useful resource and platform for future investigation of this fascinating membrane system.

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