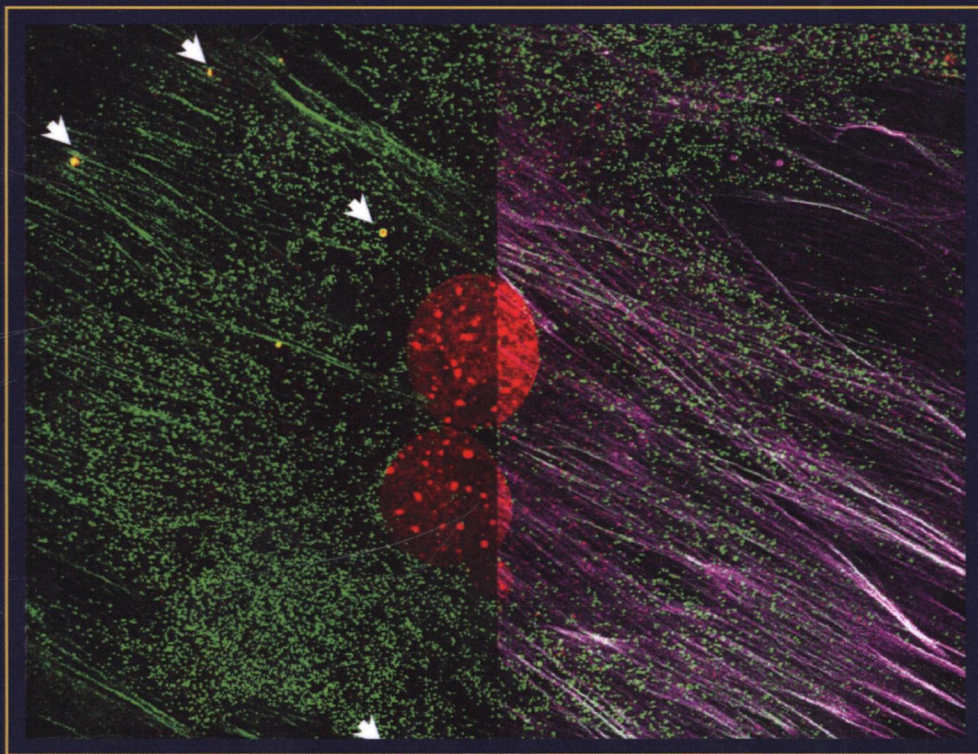


Autophagy and Signaling



Edited by Esther Wong



METHODS IN SIGNAL TRANSDUCTION SERIES



Autophagy and Signaling

Autophagy and Signaling is an up-to-date overview of the many signaling pathways regulating autophagy in response to different cellular needs. Discussion includes the status and future directions of autophagy signaling research with respect to different aspects of health and disease. These include the roles of autophagy in regulating cell fate, immune response and host defense, nutrient sensing and metabolism, neural functions and homeostasis. The mechanisms and significance of cross-talk between autophagy and other cellular processes is also explored. Lastly, alterations in autophagy observed in aging and age-related pathologies are described.

Key Features

- Reviews the role autophagy plays in regulating cell functions
- Describes different types of autophagy signaling
- Discusses the versatility of cell autophagy and signaling regarding cell fate, immune responses and homeostasis
- Explores cellular cross-talk between autophagy and other cellular processes

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AUTOPHAGY AND SIGNALING

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Series Preface

The concept of signal transduction is now long established as a central tenet of biological sciences. Since the inception of the field close to 50 years ago, the number and variety of signal transduction pathways, cascades, and networks have steadily increased and now constitute what is often regarded as a bewildering array of mechanisms by which cells sense and respond to extracellular and intracellular environmental stimuli. It is not an exaggeration to state that virtually every cell function is dependent on the detection, amplification, and integration of these signals. Moreover, there is increasing appreciation that in many disease states, aspects of signal transduction are critically perturbed.

Our knowledge of how information is conveyed and processed through these cellular molecular circuits and biochemical switches has increased enormously in scope and complexity since this series was initiated 15 years ago. Such advances would not have been possible without the supplementation of older technologies, drawn chiefly from cell and molecular biology, biochemistry, physiology, pharmacology, with newer methods that make use of sophisticated genetic approaches as well as structural biology, imaging, bioinformatics, and systems biology analysis.

The overall theme of this series continues to be the presentation of the wealth of up-to-date research methods applied to the many facets of signal transduction. Each volume is assembled by one or more editors who are preeminent in their specialty. In turn, the guiding principle for editors is to recruit chapter authors who will describe procedures and protocols with which they are intimately familiar in a reader-friendly format. The intent is to assure that each volume will be of maximum practical value to a broad audience, including students and researchers just entering an area, as well as seasoned investigators.

As a common pathway important for cell survival, autophagy has received great attention in recent years, encompassing such broad areas as normal physiology of all tissues and organ systems as well as disease conditions, including muscle atrophy, neurodegeneration, cancer, etc. This fast growing area of signal transduction is constantly evolving, with new concepts and methodology frequently developed, many of which are covered in the current volume. It is hoped that the information contained in this volume, as well as other books of this series, will constitute a useful resource to the life sciences research community well into the future.

Joseph Eichberg
Michael Xi Zhu
Series Editors

Preface

Autophagy is a self-eating pathway that the cell uses to recycle its cellular components in lysosomes. Over the years, our understanding of autophagy has evolved from a mere “garbage disposal” pathway to a highly sophisticated system that plays integral roles in multiple cell survival processes. There is a paradigm shift in the recognition of autophagy as a significant pathway that triages health and diseases. This was recently affirmed by the 2016 Nobel Prize in Physiology or Medicine to Professor Yoshinori Ohsumi for his pioneering work on elucidating how autophagy works in yeast.

Besides being a quality control process, autophagy participates in a myriad of physiological functions that directly impact cellular and organismal health. Healthy functional autophagy is associated with longevity while dysfunction in this pathway contributes to the aging process and an array of diseases. Autophagy maintains the health of cells and tissues by regulating cellular homeostasis, cell fate and remodeling, metabolism, immune defense, stress responses and repairs. In recent years, different forms of autophagy have been identified that endow cells with multifaceted mechanisms to better counteract different stressors and toxic cargoes. Further findings support a central role of autophagy in many molecular networks, where autophagy is interconnected with other signaling pathways, serving either as a regulator or an effector to coordinate and orchestrate specific or systematic cellular responses and adaptation. These different autophagic variants and multiplicity of connections together confer cells with great versatility for survival. Thus, understanding autophagy signaling has direct relevance for promoting health and mitigating disease progression. This sets the backdrop for this book, which aims to provide an up-to-date overview of the plethora of signaling pathways that converge on regulating autophagy in response to different cellular needs. The various chapters cover the current perspective of autophagy in regulating cell fate, immune response, nutrient sensing and metabolism, neural functions, and homeostasis. Some chapters also include exploration of the mechanisms and significance of cross talk between autophagy and other cellular processes. Alterations in autophagy observed in aging and age-related pathologies are also discussed. I hope each reader will gain new insights on the different flavors of autophagic mechanisms and come to appreciate the diverse functions and importance of autophagy from the different chapters. Finally, special thanks to all the authors for contributing their time and talent for this book.

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Section I

*Signaling Pathways
Regulating Autophagy*

