

PREFACE

Discovered a half century ago as a self-eating process in mammalian cells, autophagy was studied in the context of tissue development, hormonal regulation and chemotherapy through the 1970s before entering a relatively dormant phase. The identification of the first autophagy gene in the 1990s marks the beginning of a molecular era of autophagy research that triggered an ongoing explosion of interest in autophagy with relation to its basic regulation, role in disease mechanisms and potential therapeutic applications. We now know that autophagy represents a basally active cellular quality control mechanism that is exquisitely regulated in response to a diverse array of cellular signals in health and disease.

Autophagy has three subtypes, which employ distinct mechanisms to sequester and deliver specific cargo for digestion in the lysosome. The regulatory mechanisms underlying digestion by autophagy, however, varies in different cell types and tissues, and the outcome of autophagy is dependent on the larger context of various patho-physiological conditions. With the rapidly increasing molecular knowledge about autophagy mechanisms, we hereby compile expert reviews focused on the topic of neuronal autophagy and the role of autophagy in neurodegeneration and other neurological disorders.

The chapters within this volume elaborate upon how the conserved autophagic process has evolved to include accelerators and brakes in the mammalian nervous system, and how autophagy participates actively in the regulation of neuronal survival and death in the context of neurological diseases. A section is devoted to critical discussion regarding the implication of autophagy dysregulation in brain and retinal development and in major human brain diseases: Alzheimer's, Parkinson's, Huntington's, amyotrophic lateral sclerosis, ischemia/hypoxia and lysosomal storage diseases. Emerging views of autophagy as a promising therapeutic target and new strategies for developing "autophagy-modulatory drugs" to treat neurological diseases are highlighted. The final section is devoted to emerging frontiers in neuronal autophagy research involving synaptic structure/function and axo-dendritic mitochondrial content.

We expect that this book will be helpful for a range of basic, translational, clinical and industrial research scientists. We are grateful to our colleagues who have contributed their expert viewpoints to this book despite busy schedules, and hope that this volume will function as a useful springboard for exploring the seminal contributions of many other groups in the primary literature, who could not be included due to space constraints.

Zhenyu Yue, New York, NY

Charleen T. Chu, Pittsburgh, PA

January 2012