

CONTENTS

<i>Contributors</i>	<i>xi</i>
<i>Preface</i>	<i>xv</i>
1. Cell Death in <i>C. elegans</i> Development	1
Jennifer Zuckerman Malin and Shai Shaham	
1. Introduction	2
2. Core Apoptosis Regulators in <i>C. elegans</i>	4
3. The Core Apoptotic Pathway of <i>C. elegans</i>	16
4. Regulating Apoptosis	20
5. The Engulfment Genes and Their Roles in Cell Death	24
6. Linker Cell Death	30
7. Looking Ahead	33
Acknowledgments	34
References	34
2. Mitochondrial Cell Death Pathways in <i>Caenorhabditis elegans</i>	43
Mahendra Seervi and Ding Xue	
1. Introduction	44
2. Mitochondria: A Central Player in Mammalian Apoptosis	46
3. Programmed Cell Death in <i>C. elegans</i>	49
4. Mitochondrion is an Important Component in <i>C. elegans</i> Programmed Cell Death	51
5. Concluding Remarks	60
Acknowledgments	60
References	61
3. Autophagy in Cell Life and Cell Death	67
Allyson L. Anding and Eric H. Baehrecke	
1. Introduction	67
2. Autophagy Genes	69
3. Autophagy and Cell Survival	71
4. Autophagy and Cell Death	77
5. Conclusions	83
Acknowledgments	84
References	84

4. The End of the Beginning: Cell Death in the Germline	93
Jeanne S. Peterson, Allison K. Timmons, Albert A. Mondragon, and Kimberly McCall	
1. Overview of Cell Death Pathways	94
2. Death of Primordial Germ Cells	98
3. Germline Cell Death in the Adult Ovary	100
4. Cell Death in the Testis	111
5. Comparison of PCD in the <i>Drosophila</i> and Mammalian Ovary	112
6. Conclusion	113
Acknowledgments	113
References	113
5. The HOX–Apoptosis Regulatory Interplay in Development and Disease	121
Katrin Domsch, Fani Papagiannouli, and Ingrid Lohmann	
1. Introduction	122
2. <i>Hox</i> Genes: Homeotic Genes with Master Regulatory Functions	123
3. Apoptosis: The Controlled Killing of Cells	128
4. Hox–Apoptosis Regulatory Interactions During Development	130
5. Interplay of <i>Hox</i> Genes and Apoptosis in the Disease Context	141
6. Concluding Remarks	147
Acknowledgments	148
References	148
6. Programmed Cell Death and Caspase Functions During Neural Development	159
Yoshifumi Yamaguchi and Masayuki Miura	
1. Introduction	160
2. Neurotrophic Support for Neuronal or Glial Survival	161
3. Involvement in Morphogenesis	163
4. Elimination of Morphogen-Producing Cells	164
5. Intrinsic Regulation of the Number of Progeny from a Specific Cell Lineage	165
6. Canceling Developmental Errors	166
7. Neural Cell Death in Sensory System Development: The Visual System as a Model	167
8. The Role of Neural Cell Death in Tissue Remodeling	168
9. Glial Function in Controlling Neural Architecture by Elimination of Dead Cells	170

10. The Nonapoptotic Functions of Caspases in Neural Development	171
11. Neurite Pruning	172
12. Mechanisms that Control Nonapoptotic Caspase Activation	173
13. Transient or Weak Caspase Activation	174
14. Local Caspase Activation	175
15. Conclusion	176
Acknowledgments	176
References	176

7. Regulation of Cell Death by IAPs and Their Antagonists 185

Deepika Vasudevan and Hyung Don Ryoo

1. Introduction	186
2. IAP/Antagonist Interaction	186
3. Mitochondrial Association of IAP-Antagonists	189
4. The Role of Mammalian IAP-Antagonists	191
5. Transcriptional Regulation of <i>Drosophila</i> IAP-Antagonists	191
6. Posttranscriptional Regulation of IAP-Antagonists	193
7. The Role of IAP-Antagonists in Nervous System Development	195
8. IAPs and Their Antagonists in Sculpting Morphogenesis	195
9. Nonapoptotic Roles of IAPs in Morphogenesis, Cell Migration, and Proliferation	196
10. The Roles of IAPs in the Innate Immune Response	198
11. Concluding Remarks	200
Acknowledgments	201
References	201

8. Ubiquitin-Mediated Regulation of Cell Death, Inflammation, and Defense of Homeostasis 209

Pascal Meier, Otto Morris, and Meike Broemer

1. Introduction	210
2. Ubiquitin as Mediator of Signaling Events	212
3. Ub as Arbiter of Life and Death—TNF Signaling as Paradigm	213
4. Ub-Dependent Regulation of RIPK1 and the Ripoptosome	218
5. IAP-Mediated Regulation of Caspases	220
6. Concluding Remarks	230
Acknowledgments	231
References	231

9. The Sound of Silence: Signaling by Apoptotic Cells	241
Caitlin E. Fogarty and Andreas Bergmann	
1. Apoptosis: A Silent Death?	242
2. Apoptotic Signals Dictate Immunological Responses to Cell Death	243
3. Apoptotic Cells Directly Influence Tissue Homeostasis and Growth Control	249
4. Apoptosis: A Loud Death	256
Acknowledgments	257
References	257
10. Clearance of Apoptotic Cells and Pyrenocytes	267
Satoshi Toda, Chihiro Nishi, Yuichi Yanagihashi, Katsumori Segawa, and Shigekazu Nagata	
1. Introduction	268
2. Apoptosis and Signal Transduction	269
3. The Engulfment of Apoptotic Cells	274
4. The Engulfment of Pyrenocytes	282
5. DNA Degradation in Macrophages	284
6. Perspectives	287
References	288
11. Apoptotic Cell Clearance in Development	297
Jeny Shklover, Flonia Levy-Adam, and Estee Kurant	
1. Introduction	298
2. Professional and Nonprofessional Phagocytes During Development	301
3. How Do Phagocytes "Sense" Apoptotic Cells?	304
4. How Do Phagocytes Recognize Apoptotic Cells?	304
5. Intracellular Phagocytic Machinery	309
6. How Do Phagocytes Become Phagocytic?	311
7. Why Are Living Cells Not Removed by Phagocytes?	313
8. Glial Phagocytosis of Apoptotic Neurons in the Developing CNS	314
9. Additional Examples of Apoptotic Cell Clearance During Development	316
10. Stress-Induced Upregulation of Phagocytosis During Development	318
11. Anti-Inflammatory Response Following Apoptotic Cell Clearance	319
12. Phagocytosis-Promoted PCD	320
13. Concluding Remarks	322
Acknowledgments	322
References	323

12. The Morphogenetic Role of Apoptosis 335

Bruno Monier and Magali Suzanne

1. Introduction 336
2. Part I: Cytoskeletal Control of Apoptotic Cell Dynamics 337
3. Part II: Influence of Apoptotic Cells on Their Surroundings 345
4. Conclusion 356
- References 357

Index 363

Andreas Bergmann

Department of Molecular, Cell, and Tissue Biology, Harvard Medical School, Boston, Massachusetts, U.S.A.

Malin Brannstrom

Chemical Center for Neurodegenerative Research, Karolinska Institute, Stockholm, Sweden

Katrin Dammich

Center for Organismal Studies (COS), University of Heidelberg, Heidelberg, Germany

Colleen E. Fogarty

Department of Molecular, Cell, and Tissue Biology, Harvard Medical School, Boston, Massachusetts, U.S.A.

Idan Hershkov

Department of Genetics and Developmental Biology, Faculty of Life Sciences, Tel Aviv University, Ramat Aviv, Israel

Shosh Levy-Adini

Department of Genetics and Developmental Biology, Faculty of Life Sciences, Tel Aviv University, Ramat Aviv, Israel

Ragad Lohmann

Center for Organismal Studies (COS), University of Heidelberg, Heidelberg, Germany

Jennifer Zacherman Malin

Department of Developmental Genetics, Harvard Medical School, Boston, Massachusetts, U.S.A.

Elizabeth McCull

Department of Biology, Boston University, Boston, Massachusetts, U.S.A.

David Meier

The Heriethrough Toby Rothman Research Center, The Center for Cancer Research, Dana-Farber Cancer Institute, Boston, Massachusetts, U.S.A.