
CONTENTS

Contributors	xi
--------------	----

Preface	xiii
---------	------

Part I: Cell Biology

1. Live Imaging of the Cytoskeleton in Early Cleavage-Stage Zebrafish Embryos	1
<i>M. Wihr, N. D. Obholzer, S. G. Megason, H. W. Detrich III, and T. J. Mitchison</i>	
I. Introduction	2
II. Maintaining the Breeding Competence of Zebrafish throughout the Day	4
III. Mounting Zebrafish Embryos for Live Imaging	5
IV. Live Imaging of Microtubules in Cleaving Zebrafish Embryos	6
V. Live Imaging of Microfilaments in Cleaving Zebrafish Embryos	10
VI. Comparison of Microscopic Techniques for Imaging the Cytoskeleton of Cleaving Zebrafish Embryos	12
VII. Discussion and Future Directions	14
References	15
2. Analysis of Cell Proliferation, Senescence, and Cell Death in Zebrafish Embryos	19
<i>Daniel Verduzco and James F. Amatruda</i>	
I. Introduction: The Cell Cycle in Zebrafish	20
II. Zebrafish Embryo Cell-Cycle Protocols	22
III. Screening for Chemical Suppressors of Zebrafish Cell-Cycle Mutants	31
IV. Conclusions	34
V. Reagents and Supplies	34
References	35
3. Analysis of Cilia Structure and Function in Zebrafish	39
<i>Jarema Malicki, Andrei Avanesov, Jade Li, Shiatlou Yuan, and Zhaoxia Sun</i>	
I. Introduction	40

II. Cilia in Zebrafish Embryos and Larvae	41
III. Analytical Tools for Cilia Morphology and Motility	47
IV. Analysis of Cilia-related Mutant Phenotypes in Zebrafish	54
V. Future Directions	68
References	69
4. Cellular Dissection of Zebrafish Hematopoiesis	75
<i>David L. Stachura and David Traver</i>	
I. Introduction	76
II. Zebrafish Hematopoiesis	76
III. Hematopoietic Cell Transplantation	86
IV. Enrichment of Hematopoietic Stem Cells	94
V. <i>In vitro</i> Culture and Differentiation of Hematopoietic Progenitors	97
VI. Conclusions	105
References	105
5. Zebrafish Lipid Metabolism: From Mediating Early Patterning to the Metabolism of Dietary Fat and Cholesterol	111
<i>Jennifer L. Anderson, Juliana D. Carten, and Steven A. Farber</i>	
I. Introduction	112
II. Lipid Metabolism in Developing Zebrafish	114
III. Yolk Metabolism During Early Vertebrate Development	115
IV. Lipid Signaling During Early Zebrafish Development	118
V. Visualizing Lipid Metabolism in Larval and Adult Zebrafish	122
VI. Triple Screen: Phospholipase, Protease and Swallowing Function Assays	131
VII. Zebrafish Models of Human Dyslipidemias	134
VIII. Summary	135
References	136
Part II: Developmental and Neural Biology	
6. Development of the Zebrafish Enteric Nervous System	143
<i>Iain Shepherd and Judith Eisen</i>	
I. Introduction	144
II. Organization of the Zebrafish Intestinal Tract	144
III. Early Development of the ENS	146
IV. Genetic Approaches to Studying ENS Development	148
V. Molecular Mechanisms of ENS Development	149
VI. ENS Differentiation	150
VII. Regulation of Gut Motility	151
VIII. Zebrafish ENS as a Model for Understanding Human Diseases	153
IX. Future Prospects	155
References	156

7. A Guide to Analysis of Cardiac Phenotypes in the Zebrafish Embryo	161
<i>Grant I. Miura and Deborah Yelon</i>	
I. Introduction	161
II. Defects in Heart Size	163
III. Defects in Heart Shape	168
IV. Defects in Cardiac Function	174
V. Summary	176
References	176
8. Chemical Approaches to Angiogenesis in Development and Regeneration	181
<i>Sean Hasso and Joanne Chan</i>	
I. Introduction	182
II. Chemical Approaches and Zebrafish Vascular Development	183
III. Novel Chemical Strategies to Investigate Mechanisms of Angiogenesis	189
IV. Summary	192
References	192
9. Laser-Induced Thrombosis in Zebrafish	197
<i>Pudur Jagadeeswaran, Maira Carrillo, Uvaraj P. Radhakrishnan, Surendra K. Rajpurohit, Seongcheol Kim</i>	
I. Introduction	197
II. Vascular Occlusion	199
III. Methods	199
IV. Future Perspectives	202
References	203
10. Endoderm Specification, Liver Development, and Regeneration	205
<i>Trista E. North and Wolfram Goessling</i>	
I. Review of the Literature	206
II. Embryonic and Larval Protocols to Analyze Liver Formation	210
III. Liver Injury and Regeneration Protocols	213
IV. Assessment of Liver Function	217
V. Summary	219
References	219
11. Morphogenesis of the Zebrafish Jaw: Development Beyond the Embryo	225
<i>Kevin J. Parsons, Viktoria Andreeva, W. James Cooper, Pamela C. Yelick, and R. Craig Albertson</i>	
I. Postembryonic Development – Framing the Questions and Understanding the Challenges	226
II. Obtaining Phenotypes	228
III. Quantitative Methods for Studying Adult Phenotypes	231

IV. A Complementary Approach: The Use of Natural Variation to Complement that Generated in the Lab for Understanding Jaw Morphogenesis	242
V. Implications and Conclusions	244
References	245
 12. Associative Learning in Zebrafish (<i>Danio rerio</i>)	249
Robert Gerlai	
I. Introduction	250
II. Rationale	251
III. Methods and Discussion	253
IV. Summary	268
References	268
 Index	271
 Volumes in Series	283