

Contents

Biographies	ix	8. First Cell Fate Decisions in Early Development: Towards Establishment of the Trophoblast Lineage	95
Preface	xi	Myriam Hemberger and Wendy Dean	
Contributors	xv		
PART I. ATLAS			
1. The Cycling and Pregnant Mouse: Gross Anatomy	3	9. Tetraploid Complementation Assay	107
Stephen C. Pang, Judith Janzen-Pang, M. Yat Tse, B. Anne Croy, and Patricia D.A. Lima		Marina Gertsenstein	
2. Implant Site Dissections	21	10. Biology of the Ectoplacental Cone	113
Stephen C. Pang, Judith Janzen-Pang, M. Yat Tse, B. Anne Croy, and Denise Tse		Estela Bevilacqua, Aline R. Lorenzon, Carla L. Bandeira, and Mara S. Hoshida	
3. Microscopic Anatomy of the Pregnant Mouse Uterus Throughout Gestation	43	11. Decidualization and Endometrial Extracellular Matrix Remodeling	125
Andrew K. Edwards, Judith Janzen-Pang, Annie R. Peng, Chandrakant Tayade, Amanda Carniato, Aureo T. Yamada, Patricia D.A. Lima, and Denise Tse		Rodolfo Favaro, Paulo A. Abrahamsohn, and M. Telma Zorn	
4. Anatomy of the Mouse Placenta Throughout Gestation	69	Interval B. The Maternal-Fetal Interface - Primitive Streak to Term	
Sarah M. Isaac, Michael B. Langford, David G. Simmons, and S. Lee Adamson		12. Postimplantation Development of the Chorioallantoic Placenta	143
5. Whole-Mount Immunohistochemistry of Early Implantation Sites	75	David G. Simmons	
Alexander P. Hofmann, Matthew T. Rätsep, Zhilin Chen, and B. Anne Croy		13. Unique Features of Endometrial Dynamics During Pregnancy	163
6. Magnetic Resonance Imaging of the Mouse Placenta	79	Aureo T. Yamada, Juarez R. Bianco, Eliana M.O. Lippe, Karina Y. Degaki, Aline F. Dalmorin, Andrew K. Edwards, Patricia D.A. Lima, and Valdemar A. Paffaro Jr	
Chressen Catharina Remus and Petra Clara Arck		14. Pathology Analysis of the Placenta	175
		Brad Bolon	
		15. Changes in Structures and Relationships of Trophoblasts, Leukocytes, and Maternal Vessels in Implantation Sites to Midpregnancy	189
		Alexander P. Hofmann, Matthew T. Rätsep, Zhilin Chen, Allison M. Felker, B. Anne Croy, and Scott A. Gerber	
PART II. BASIC BIOLOGY			
Interval A. Estrus, Early Development, Implantation and Uterine Receptivity			
7. Reproductive Tract Changes During the Mouse Estrous Cycle	85	16. The Uteroplacental, Fetoplacental, and Yolk Sac Circulations in the Mouse	201
Kalyne Bertolin and Bruce D. Murphy		Monique Y. Rennie, Junwu Mu, Anum Rahman, Dawei Qu, Kathie J. Whiteley, John G. Sled, and S. Lee Adamson	

17. **Physiological Exchange across Mouse Placenta** 211
Mark Dilworth, Jocelyn D. Glazier, and Colin P. Sibley
 18. **Hypoxia-Associated Regulation within Implantation Sites** 217
Sruthi Alahari and Isabella Caniggia
 19. **Leukocyte Population Dynamics and Functions at the Maternal-Fetal Interface** 227
Adrian Erlebacher
 20. **In Vivo Tracking of Mononuclear Cells in the Virgin Uterus and in Implantation Sites** 243
David N. Olivieri, Ana C. Zenclussen, and Carlos E. Tadokoro
 21. **Microchimerism in Mouse Pregnancy** 251
Dany Nassar, Kiarash Khosrotehrani, and Selim Aractingi
 22. **Systems Biology Analyses of the Placenta** 259
Brian J. Cox
 23. **Contribution of Placental Genomic Imprinting and Identification of Imprinted Genes** 275
Laura C. Kusinski, Wendy N. Cooper, Ionel Sandovici, and Miguel Constância
 24. **Epigenetics of Placental Development and Function** 285
Shuhei Ito, Mitsuko Hirokawa, Koji Hayakawa, Shintaro Yagi, Satoshi Tanaka, and Kunio Shiota
 25. **Genome-Wide Analysis of the Mouse Decidua** 297
Brent M. Bany
 26. **Conditional Gene Deletion in the Placenta Using the Cre-loxP System** 309
Han Li, Hoon-Ki Sung, Dawei Qu, Andras Nagy, and S. Lee Adamson
 27. **Genetic Engineering of Mice to Investigate Uterine Function in Early Pregnancy** 315
Margeaux Wetendorf and Francesco J. DeMayo
 28. **Lentivirus-Mediated Transduction of Optical Reporter Genes in Blastocysts for Placental Studies** 331
Xiujun Fan and Nihar R. Nayak
 29. **Blood Pressure Regulation during Mouse Pregnancy** 341
Suzanne D. Burke
 30. **Intravital Imaging of Vasoactivity in the Uterine Arterial Tree during Pregnancy** 353
Coral L. Murrant
 31. **Multimodal Imaging of the Mouse Placenta** 363
Tal Raz, Reut Avni, and Michal Neeman
- Interval C. Parturition, Lactation and Postnatal Outcomes**
32. **Regulation of Parturition** 373
Oksana Shynlova and Stephen J. Lye
 33. **Cervical Changes Accompanying Birth** 391
Yucel Akgul and Mala Mahendroo
 34. **Peri-Partum Changes to Mouse Pubic Symphysis** 403
Paulo Pinto Joazeiro, Silvio Roberto Consonni, Renata Giardini Rosa, and Olga Maria Szymanski Toledo
 35. **Mammary Gland Morphogenesis and Function during Pregnancy** 419
Ramakrishna Kommagani, Maria M. Szwarc, John P. Lydon, and Paula Amato
 36. **Gestational Programming of the Cardiovascular System** 431
Sandra Rugonyi
 37. **Maternal Stress-Mediated Gene Expression Changes in the Mouse Placenta: A Mosaic Hypothesis of Epigenesis** 443
Lawrence D. Longo and Ravi Goyal
 38. **Pregnancy Alterations from Environmental Pollutants** 463
Mariana M. Veras, Natália S.X. Costa, and Paulo H.N. Saldiva

PART III. PROTOCOLS

- | | | | |
|---|-----|--|-----|
| 39. Monitoring Mouse Estrous Cycles | 475 | 50. Nonradioactive In Situ Hybridization: Optimization for Tissue Sections from Pregnant Uteri and Placenta during the First Half of Pregnancy | 591 |
| <i>Kalyne Bertolin and Bruce D. Murphy</i> | | <i>Brent M. Bany and David G. Simmons</i> | |
| 40. Lentivirus Transduction of Gene Tags in Blastocysts | 479 | 51. Whole Mount In Situ Immunohistochemistry | 605 |
| <i>Xiujun Fan and Nihar R. Nayak</i> | | <i>Alexander P. Hofmann, Matthew T. Rätsep, Zhilin Chen, Allison M. Felker, B. Anne Croy, and Scott A. Gerber</i> | |
| 41. Tetraploid Complementation Assay | 489 | 52. Guidelines for Evaluation of Reproductive and Developmental Endpoints | 611 |
| <i>Marina Gertsenstein</i> | | <i>Mariana M. Veras, Natália S.X. Costa, and Paulo H. N. Saldiva</i> | |
| 42. Pseudopregnant Bead-Induced Mouse Deciduoma Model | 499 | 53. Flow Cytometric Analysis of Myometrial and Decidual Cell Suspensions | 619 |
| <i>Brent M. Bany</i> | | <i>Adam Blaisdell and Adrian Erlebacher</i> | |
| 43. Ectoplacental Cone Isolation, Culture and Assessment | 505 | 54. Uterine Leukocyte Isolation and Culture | 629 |
| <i>Estela Bevilacqua, Aline R. Lorenzon, Carla L. Bandeira, Mara S. Hoshida, Maria Cecília Da Lozzo Garbelini, and Claudia Regina Gonçalves</i> | | <i>Marcia C. Bizinotto, Allison M. Felker, Karina Y. Degaki, and Aureo T. Yamada</i> | |
| 44. Layer-Enriched Tissue Dissection of the Mouse Placenta in Late Gestation | 529 | 55. Scanning Electron Microscopy and Micro-Computed Tomography Imaging of the Utero- and Fetoplacental Circulations | 637 |
| <i>Dawei Qu, Angela McDonald, Kathie J. Whiteley, Shannon A. Bainbridge, and S. Lee Adamson</i> | | <i>Monique Y. Rennie, Kathie J. Whiteley, John G. Sled, and S. Lee Adamson</i> | |
| 45. Protocols for Placental Histology | 537 | 56. Radiotelemetry in Mouse Pregnancy | 649 |
| <i>Brad Bolon</i> | | <i>Suzanne D. Burke</i> | |
| 46. Best Practice for Quantifying the Microscopic Structure of Mouse Placenta: The Stereological Approach | 545 | 57. Ex vivo Perfusion of the Mouse Placenta for Maternal-Fetal Interaction Studies during Pregnancy | 661 |
| <i>Mariana M. Veras, Natália S.X. Costa, and Terry Mayhew</i> | | <i>Nick Goeden and Alexandre Bonnin</i> | |
| 47. Electron Microscopy and Immunoelectromicroscopy Protocols | 557 | 58. Evaluation of Placental Transport Function | 673 |
| <i>Aureo T. Yamada, Patricia D.A. Lima, Matthew T. Rätsep, Valdemar A. Paffaro Jr, Tetsuji Nagata, M. Telma Zorn, and Paulo A. Abrahamsohn</i> | | <i>Mark Dilworth, Colin P. Sibley, and Jocelyn D. Glazier</i> | |
| 48. Laser Capture Microdissection | 567 | 59. Hypoxia-Associated Regulation within Implantation Sites | 687 |
| <i>Chandrakant Tayade, Andrew K. Edwards, and Mallikarjun Bidarimath</i> | | <i>Sruthi Alahari and Isabella Caniggia</i> | |
| 49. Immunofluorescence and Immunohistochemistry | 577 | 60. Method to Locate the Uterine Artery in Mice for Micro-Ultrasound Doppler Blood Velocity Examination | 693 |
| <i>Adam Blaisdell and Adrian Erlebacher</i> | | <i>Dawei Qu, S. Lee Adamson, and Yu-Qing Zhou</i> | |

61. Two-Photon Intravital Microscopy of the Virgin and Pregnant Mouse Uterus	699	68. Dietary and Hypoxic Protocols That Alter Placental Gene Expression in Response to Maternal Stress	761
<i>Carlos E. Tadokoro</i>		<i>Lawrence D. Longo, Ciprian P. Gheorghe and Ravi Goyal</i>	
62. Intravital Imaging of Vasoactivity in the Uterine Arterial Vasculature Tree during Pregnancy	709	69. Parental-Specific Gene Expression and Epigenetic Analyses of Imprinted Genes in Mouse Placenta	763
<i>Coral L. Murrant</i>		<i>Laura C. Kusinski, Wendy N. Cooper, Ionel Sandovici, and Miguel Constância</i>	
63. MRI, Intra-vital, and Ex-vivo Fluorescence Microscopy of the Mouse Uterine Vasculature and Placenta	715	70. A Method for Obtaining Epigenomic Data	773
<i>Reut Avni, Tal Raz, and Michal Neeman</i>		<i>Koji Hayakawa, Mitsuko Hirotsawa, and Kunio Shiota</i>	
64. Assessment of Changes in the Peripartum Cervix	723	71. Methods for Genetic Engineering in Mice	777
<i>Yucel Akgul and Mala Mahendroo</i>		<i>Margeaux Wetendorf, Janet L. DeMayo, and Francesco J. DeMayo</i>	
65. Pubic Symphysis Evaluation	733	Appendix: Reproductive Parameters of Common, Commercially Available Mouse Strains	791
<i>Paulo Pinto Joazeiro, Sílvia Roberto Consonni, Renata Giardini Rosa, and Olga Maria Szymanski Toledo</i>		<i>Alice White McVey</i>	
66. Labor and Preterm Labor	751	Index	795
<i>Oksana Shynlova and Stephen J. Lye</i>			
67. Epithelial Transplantation into the Cleared Mammary Fat Pad	755		
<i>Ramakrishna Kommagani, Maria M. Szwarc, John P. Lydon, and Paula Amato</i>			