
Contents

Preface	v
Contributors	xi

I MODEL SYSTEMS TO STUDY MITOCHONDRIAL FUNCTIONS

1 The Mitochondria of Cultured Mammalian Cells: <i>I: Analysis by Immunofluorescence Microscopy, Histochemistry, Subcellular Fractionation, and Cell Fusion</i> Florence Malka, Karine Auré, Steffi Goffart, Johannes N. Spelbrink, and Manuel Rojo	3
2 The Mitochondria of Cultured Mammalian Cells: <i>II: Expression and Visualization of Exogenous Proteins in Fixed and Live Cells</i> Steffi Goffart, Peter Martinsson, Florence Malka, Manuel Rojo, and Johannes N. Spelbrink	17
3 <i>Drosophila melanogaster</i> as a Model System to Study Mitochondrial Biology Miguel Angel Fernández-Moreno, Carol L. Farr, Laurie S. Kaguni, and Rafael Garesse	33
4 Isolation and Functional Analysis of Mitochondria From the Nematode <i>Caenorhabditis elegans</i> Leslie I. Grad, Leanne C. Sayles, and Bernard D. Lemire	51
5 Isolation of Mitochondria From Procyclic <i>Trypanosoma brucei</i> André Schneider, Fabien Charrière, Mascha Pusnik, and Elke K. Horn	67
6 <i>Saccharomyces cerevisiae</i> as a Model Organism to Study Mitochondrial Biology: <i>General Considerations and Basic Procedures</i> Katrin Altmann, Mark Dürr, and Benedikt Westermann	81

- 7 Studying Mitochondria in An Attractive Model:
Schizosaccharomyces pombe
**Stéphane Chiron, Mauricette Gaisne, Emmanuelle Guillou,
Pascale Belenguer, G. Desmond Clark-Walker,
and Nathalie Bonnefoy** 91
- 8 *Neurospora crassa* as a Model Organism
for Mitochondrial Biogenesis
Frank E. Nargang and Doron Rapaport 107
- 9 Isolation of Intact, Functional Mitochondria
From the Model Plant *Arabidopsis thaliana*
**Lee J. Sweetlove, Nicolas L. Taylor,
and Christopher J. Leaver** 125
- 10 *Chlamydomonas reinhardtii*:
The Model of Choice to Study Mitochondria
From Unicellular Photosynthetic Organisms
**Soledad Funes, Lars-Gunnar Franzén,
and Diego González-Halphen** 137

II GENETICS AND MOLECULAR BIOLOGY

- 11 Directed Alteration of *Saccharomyces cerevisiae*
Mitochondrial DNA by Biolistic Transformation
and Homologous Recombination
Nathalie Bonnefoy and Thomas D. Fox 153
- 12 Screens for Mitochondrial Mutants in Yeast
Françoise Foury 167
- 13 Transcript End Mapping and Analysis
of RNA Editing in Plant Mitochondria
**Frank Kempken, Nina Bolle, Joachim Forner,
and Stefan Binder** 177
- 14 In Vitro Analysis of the Yeast Mitochondrial RNA Polymerase
Elizabeth A. Amriott and Judith A. Jaehning 193
- 15 Functional Analysis by Inducible RNA Interference
in *Drosophila melanogaster*
**Yuichi Matsushima, Cristina Adán, Rafael Garesse,
and Laurie S. Kaguni** 207
- 16 Analysis of Replicating Mitochondrial DNA
by Two-Dimensional Agarose Gel Electrophoresis
Aurelio Reyes, Takehiro Yasukawa, and Ian J. Holt 219

III BIOCHEMISTRY

- 17 The Analysis of tRNA Import Into Mammalian Mitochondria
*Anne-Marie Mager-Heckel, Nina Entelis,
 Irina Brandina, Petr Kamenski, Igor A. Krashennnikov,
 Robert P. Martin, and Ivan Tarassov* 235
- 18 Analysis of Mitochondrial Protein Synthesis in Yeast
Soledad Funes and Johannes M. Herrmann 255
- 19 Large-Scale Isolation of Mitochondrial Ribosomes
 From Mammalian Tissues
Linda L. Spremulli 265
- 20 Protein Import Into Isolated Mitochondria
Dejana Mokranjac and Walter Neupert 277
- 21 Analyzing Import Intermediates of Mitochondrial Proteins
 by Blue Native Gel Electrophoresis
Thomas Waizenegger and Doron Rapaport 287
- 22 In Vitro and In Vivo Protein Import Into Plant Mitochondria
*Pavel F. Pavlov, Charlotta Rudhe, Shashi Bhushan,
 and Elzbieta Glaser* 297
- 23 Two-Dimensional Blue Native/Blue Native Polyacrylamide
 Gel Electrophoresis for the Characterization
 of Mitochondrial Protein Complexes and Supercomplexes
*Stephanie Sunderhaus, Holger Eubel,
 and Hans-Peter Braun* 315
- 24 Investigation of Iron-Sulfur Protein Maturation in Eukaryotes
*Oliver Stehling, Paul M. Smith, Annette Biederbick,
 Janneke Balk, Roland Lill, and Ulrich Mühlenhoff* 325
- 25 Studying Proteolysis Within Mitochondria
Takashi Tatsuta and Thomas Langer 343

IV PHYSIOLOGY

- 26 Methods to Determine the Status
 of Mitochondrial ATP Synthase Assembly
Sharon H. Ackerman and Alexander Tzagoloff 363
- 27 ATP Production in Isolated Mitochondria
 of Procyclic *Trypanosoma brucei*
*André Schneider, Nabile Bouzaidi-Tiali,
 Anne-Laure Chanez, and Laurence Bulliard* 379

- 28 Oxidative Stress and Plant Mitochondria
Nicolas L. Taylor and A. Harvey Millar 389
- 29 Measuring Mitochondrial Shape Changes
 and Their Consequences on Mitochondrial Involvement
 During Apoptosis
Christian Frezza, Sara Cipolat, and Luca Scorrano 405
- 30 Assessing Mitochondrial Potential, Calcium,
 and Redox State in Isolated Mammalian Cells
 Using Confocal Microscopy
Sean M. Davidson, Derek Yellon, and Michael R. Duchen ... 421

V DYNAMICS AND MORPHOLOGY

- 31 Fluorescence Imaging of Mitochondria in Yeast
Theresa C. Swayne, Anna C. Gay, and Liza A. Pon 433
- 32 Mitochondrial Fusion In Vitro
Shelly L. Meeusen and Jodi Nunnari 461
- 33 Conventional and Immunoelectron Microscopy
 of Mitochondria
Edward M. Perkins and J. Michael McCaffery 467
- 34 Mitochondrial Division in *Caenorhabditis elegans*
Shilpa Gandre and Alexander M. van der Bliek 485

VI FUNCTIONAL GENOMICS

- 35 Yeast Mitochondrial Transcriptomics
**Mathilde Garcia, Xavier Darzacq, Frederic Devaux,
 Robert H. Singer, and Claude Jacq** 505
- 36 Plant Mitochondrial Transcriptomics
 by Quantitative RT-PCR
Rachel Clifton and James Whelan 529
- 37 Proteomics of Yeast Mitochondria
Jörg Reinders and Albert Sickmann 543
- 38 *Arabidopsis* Mitochondrial Proteomics
Joshua L. Heazlewood and A. Harvey Millar 559
- 39 MitoP2, an Integrated Database for Mitochondrial Proteins
Holger Prokisch and Uwe Ahting 573

- Index 587