

METHODS IN MOLECULAR BIOLOGY

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SMC Complexes

Methods and Protocols

Edited by

Anjana Badrinarayanan

National Centre for Biological Sciences, Tata Institute of Fundamental Research (TIFR), Bangalore, India

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Editor

Anjana Badrinarayanan
National Centre for Biological Sciences
Tata Institute of Fundamental Research (TIFR)
Bangalore, India

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Preface

Chromosomes must be highly compacted to fit inside the limited volume of a cell. In this confined space, they must also be faithfully duplicated, segregated, and transcribed. Several studies have begun to reveal the general principles of genome organization and maintenance across domains of life and have identified and mechanistically characterized central players that mediate key steps of this process, such as the Structural Maintenance of Chromosome (SMC) proteins. SMC proteins are ubiquitous across prokaryotic and eukaryotic systems and participate in a range of chromosome-associated processes including chromosome condensation, organization, and segregation as well as DNA repair and gene expression regulation. These proteins act with accessory subunits to form functional SMC complexes inside cells. Eukaryotic cells have dedicated SMC complexes that have evolved for specialized activities on DNA (Cohesin, Condensin, SMC5/6, and the MRN complex). In contrast, most chromosome organization and segregation activities are carried out by a single SMC complex in prokaryotes (SMC-ScpAB/MukBEF/MksBEF), while a second SMC complex participates in aspects of DNA repair (RecN/SbcCD). This volume of *Methods in Molecular Biology* brings together recent methods and theoretical approaches developed to dissect the activity and function of bacterial and eukaryotic SMC proteins. Protocols have been divided into six parts: *Part I*—Depletion systems to assess SMC function; *Part II*—Genetic manipulation of SMC function; *Part III*—Chromosomal assays of SMC activity; *Part IV*—Biochemical assays of SMC activity; *Part V*—Microscopy-based assays of SMC activity; *Part VI*—Theoretical modeling and simulation of SMC activity. These sections carry methods relevant to both prokaryotic and eukaryotic systems, and chapters are arranged in an increasing order of biological scale. Together, the range of tools and techniques covered in this issue should facilitate studies looking into the mechanisms of action of SMC complexes on DNA.

Bangalore, India

Anjana Badrinarayanan

Contents

<i>Preface</i>	<i>v</i>
<i>Contributors</i>	<i>xi</i>
PART I DEPLETION SYSTEMS TO ASSESS SMC FUNCTION	
1 Using Cell Cycle-Restricted Alleles to Study the Chromatin Dynamics and Functions of the Structural Maintenance of Chromosomes (SMC) Complexes In Vivo	3
<i>Demis Menolfi and Dana Branzei</i>	
2 Degradation of <i>S. cerevisiae</i> Cohesin with the Auxin-Inducible Degron System	17
<i>Clémentine Brocas, Cécile Ducrot, and Karine Dubrana</i>	
3 Efficient Depletion of Fission Yeast Condensin by Combined Transcriptional Repression and Auxin-Induced Degradation	25
<i>Yasutaka Kakui and Frank Uhlmann</i>	
4 Conditional Mutation of <i>SMC5</i> in Mouse Embryonic Fibroblasts	35
<i>Himaja Gaddipati, Marina V. Pryzhkova, and Philip W. Jordan</i>	
PART II GENETIC MANIPULATION OF SMC FUNCTION	
5 High-Throughput Allelic Replacement Screening in <i>Bacillus subtilis</i>	49
<i>Marie-Laure Diebold-Durand, Frank Bürmann, and Stephan Gruber</i>	
6 Identifying Functional Domains in Subunits of Structural Maintenance of Chromosomes (SMC) Complexes by Transposon Mutagenesis Screen in Yeast	63
<i>Avi Matityahu, Michal Shwartz, and Itay Onn</i>	
7 Multicomponent Yeast Two-Hybrid System: Applications to Study Protein–Protein Interactions in SMC Complexes	79
<i>Jan Josef Paleček, Lucie Vondrová, Kateřina Zábřady, and Jakub Otočka</i>	
8 Knocking in Multifunctional Gene Tags into SMC Complex Subunits Using Gene Editing	91
<i>Paul Kalitsis, Tao Zhang, Ji Hun Kim, Christian F. Nielsen, Kathryn M. Marshall, and Damien F. Hudson</i>	
PART III CHROMOSOMAL ASSAYS OF SMC ACTIVITY	
9 Chromosome Conformation Capture with Deep Sequencing to Study the Roles of the Structural Maintenance of Chromosomes Complex In Vivo	105
<i>Tung B. K. Le</i>	

10	Analysis of the Chromosomal Localization of Yeast SMC Complexes by Chromatin Immunoprecipitation	119
	<i>Vasso Makrantonis, Daniel Robertson, and Adele L. Marston</i>	
11	Analysis of Cohesin Association to Newly Replicated DNA Through Nascent Strand Binding Assay (NSBA)	139
	<i>Camilla Frattini and Rodrigo Bermejo</i>	
12	Preparation of Cell Cycle-Synchronized <i>Saccharomyces cerevisiae</i> Cells for Hi-C	155
	<i>Stephanie A. Schalbetter and Jonathan Baxter</i>	
PART IV BIOCHEMICAL ASSAYS OF SMC ACTIVITY		
13	Dissecting DNA Compaction by the Bacterial Condensin MukB	169
	<i>Rupesh Kumar, Soon Bahng, and Kenneth J. Mariani</i>	
14	In Vivo and In Vitro Assay for Monitoring the Topological Loading of Bacterial Condensins on DNA	181
	<i>Koichi Yano, Koichiro Akiyama, and Hironori Niki</i>	
15	A Protocol for Assaying the ATPase Activity of Recombinant Cohesin Holocomplexes	197
	<i>Menelaos Voulgaris and Thomas G. Gligoris</i>	
16	In Vitro Detection of Long Noncoding RNA Generated from DNA Double-Strand Breaks	209
	<i>Sheetal Sharma and Fabrizio d'Adda di Fagagna</i>	
PART V MICROSCOPY-BASED ASSAYS OF SMC ACTIVITY		
17	Tracking Bacterial Chromosome Dynamics with Microfluidics-Based Live Cell Imaging	223
	<i>Suchitha Raghunathan and Anjana Badrinarayanan</i>	
18	Live-Cell Fluorescence Imaging of RecN in <i>Caulobacter crescentus</i> Under DNA Damage	239
	<i>Afroze Chimthanawala and Anjana Badrinarayanan</i>	
19	Microinjection Techniques in Fly Embryos to Study the Function and Dynamics of SMC Complexes	251
	<i>Catarina Carmo, Margarida Araújo, and Raquel A. Oliveira</i>	
20	Purification and Biophysical Characterization of the Mre11-Rad50-Nbs1 Complex	269
	<i>Logan R. Myler, Michael M. Soniat, Xiaoming Zhang, Rajashree A. Deshpande, Tanya T. Paull, and Ilya J. Finkelstein</i>	

PART VI THEORETICAL MODELING AND SIMULATION
OF SMC ACTIVITY

21 Three-Dimensional Thermodynamic Simulation of Condensin
as a DNA-Based Translocase 291
Josh Lawrimore, Yunyan He, Gregory M. Forest, and Kerry Bloom

22 Molecular Dynamics Simulations of Condensin-Mediated
Mitotic Chromosome Assembly 319
Yuji Sakai, Tatsuya Hirano, and Masashi Tachikawa

Index 335

Contributors

- KOICHIRO AKIYAMA • *Microbial Physiology Laboratory, Department of Gene Function and Phenomics, National Institute of Genetics, Mishima, Shizuoka, Japan*
- MARGARIDA ARAÚJO • *Chromosome Dynamics Lab, Instituto Gulbenkian de Ciência, Oeiras, Portugal*
- ANJANA BADRINARAYANAN • *National Centre for Biological Sciences, Tata Institute of Fundamental Research (TIFR), Bangalore, India*
- SOON BAHNG • *Molecular Biology Program, Memorial Sloan Kettering Cancer Center, New York, NY, USA*
- JONATHAN BAXTER • *Genome Damage and Stability Centre, School of Life Sciences, University of Sussex, Brighton, East Sussex, UK*
- RODRIGO BERMEJO • *Centro de Investigaciones Biológicas (CIB-CSIC), Madrid, Spain*
- KERRY BLOOM • *Department of Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA*
- DANA BRANZEI • *IFOM—The FIRC Institute of Molecular Oncology, Milan, Italy; Istituto di Genetica Molecolare, Consiglio Nazionale delle Ricerche (IGM-CNR), Pavia, Italy*
- CLÉMENTINE BROCAS • *UMR Stabilité Génétique Cellules Souches et Radiations, Université Paris Diderot, Université Paris-Sud, CEA, Fontenay-aux-Roses, France; U1274, Inserm Fontenay-aux-Roses, France; iRCM/JACOB/DRF, CEA, Fontenay-aux-Roses, France*
- FRANK BÜRMAN • *Structural Studies, MRC Laboratory of Molecular Biology, Cambridge, UK*
- CATARINA CARMO • *Chromosome Dynamics Lab, Instituto Gulbenkian de Ciência, Oeiras, Portugal*
- AFROZE CHIMTHANAWALA • *National Centre for Biological Sciences, Tata Institute of Fundamental Research (TIFR), Bangalore, India; SASTRA University, Tanjore, India*
- FABRIZIO D'ADDA DI FAGAGNA • *IFOM—The FIRC Institute of Molecular Oncology, Milan, Italy; Department of Experimental Medicine and Biotechnology, Postgraduate Institute of Medical Education and Research, Chandigarh, India*
- RAJASHREE A. DESHPANDE • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA; The Howard Hughes Medical Institute, The University of Texas at Austin, Austin, TX, USA*
- MARIE-LAURE DIEBOLD-DURAND • *Department of Fundamental Microbiology, University of Lausanne, Lausanne, Switzerland*
- KARINE DUBRANA • *UMR Stabilité Génétique Cellules Souches et Radiations, Université Paris Diderot, Université Paris-Sud, CEA, Fontenay-aux-Roses, France; U1274, Inserm Fontenay-aux-Roses, France; iRCM/JACOB/DRF, CEA, Fontenay-aux-Roses, France*
- CÉCILE DUCROT • *UMR Stabilité Génétique Cellules Souches et Radiations, Université Paris Diderot, Université Paris-Sud, CEA, Fontenay-aux-Roses, France; U1274, Inserm Fontenay-aux-Roses, France; iRCM/JACOB/DRF, CEA, Fontenay-aux-Roses, France*
- ILYA J. FINKELSTEIN • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA; Center for Systems and Synthetic Biology, The University of Texas at Austin, Austin, TX, USA*
- CAMILLA FRATTINI • *Centro de Investigaciones Biológicas (CIB-CSIC), Madrid, Spain; Institut de Génétique Humaine—IGH, Montpellier, France*

- HIMAJA GADDIPATI • *Department of Biochemistry and Molecular Biology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*
- THOMAS G. GLIGORIS • *Department of Biochemistry, University of Oxford, Oxford, UK*
- GREGORY M. FOREST • *Department of Mathematics and Biomedical Engineering, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA*
- STEPHAN GRUBER • *Department of Fundamental Microbiology, University of Lausanne, Lausanne, Switzerland*
- YUNYAN HE • *Department of Mathematics and Biomedical Engineering, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA*
- TATSUYA HIRANO • *Chromosome Dynamics Laboratory, RIKEN, Wako, Japan*
- DAMIEN F. HUDSON • *Murdoch Childrens Research Institute, Royal Children's Hospital, Parkville, VIC, Australia; Department of Paediatrics, University of Melbourne, Parkville, VIC, Australia*
- PHILIP W. JORDAN • *Department of Biochemistry and Molecular Biology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*
- YASUTAKA KAKUI • *Chromosome Segregation Laboratory, The Francis Crick Institute, London, UK*
- PAUL KALITSIS • *Murdoch Childrens Research Institute, Royal Children's Hospital, Parkville, VIC, Australia; Department of Paediatrics, University of Melbourne, Parkville, VIC, Australia*
- JI HUN KIM • *Department of Bioengineering, University of Pennsylvania, Philadelphia, PA, USA*
- RUPESH KUMAR • *Molecular Biology Program, Memorial Sloan Kettering Cancer Center, New York, NY, USA*
- JOSH LAWRIMORE • *Department of Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; Curriculum in Genetics and Molecular Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA*
- TUNG B. K. LE • *Department of Molecular Microbiology, John Innes Centre, Norwich, UK*
- VASSO MAKRANTONI • *The Wellcome Centre for Cell Biology, Institute of Cell Biology, School of Biological Sciences, University of Edinburgh, Edinburgh, UK*
- KENNETH J. MARIANS • *Molecular Biology Program, Memorial Sloan Kettering Cancer Center, New York, NY, USA*
- KATHRYN M. MARSHALL • *Department of Surgery, Austin Health, University of Melbourne, Heidelberg, VIC, Australia*
- ADELE L. MARSTON • *The Wellcome Centre for Cell Biology, Institute of Cell Biology, School of Biological Sciences, University of Edinburgh, Edinburgh, UK*
- AVI MATITYAHU • *The Azrieli Faculty of Medicine, Bar-Ilan University, Safed, Israel*
- DEMIS MENOLFI • *Institute for Cancer Genetics, Department of Pathology and Cell Biology, College of Physicians & Surgeons, Columbia University, New York, NY, USA; IFOM, the FIRC Institute of Molecular Oncology, Milan, Italy*
- LOGAN R. MYLER • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA*
- CHRISTIAN F. NIELSEN • *Murdoch Childrens Research Institute, Royal Children's Hospital, Parkville, VIC, Australia; Department of Paediatrics, University of Melbourne, Parkville, VIC, Australia*
- HIRONORI NIKI • *Microbial Physiology Laboratory, Department of Gene Function and Phenomics, National Institute of Genetics, Mishima, Shizuoka, Japan; Department of Genetics, SOKENDAI (The Graduate University for Advanced Studies), Mishima, Shizuoka, Japan*

- RAQUEL A. OLIVEIRA • *Chromosome Dynamics Lab, Instituto Gulbenkian de Ciência, Oeiras, Portugal*
- ITAY ONN • *The Azrieli Faculty of Medicine, Bar-Ilan University, Safed, Israel*
- JAKUB OTOČKA • *National Centre for Biomolecular Research, Faculty of Science, Masaryk University, Brno, Czech Republic*
- JAN JOSEF PALEČEK • *National Centre for Biomolecular Research, Faculty of Science, Masaryk University, Brno, Czech Republic; Mendel Centre for Plant Genomics and Proteomics, Central European Institute of Technology, Masaryk University, Brno, Czech Republic*
- TANYA T. PAULL • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA; The Howard Hughes Medical Institute, The University of Texas at Austin, Austin, TX, USA*
- MARINA V. PRYZHKOVA • *Department of Biochemistry and Molecular Biology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA*
- SUCHITHA RAGHUNATHAN • *National Centre for Biological Sciences, Tata Institute of Fundamental Research (TIFR), Bangalore, India; Transdisciplinary University (TDU), Bangalore, India*
- DANIEL ROBERTSON • *The Wellcome Centre for Cell Biology, Institute of Cell Biology, School of Biological Sciences, University of Edinburgh, Edinburgh, UK*
- YUJI SAKAI • *Department of Biochemistry and Molecular Biology, Graduate School and Faculty of Medicine, The University of Tokyo, Tokyo, Japan; Theoretical Biology Laboratory, RIKEN, Wako, Japan; Interdisciplinary Theoretical and Mathematical Sciences Program (iTHEMS), RIKEN, Wako, Japan*
- STEPHANIE A. SCHALBETTER • *Genome Damage and Stability Centre, School of Life Sciences, University of Sussex, Brighton, East Sussex, UK*
- SHEETAL SHARMA • *IFOM—The FIRC Institute of Molecular Oncology, Milan, Italy; Department of Experimental Medicine and Biotechnology, Postgraduate Institute of Medical Education and Research, Chandigarh, India*
- MICHAL SHWARTZ • *The Azrieli Faculty of Medicine, Bar-Ilan University, Safed, Israel*
- MICHAEL M. SONIAT • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA; Center for Systems and Synthetic Biology, The University of Texas at Austin, Austin, TX, USA*
- MASASHI TACHIKAWA • *Theoretical Biology Laboratory, RIKEN, Wako, Japan; Interdisciplinary Theoretical and Mathematical Sciences Program (iTHEMS), RIKEN, Wako, Japan*
- FRANK UHLMANN • *Chromosome Segregation Laboratory, The Francis Crick Institute, London, UK*
- LUCIE VONDROVÁ • *National Centre for Biomolecular Research, Faculty of Science, Masaryk University, Brno, Czech Republic*
- MENELAOS VOULGARIS • *Department of Biochemistry, University of Oxford, Oxford, UK*
- KOICHI YANO • *Microbial Physiology Laboratory, Department of Gene Function and Phenomics, National Institute of Genetics, Mishima, Shizuoka, Japan*
- KATEŘINA ZÁBRADY • *Genome Damage and Stability Centre, University of Sussex, Brighton, UK*
- TAO ZHANG • *Murdoch Childrens Research Institute, Royal Children's Hospital, Parkville, VIC, Australia; Department of Paediatrics, University of Melbourne, Parkville, VIC, Australia*
- XIAOMING ZHANG • *Department of Molecular Biosciences and Institute for Cellular and Molecular Biology, The University of Texas at Austin, Austin, TX, USA; The Howard Hughes Medical Institute, The University of Texas at Austin, Austin, TX, USA*