Preface

Cellular adhesion is a fundamental process that influences numerous biological activities such as morphogenesis, cell motility and division, as well as signalling. In addition, adhesion is a process important not only in normal physiology and development but also in disease states such as tumorigenesis, cardiovascular disease, inflammation, and infection. There are a plethora of proteins involved in adhesion-related events with a huge diversity in function. As a result, a wide variety of techniques exist to study adhesion-related proteins and processes and choosing which to include was a difficult task, but I hope the end result will provide a diverse collection of useful techniques.

Many of the microscopy techniques will be of use to a broad range of disciplines and this text provides excellent chapters on total internal reflection fluorescence microscopy, localization-based super-resolution imaging, and atomic force microscopy (Chapters 2–4, 9). In addition, the use of fixed and live cell imaging to study podosome formation is outlined in Chapter 6, while Chapter 21 details a custom-built high-resolution fluorescence microscope to enable high-resolution live-cell imaging and time-lapse microscopy of invadopodium dynamics.

As well, the use of microarrays and proteomics, more commonly used in various disciplines, is outlined in Chapters 5 and 12 and will be applicable to many areas of study.

Novel platforms to analyze cell adhesion using micropatterning are described in Chapters 7 and 13, while in Chapter 23 McLane et al. describe how to generate biomimetic nanofibers to evaluate the effects of specific extracellular matrix features on cell adhesion. Cell invasion is expertly dealt with in Chapters 8 and 10 using both synthetic and tissue-derived substrates and the measurement of cell motility and invasion in real time is outlined by Scrace et al. in Chapter 17. In Chapter 18, the Insall lab describes their novel direct visualization chemotaxis chamber for studying cell migration.

Various chapters describe protocols for the study of specific adhesion molecules including Chapter 1 where the Ginsberg lab explain how to reconstruct integrin activation in vitro using phospholipid nanodiscs, Chapter 11 describes how to perform biochemical Rho GTPase assays, and Chapter 22 provides procedures for imaging Rho GTPase biosensors in tumor cells.

In Chapter 20 Monaghan-Benson and Burridge describe how to use cadherin status of microvascular endothelial cells as a measure of permeability. In Chapter 24 the Ostap lab details a single-molecule, optical-trapping method for the measurement of protein–membrane adhesion forces. The microtubule cytoskeleton undergoes constant and dynamic remodelling and in Chapter 19 Ziolkowska and Roll-Mecak describe how to set up in vitro microtubule severing assays in order to explore this poorly understood process.

Several detailed protocols (Chapters 9, 14–16) deal with purification of the fundamental adhesion proteins actin and the Arp2/3 complex from a variety of sources and their subsequent use in polymerization assays. These techniques are commonly employed to investigate the roles of actin-binding proteins in the kinetics and morphology of actin assembly and will thus be of wide use.
I hope you will agree that this third edition of Adhesion Protein Protocols brings together a unique collection of protocols that covers standard, as well as novel and more specialized, techniques. Because of this range, the protocols will be useful for those new to the field of adhesion protein research as well as the more experienced scientist. Importantly, I hope these techniques will be used to gain further insight into the complex and incompletely understood processes that are involved in cellular adhesion.

Lastly, I would also like to thank all the authors for their excellent contributions, John Walker for his expert advice and assistance, and Springer/Humana Press for all their efforts.

Oxford, UK

Amanda S. Coutts
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Contributors

Mirjam Andreasson-Ochsner • Department of Materials, Laboratory for Surface Science and Technology, ETH Zurich, Zurich, Switzerland
Jose Javier Bravo-Cordero • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY, USA
Keith Burridge • Department of Cell and Developmental Biology, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
Pasquale Cervero • Institut für medizinische Mikrobiologie, Virologie und Hygiene, Universitätsklinikum Eppendorf, Hamburg, Germany
Sunkyu Choi • Department of Pathology and Moores Cancer Center, University of California, San Diego, La Jolla, CA, USA
John Condeelis • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine, Bronx, NY, USA
Lynda K. Doolittle • Department of Biophysics, UT Southwestern Medical Center and Howard Hughes Medical Institute, Dallas, TX, USA
David Entenberg • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine, Bronx, NY, USA
Jens Friedrichs • Leibniz Institute of Polymer Research Dresden, Institute for Biofunctional Polymer Materials, Dresden, Germany
Ryan J. Gilbert • Center for Biotechnology and Interdisciplinary studies, Rensselaer Polytechnic Institute, Troy, NY, USA; Department of Biomedical Engineering, Rensselaer Polytechnic Institute, Troy, NY, USA
Alexandre R. Gingras • Department of Medicine, University of California, San Diego, La Jolla, CA, USA
Mark H. Ginsberg • Department of Medicine, University of California, San Diego, La Jolla, CA, USA
Alexandros Glentis • Institut Curie/UMR144 CNRS, Paris, France
Scott A. Guelcher • Department of Chemical and Biomolecular Engineering, Vanderbilt University, Nashville, TN, USA
Vasily V. Gurchenkov • Institut Curie/UMR144 CNRS, Paris, France
Ester M. Hammond • Department of Oncology, Gray Institute for Radiation Oncology and Biology, University of Oxford, Oxford, UK
Scott D. Hansen • Department of Cellular and Molecular Pharmacology, University of California, San Francisco, CA, USA
Ian S. Harper • Monash Microimaging, Monash University, Melbourne, VIC, Australia
David J. Harrison • School of Medicine, University of St Andrews, St Andrews, UK
Louis Hodgson • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY, USA
Robert H. Insall • CRUK Beatson Institute for Cancer Research, Glasgow, UK
SHAUN P. JACKSON • The Australian Centre for Blood Diseases, Alfred Medical Research and Educational Precinct, Monash University, Melbourne, VIC, Australia

XINNING JIANG • Department of Pathology and Moores Cancer Center, University of California, San Diego, La Jolla, CA, USA

GABRIELA KALNA • CRUK Beatson Institute for Cancer Research, Glasgow, UK

PAKORN KANCHANAWONG • Department of Bioengineering, Mechanobiology Institute, National University of Singapore, Singapore, Singapore

ELAD KATZ • AMS Biotechnology, Abingdon, UK

JONATHAN A. KELBER • Department of Biology, California State University, Northridge, Northridge, CA, USA

RICHARD L. KLEMKE • Department of Pathology and Moores Cancer Center, University of California, San Diego, La Jolla, CA, USA

DAVID A. KNECHT • Department of Molecular and Cell Biology, University of Connecticut, Storrs, CT, USA

ALEXEY A. LARIONOV • Breakthrough Breast Cancer Research Unit, Western General Hospital, Edinburgh, UK

LEE A. LIGON • Department of Biology, Rensselaer Polytechnic Institute, Troy, NY, USA; Center for Biotechnology and Interdisciplinary studies, Rensselaer Polytechnic Institute, Troy, NY, USA

STEFAN LINDER • Institut für medizinische Mikrobiologie, Virologie und Hygiene, Universitätsklinikum Eppendorf, Hamburg, Germany

MOLLY LOWNDES • Cancer Biology Program, Stanford University, Stanford, CA, USA

JOSHUA S. MCLANE • Department of Biology, Rensselaer Polytechnic Institute, Troy, NY, USA; Center for Biotechnology and Interdisciplinary studies, Rensselaer Polytechnic Institute, Troy, NY, USA

ELIZABETH MONAGHAN-BENSON • Department of Cell and Developmental Biology, Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

YASMIN MOSHEFEGH • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY, USA

ANDREW J. MUINONEN-MARTIN • CRUK Beatson Institute for Cancer Research, Glasgow, UK

DANIEL J. MÜLLER • Department of Biosystems Science and Engineering, ETH Zürich, Basel, Switzerland

R. DYCHE MULLINS • Department of Cellular and Molecular Pharmacology, University of California, San Francisco, CA, USA

W. JAMES NELSON • Department of Biology, Stanford University, Stanford, CA, USA; Department of Molecular and Cellular Physiology Stanford University, Stanford, CA, USA

WARWICK S. NESBITT • The Bionics Institute, St Vincent’s Hospital, Melbourne, VIC, Australia

ERIC O’NEILL • Department of Oncology, Gray Institute for Radiation Oncology and Biology, University of Oxford, Oxford, UK

E. MICHAEL OSTAP • Department of Physiology, Pennsylvania Muscle Institute, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA

SHAE B. PADRICK • Department of Biophysics, UT Southwestern Medical Center and Howard Hughes Medical Institute, Dallas, TX, USA
Contributors

JONATHAN M. PAGE • Department of Chemical and Biomolecular Engineering, Vanderbilt University, Nashville, TN, USA
LINDA PANZER • Institut für medizinische Mikrobiologie, Virologie und Hygiene, Universitätsgesundheitsklinikum Eppendorf, Hamburg, Germany
ARON PAREKH • Department of Otolaryngology, Vanderbilt University Medical Center, Nashville, TN, USA
ISABEL M. PIRES • School of Biological, Biomedical and Environmental Sciences, University of Hull, Hull, UK
SERAPION PYRPASSOPoulos • Department of Physiology, Pennsylvania Muscle Institute, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA
ERIK REIMHULT • Department of Nanobiotechnology, Institute for Biologically inspired materials, University of Natural Resources and Life Sciences Vienna, Vienna, Austria
ANNE J. RIDLEY • Randall Division of Cell and Molecular Biophysics, King's College London, London, UK
ANTONINA ROLL-MECAK • Cell Biology and Biophysics Unit, Center for Biophysics, National Institute of Neurological Disorders and Stroke, National Heart, Lung and Blood Institute, Bethesda, MD, USA
MICHAEL K. ROSEN • Department of Biophysics, UT Southwestern Medical Center and Howard Hughes Medical Institute, Dallas, TX, USA
NICHOLAS J. SCABU • Center for Biotechnology and Interdisciplinary studies, Rensselaer Polytechnic Institute, Troy, NY, USA; Department of Biomedical Engineering, Rensselaer Polytechnic Institute, Troy, NY, USA
MARIE SCHOUWACHER • Institut Curie/UMR144 CNRS, Paris, France; Novartis Institute of Biomedical Research, Cambridge, MA, USA
SIMON SCRACE • Department of Oncology, Gray Institute for Radiation Oncology and Biology, University of Oxford, Oxford, UK
VED P. SHARMA • Department of Anatomy and Structural Biology and Gruss Lipper Biophotonics Center, Albert Einstein College of Medicine, Bronx, NY, USA
HENRY SHUMAN • Department of Physiology, Pennsylvania Muscle Institute, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA
ANDREW H. SIMS • Breakthrough Breast Cancer Research Unit, Western General Hospital, Edinburgh, UK
NARENDRA SURYAVANSHI • Randall Division of Cell and Molecular Biophysics, King's College London, London, UK
PETER A. THOMASON • CRUK Beatson Institute for Cancer Research, Glasgow, UK
FRANCISCO J. TOVAR-LOPEZ • Microplatforms Research Group, Melbourne, VIC, Australia
DOUWE M. VELTMAN • CRUK Beatson Institute for Cancer Research, Glasgow, UK
DANIJELA M. VIGNJEVIC • Institut Curie/UMR144 CNRS, Paris, France
CLARE M. WATERMAN • Cell Biology and Physiology Center, National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, MD, USA
ALISSA M. WEAVER • Department of Cancer Biology, Vanderbilt University Medical Center, Nashville, TN, USA; Department of Pathology, Vanderbilt University Medical Center, Nashville, TN, USA
CARSTEN WERNER • Leibniz Institute of Polymer Research Dresden, Institute for Biofunctional Polymer Materials, Dresden, Germany
ERIK WESTEIN • Baker IDI Heart and Diabetes Institute, Alfred Medical Research and Educational Precinct, Melbourne, VIC, Australia
FENG YE • Department of Medicine, University of California, San Diego, La Jolla, CA, USA
NATASZA E. ZIÓŁKOWSKA • Cell Biology and Biophysics Unit, National Institute of Neurological Disorders and Stroke, Bethesda, MD, USA
J. BRADLEY ZUCHERO • Department of Neurobiology, Stanford University, Stanford, CA, USA