

METHODS IN MOLECULAR BIOLOGY

Series Editor
John M. Walker
School of Life and Medical Sciences
University of Hertfordshire
Hatfield, Hertfordshire, AL10 9AB, UK

For further volumes:
<http://www.springer.com/series/7651>

Prostate Cancer

Methods and Protocols

Edited by

Zoran Culig

Department of Urology, Innsbruck Medical University, Innsbruck, Austria

Editor

Zoran Culig
Department of Urology
Innsbruck Medical University
Innsbruck, Austria

ISSN 1064-3745 ISSN 1940-6029 (electronic)
Methods in Molecular Biology
ISBN 978-1-4939-7843-4 ISBN 978-1-4939-7845-8 (eBook)
<https://doi.org/10.1007/978-1-4939-7845-8>

Library of Congress Control Number: 2018942021

© Springer Science+Business Media, LLC, part of Springer Nature 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Humana Press imprint is published by the registered company Springer Science+Business Media, LLC part of Springer Nature.

The registered company address is: 233 Spring Street, New York, NY 10013, U.S.A.

Preface

Progress has been made in the development of cellular and animal models for prostate cancer. In addition to cell lines which have been used over many years in research, patient-derived xenograft models are available for studying specific questions in prostate cancer biology. Combination of various cellular and animal models is reasonable especially in research with novel drug substances for targeting oncogenes in prostate cancer. Experimental procedures in order to develop novel models are the focus of this chapter. Our authors also provided contributions on imaging, an area in which rapid progress is observable. Methodologies described in this book will allow readers to learn about modern analysis of steroid receptor function. Androgen receptor is a recognized target in castration therapy-resistant prostate cancer, and use of the antiandrogen enzalutamide leads to a more efficient inhibition of androgen receptor function. Several methodological approaches described in this book could facilitate studies with novel drugs including antiandrogens and chemotherapeutics. The editor and the publisher appreciate the efforts of the authors, principal investigators, and their associates who provided details of their experimental work.

Innsbruck, Austria

Zoran Culig

Contents

<i>Preface</i>	<i>v</i>
<i>Contributors</i>	<i>ix</i>
1 Generation of Prostate Cancer Patient-Derived Xenografts to Investigate Mechanisms of Novel Treatments and Treatment Resistance.	1
<i>Hung-Ming Lam, Holly M. Nguyen, and Eva Corey</i>	
2 Methods to Study Angiogenesis in a Mouse Model of Prostate Cancer	29
<i>Ana-Rita Pedrosa, Alexandre Trindade, and António Duarte</i>	
3 Methodologies Applied to Establish Cell Cultures in Prostate Cancer.	55
<i>Anne T. Collins</i>	
4 Protocols for Migration and Invasion Studies in Prostate Cancer	67
<i>Arjanneke F. van de Merbel, Geertje van der Horst, Jeroen T. Buijs, and Gabri van der Pluijm</i>	
5 Transplantable Animal Studies and Whole-Body Optical Imaging in Prostate Carcinoma	81
<i>Geertje van der Horst, Maaïke van der Mark, Henry Cheung, and Gabri van der Pluijm</i>	
6 Protocols for Tissue Microarrays in Prostate Cancer Studies	103
<i>Tatjana Vlajnic, Serenella Eppenberger-Castori, and Lukas Bubendorf</i>	
7 Functional Studies on Steroid Receptors	117
<i>Simon Schlanger and Hannelore V. Heemers</i>	
8 Protocols for Studies on TMPRSS2/ERG in Prostate Cancer.	131
<i>Hubert Pakula, Douglas E. Linn, Daniel R. Schmidt, Marit Van Gorsel, Matthew G. Vander Heiden, and Zhe Li</i>	
9 Protocols for the Study of Taxanes Chemosensitivity in Prostate Cancer.	153
<i>M. Luz Flores and Carmen Sáez</i>	
10 A Method for Prostate and Breast Cancer Cell Spheroid Cultures Using Gelatin Methacryloyl-Based Hydrogels	175
<i>Christoph Meinert, Christina Theodoropoulos, Travis J. Klein, Dietmar W. Hutmacher, and Daniela Loessner</i>	
11 Protocols for Studies on Genetically Engineered Mouse Models in Prostate Cancer	195
<i>Chris W. D. Armstrong, Oksana Lyubomska, Melissa J. LaBonte, and David J. J. Waugh</i>	
12 Protocols for Studies on Stromal Cells in Prostate Cancer.	207
<i>Damien A. Leach and Grant Buchanan</i>	
13 Techniques for Evaluation of AR Transcriptional Output and Recruitment to DNA.	219
<i>Manqi Zhang, William C. Krause, and Irina U. Agoulnik</i>	

14	NMR-Based Prostate Cancer Metabolomics	237
	<i>Leslie R. Euceda, Maria K. Andersen, May-Britt Tessem, Siver A. Moestue, Maria T. Grinde, and Tone F. Bathen</i>	
15	Studies on Steroid Receptor Coactivators in Prostate Cancer	259
	<i>Zoran Culig and Frédéric R. Santer</i>	
	<i>Index</i>	263

Contributors

- IRINA U. AGOULNIK • *Biomolecular Sciences Institute, FIU, Miami, FL, USA; Baylor College of Medicine, Houston, TX, USA; Department of Human and Molecular Genetics, Herbert Wertheim College of Medicine, Miami, FL, USA*
- MARIA K. ANDERSEN • *Department of Circulation and Medical Imaging, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway*
- CHRIS W. D. ARMSTRONG • *Centre for Cancer Research and Cell Biology (CCRCB), Queen's University Belfast, Belfast, UK*
- TONE F. BATHEN • *Department of Circulation and Medical Imaging, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway*
- LUKAS BUBENDORF • *Institute of Pathology, University Hospital Basel, Basel, Switzerland*
- GRANT BUCHANAN • *Divisions of Medicine and Surgery, The Basil Hetzel Institute for Translational Health Research, University of Adelaide, Adelaide, SA, Australia; Department of Radiation Oncology, Canberra Teaching Hospital, Canberra, Australia*
- JEROEN T. BUIJS • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*
- HENRY CHEUNG • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*
- ANNE T. COLLINS • *YCR Cancer Research Unit, Department of Biology, University of York, York, UK*
- EVA COREY • *Department of Urology, University of Washington, Seattle, WA, USA*
- ZORAN CULIG • *Experimental Urology, Department of Urology, Medical University of Innsbruck, Innsbruck, Austria*
- ANTÓNIO DUARTE • *Faculdade de Medicina Veterinária—ULisboa, Av. da Universidade Técnica, Centro Interdisciplinar de Investigação em Sanidade Animal (CIISA), University of Lisbon, Lisbon, Portugal; Instituto Gulbenkian de Ciência, Oeiras, Portugal*
- SERENELLA EPPENBERGER-CASTORI • *Institute of Pathology, University Hospital Basel, Basel, Switzerland*
- LESLIE R. EUCEDA • *Department of Circulation and Medical Imaging, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway*
- MARIT VAN GORSEL • *Department of Biology, The Koch Institute for Integrative Cancer Research, Massachusetts Institute of Technology, Cambridge, MA, USA*
- MARIA T. GRINDE • *Department of Circulation and Medical Imaging, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway*
- HANNELORE V. HEEMERS • *Department of Cancer Biology, Cleveland Clinic, Lerner Research Institute, Cleveland, OH, USA; Department of Urology, Cleveland Clinic, Glickman Urologic & Kidney Institute, Cleveland, OH, USA; Department of Hematology/Medical Oncology, Cleveland Clinic, Taussig Cancer Institute, Cleveland, OH, USA*
- GEERTJE VAN DER HORST • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*

- DIETMAR W. HUTMACHER • *Queensland University of Technology (QUT), Brisbane, Australia; Australian Prostate Cancer Research Centre—Queensland, Translational Research Institute, Brisbane, QLD, Australia; George W Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA, USA; Institute for Advanced Study, Technical University of Munich, Munich, Germany*
- TRAVIS J. KLEIN • *Queensland University of Technology (QUT), Brisbane, QLD, Australia*
- WILLIAM C. KRAUSE • *Department of Cellular and Molecular Pharmacology, University of California, San Francisco, San Francisco, CA, USA*
- MELISSA J. LABONTE • *Centre for Cancer Research and Cell Biology (CCRCB), Queen's University Belfast, Belfast, UK*
- HUNG-MING LAM • *Department of Urology, University of Washington, Seattle, WA, USA*
- DAMIEN A. LEACH • *Divisions of Medicine and Surgery, The Basil Hetzel Institute for Translational Health Research, University of Adelaide, Adelaide, SA, Australia; Department of Surgery and Cancer, Imperial College London, London, UK*
- ZHE LI • *Division of Genetics, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA*
- DOUGLAS E. LINN • *Division of Genetics, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA*
- DANIELA LOESSNER • *Queensland University of Technology (QUT), Brisbane, QLD, Australia; Barts Cancer Institute, Queen Mary University of London, London, UK*
- M. LUZ FLORES • *Instituto de Biomedicina de Sevilla (IBIS), Hospital Universitario Virgen del Rocío, CSIC, Universidad de Sevilla, Seville, Spain*
- OKSANA LYUBOMSKA • *Centre for Cancer Research and Cell Biology (CCRCB), Queen's University Belfast, Belfast, UK*
- MAAIKE VAN DER MARK • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*
- CHRISTOPH MEINERT • *Queensland University of Technology (QUT), Brisbane, QLD, Australia*
- ARJANNEKE F. VAN DE MERBEL • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*
- SIVER A. MOESTUE • *Department of Clinical and Molecular Medicine, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway; Department of Pharmacy, Faculty of Health Sciences, Nord University, Bodø, Norway*
- HOLLY M. NGUYEN • *Department of Urology, University of Washington, Seattle, WA, USA*
- HUBERT PAKULA • *Division of Genetics, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA*
- ANA-RITA PEDROSA • *Faculdade de Medicina Veterinária—ULisboa, Av. da Universidade Técnica, Centro Interdisciplinar de Investigação em Sanidade Animal (CIISA), University of Lisbon, Lisbon, Portugal*
- GABRI VAN DER PLUIJM • *Department of Urology, Leiden University Medical Center, Leiden, The Netherlands*
- CARMEN SÁEZ • *Instituto de Biomedicina de Sevilla (IBIS), Hospital Universitario Virgen del Rocío, CSIC, Universidad de Sevilla, Seville, Spain; Department of Pathology, Hospital Universitario Virgen del Rocío, Seville, Spain*
- FRÉDÉRIC R. SANTER • *Experimental Urology, Department of Urology, Medical University of Innsbruck, Innsbruck, Austria*

SIMON SCHLANGER • *Department of Cancer Biology, Cleveland Clinic, Lerner Research Institute, Cleveland, OH, USA*

DANIEL R. SCHMIDT • *Harvard Radiation Oncology Program, Boston, MA, USA*

MAY-BRITT TESSEM • *Department of Circulation and Medical Imaging, NTNU—The Norwegian University of Science and Technology, Trondheim, Norway*

CHRISTINA THEODOROPOULOS • *Queensland University of Technology (QUT), Brisbane, QLD, Australia*

ALEXANDRE TRINDADE • *Faculdade de Medicina Veterinária—ULisboa, Av. da Universidade Técnica, Centro Interdisciplinar de Investigação em Sanidade Animal (CIISA), University of Lisbon, Lisbon, Portugal; Instituto Gulbenkian de Ciência, Oeiras, Portugal*

MATTHEW G. VANDER HEIDEN • *Department of Biology, The Koch Institute for Integrative Cancer Research, Massachusetts Institute of Technology, Cambridge, MA, USA*

TATJANA VLAJNIC • *Institute of Pathology, University Hospital Basel, Basel, Switzerland*

DAVID J. J. WAUGH • *Centre for Cancer Research and Cell Biology (CCRCB), Queen's University Belfast, Belfast, UK*

MANQI ZHANG • *Department of Chemistry and Biochemistry, Florida International University, Miami, FL, USA*