Hereditary Colorectal Cancer
Miguel A. Rodriguez-Bigas • Raul Cutait
Patrick M. Lynch • Ian Tomlinson
Hans F.A. Vasen
Editors

Hereditary Colorectal Cancer
Over the last quarter of a century, significant and explosive advancements have been made regarding the study of colorectal cancer. The wealth of information evolving is far reaching. From the first case report of the loss of the long arm of chromosome 5 in a patient with Familial Adenomatous Polyposis, to the cloning and identification of multiple genes involved in hereditary colorectal cancer, the field has progressed so we can now offer our patients genetic predisposition testing and better clinical management. Molecular mechanisms and the implications that some of these changes have for our patients is better understood. Rather than only discussing therapy these advances now allow us to discuss surgical prophylaxis and chemoprevention. Advances in the knowledge of familial colorectal cancer have not come easy and are due to the hard work of inquisitive investigators and clinicians, the development of advance instrumentations and molecular genetic techniques and most importantly from our patients and families. Without them we would not have been able to achieve this feat. Still, there is more to be done in the field. There are yet undiscovered syndromes, genes and molecular alterations which can and will change the lives of families and individuals. Thus, we cannot rely solely on what has been done, but need to continue to question existing research in the future.

The lack of a comprehensive reference book on hereditary colorectal cancer has been our driving force. The editors have gathered a multinational panel of experts to address the issues in Hereditary Colorectal Cancer. This book goes beyond the historical aspects of Familial Adenomatous Polyposis and the Lynch Syndrome. It further encompasses the basic and clinical aspects of less common and less understood syndromes such as the Hamartomatous Polyposis Syndromes and MutYH Associated Polyposis. An important section of Hereditary Colorectal Cancer is devoted to genetic counseling, an evolving area. In this section, several leading authorities describe the issues pertaining to genetic counseling around the world and within registries. Also addressed are the psychosocial aspects of hereditary colorectal cancer. This book will serve as a clinical reference, however, it will be also a useful guide for basic scientists, genetic counselors, and those interested in hereditary colorectal cancer.

While the book was being edited, one of our contributors and friend passed away. Jeremy Jass was the ultimate translational scientist. He was a pathologist and a basic
scientist whose contributions to the field are too numerous to state. The editors would like to express their gratitude for his contribution as well as for all his contributions to the advancement of understanding colorectal cancer. We also would like to express our most sincere appreciation to the editors at Springer who have been immensely helpful and patient with us. Lastly we have to mention our patients and our families whom without their support this project would have not been possible.

Houston, TX                     Miguel A. Rodriguez-Bigas
Sao Paulo, Brazil               Raul Cutait
Houston, TX                     Patrick M. Lynch
London, UK                      Ian Tomlinson
Leiden, The Netherlands         Hans F.A. Vasen
Contents

Part I  History

1 History: Familial Adenomatous Polyposis ................................. 3
   Susan K. Clark, Kay F. Neale, and Robin K.S. Phillips

2 Historical Aspects of Lynch Syndrome ................................. 15
   Henry T. Lynch, Megan P. Hitchins, Trudy G. Shaw,
   Jane F. Lynch, and Hemant Roy

Part II  Basic Sciences and Genetics

3 Molecular Genetics of Familial Adenomatous Polyposis ............... 45
   Luis G. Carvajal-Carmona, Andrew Silver, and Ian P. Tomlinson

4 DNA Mismatch Repair .................................................. 67
   C. Richard Boland

5 Basic Sciences and Genetics: Hamartomatous Polyposis .............. 87
   James R. Howe and Daniel Calva

6 Hyperplastic Polyposis Syndrome: Colorectal Cancer Predisposition ........................................ 111
   Joanne Young

7 MUTYH-Associated Polyposis ........................................... 133
   Jeremy P. Cheadle

8 Polymorphic Variation and Risk of Colorectal Cancer ................. 147
   Richard A. Hubner and Richard S. Houlston
Part III  Pathology

9 The Pathologist and the Phenotype of Hereditary Colorectal Cancer ................................................................. 175
Jeremy R. Jass

Part IV  Clinical Science: Familial Adenomatous Polyposis

10 Genotype Phenotype Correlation in Familial Adenomatous Polyposis ................................................................. 197
Miguel A. Rodriguez-Bigas

11 Surgery for Familial Adenomatous Polyposis ........................................ 203
James Church

12 Duodenal Adenomas in Familial Adenomatous Polyposis ............... 219
Andrew Latchford and Brian Saunders

13 FAP-Associated Desmoid Tumours ............................................. 239
Gabriela Moeslein

14 Attenuated Familial Adenomatous Polyposis:
Diagnosis, Management, and Future Prognosis ................................ 253
Thérèse M.F. Tuohy and Randall W. Burt

Part V  Clinical Science: Hereditary Nonpolyposis Colorectal Cancer

15 An Overview of the Lynch Syndrome
(Hereditary Non-polyposis Colorectal Cancer) ................................ 271
Hans F.A. Vasen and J.C.H. Hardwick

16 Surgical Management in Lynch Syndrome ...................................... 301
Raul Cutait and Miguel A. Rodriguez-Bigas

17 Extracolonic Tumors ...................................................................... 311
Benedito Mauro Rossi and Fabio de Oliveira Ferreira

18 Surveillance ..................................................................................... 335
Heikki J. Järvinen and Jukka-Pekka Mecklin

Part VI  Clinical Science: MYH Associated Polyposis

19 MUTYH-Associated Polyposis .................................................. 349
N. Jones, M. Nielsen, S. Vogt, C.M. Tops, H.F.A. Vasen,
F.J. Hes, S. Aretz, and J.R. Sampson
Contents

Part VII  Clinical Science: Hamartomatous Polyposis

20 Peutz–Jeghers Syndrome ......................................................... 365
   Francis M. Giardiello

21 Clinical Aspects of Juvenile Polyposis .............................................. 375
   Daniel Calva and James R. Howe

22 Hereditary Mixed Polyposis Syndrome and Multiple
   Adenoma Patients ........................................................................ 401
   Huw Thomas

Part VIII  Clinical Science: Hyperplastics Polyposis

23 Hyperplastic Polyposis ......................................................... 411
   Angel Ferrández and Randall W. Burt

Part IX  Genetic Counseling

24 Genetic Counseling Overview .................................................. 425
   Terri Berk

25 Across Culture and Health Systems: Europe ................................. 431
   Marie Luise Bisgaard

26 Across Culture and Health Systems: Asia (Hong Kong) .................... 445
   Judy Wai-chu Ho, Samuel Mun-yin Ho, and Annie Tsz-wai Chu

27 Across Culture and Health Systems: Asia (Japan) ............................. 461
   Takeo Iwama

28 Across Culture and Health Systems: Africa ....................................... 471
   Elize G. Pietersen, Brenda Kruger, Ursula Algar, 
   and Raj S. Ramesar

29 Across Culture and Health Systems: Argentina ................................. 487
   Carlos A. Vaccaro

30 Genetic Counselling Across Culture and Health Systems:
   Australia ...................................................................................... 503
   Finlay Macrae and Clara Gaff

31 Across Culture and Health Systems: Korea ....................................... 535
   Duck-Woo Kim and Jae-Gahb Park
32 Across Culture and Health Systems: America ........................................ 545
   Thuy M. Vu

Part X  Psychosocial Aspects of Hereditary Colorectal Cancer

33 Psychological Impact of Genetic Counseling and Testing for Hereditary Colorectal Cancers ........................................ 559
   Susan K. Peterson

Part XI  Chemoprevention

34 Chemoprevention for Inherited Colorectal Cancer ......................... 577
   Patrick M. Lynch

Part XII  Registries

35 Registries ........................................................................................................ 595
   Steffen Bülow and Inge Bernstein

Erratum .............................................................................................................. E1

Index .................................................................................................................. 613
Contributors

Ursula Algar, MD
Surgical Gastroenterology Unit, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa

S. Aretz
Institute of Human Genetics, University of Bonn, Bonn, Germany

Terri Berk MSSA,
Clinical Co-ordinator, Familial GI Cancer Registry, Dr. Zane Cohen Digestive Diseases Clinical Research Centre, Mount Sinai Hospital, Toronto ON, Canada tberk@mtsinai.on.ca

Inge Bernstein, MD, PhD
Department of Surgical Gastroenterology, Hvidovre University Hospital, DK-2650, Hvidovre, Denmark

Marie Luise Bisgaard, MD
Department of Cellular and Molecular Medicine, Panum Institutet, Medical Genetics Clinic, Copenhagen University, Blegdamsvej 3, 2200, København N, Denmark mlbi@sund.ku.dk

C. Richard Boland, MD
Gastroenterology, Baylor University Medical Center, 3500 Gaston Avenue (250 Hoblitzelle), Dallas, TX 75246, USA rickbo@baylorhealth.edu

Steffen Bülow, MD, DMSc
Department of Surgical Gastroenterology, Hvidovre University Hospital, DK-2650 Hvidovre, Denmark sbulow@dadlnet.dk

Randall W. Burt, MD
Huntsman Cancer Institute, University of Utah, 2000 Circle of Hope, Salt Lake City, UT 84112, USA randall.burt@hci.utah.edu
Daniel Calva, MD  
Department of General Surgery, Surgical Oncology and Endocrine Surgery,  
Roy J. and Lucille A. Carver University of Iowa, College of Medicine,  
200 Hawkins Drive, Iowa City, Iowa 5242, USA

Luis G. Carvajal-Carmona, MD  
Molecular and Population Genetics Laboratory, Cancer Research UK London  
Research Institute, London, UK

Jeremy P. Cheadle, PhD  
Institute of Medical Genetics, Cardiff University, Heath Park, Cardiff,  
CF14 4XN, UK  
cheadlejp@cardiff.ac.uk

Annie Tsz-wai Chu, BScSc, MSocSci  
Clinical Psychologist, Department of Surgery,  
The University of Hong Kong, Hong Kong, China

James Church, MBChB, FRACS  
Director, Sanford R. Weiss MD Center for Hereditary Colorectal Neoplasia,  
Digestive Diseases Institute, Cleveland Clinic Foundation, Cleveland, OH, USA  
churchj@ccf.org

Susan K Clark, MD FRCS (Gen Surg)  
Consultant Colorectal Surgeon, St Mark’s Hospital, The Polyposis Registry,  
Northwick Park Harrow HA1 3UJ, UK  
sue.clark@nwlh.nhs.uk

Raul Cutait, MD  
Associate Professor of Surgery, Director, Brazilian Registry of Inherited  
Colorectal Cancer, University of São Paulo Medical School, Sao Paulo, Brazil

Angel Ferrández, MD, PhD  
Service of Digestive Diseases, Hospital Clinico Lozano Blesa, Zaragoza, Spain

Clara Gaff, MD  
Genetic Health Services, Murdoch Childrens  
Research Institute, Royal Children’s Hospital, Flemington Road, Parkville,  
VIC, 3052, Australia

Francis M. Giardiello, MD  
Department of Medicine, The Johns Hopkins School of Medicine,  
Baltimore, MD, USA  
fgiardi@jhmi.edu

J. C. H. Hardwick  
The Netherlands Foundation for the Detection of Hereditary Tumours,  
Poortgebouw Zuid, Rijnsburgerweg 10, 2333 AA Leiden, The Netherlands and  
Department of Gastroenterology & Hepatology, Leiden University Medical  
Centre, Albinusdreef 2, 2300 RC Leiden, The Netherlands
F. J. Hes
Department of Clinical Genetics, Leiden University Medical Center, Leiden, The Netherlands

Megan P. Hitchins, PhD
Lowy Cancer Research Centre, University of New South Wales, Sydney NSW, Australia

Samuel Mun-yin Ho, PhD
Department of Psychology,
The University of Hong Kong, Hong Kong, China

Judy Wai-chu Ho, MBBS, FRCS, FCSHK, FHKAM, FACS, FRCS
Consultant and Chief, Department of Surgery, Queen Mary Hospital, Hong Kong, China
judyho@hkucc.hku.hk

Richard S. Houlston, MD, PhD
Professor of Molecular and Population Genetics, Section of Cancer Genetics, Institute of Cancer Research, Surrey, UK

James R. Howe, MD
Department of Surgery, Surgical Oncology and Endocrine Surgery, Roy J. and Lucille A. Carver University of Iowa College of Medicine, Iowa City, IA 52242-1086, USA

Richard A. Hubner, BM, BCh, MA
Section of Cancer Genetics, Institute of Cancer Research Surrey, UK
richard.hubner@rmh.nhs.uk

Takeo Iwama, MD, PhD
Department of Gastroenterological and General Surgery, Saitama Medical Center, Saitama Medical University, Kamoda-1981, 350-8550 Kawagoe, Saitama, Japan
iwama.med@nifty.com

Heikki J. Järvinen, MD
Department of Surgery, Helsinki University Central Hospital, 340 FIN-00029 HUS, Helsinki, Finland
heikki.jarvinen@hus.fi

Jeremy R. Jass, MD, DSc, FRCPath, FRCPA
Department of Cellular Pathology, St Mark’s Hospital & Imperial College, Wartford Road, Harrow, Middlesoc HAI SUJ, London, UK
jeremy.jass@nwlh.nhs.uk

M. C. Joerink-van de Beld
Department of Clinical Genetics, Leiden University Medical Center, Leiden, The Netherlands
Contributors

N. Jones
Institute of Medical Genetics, School of Medicine, Health Park, Cardiff CF14 4XN, UK
jones@bergonie.org

Duck-Woo Kim
Korean Hereditary Tumor Registry, Cancer Research Institute and Cancer Research Center, Seoul National University College of Medicine, Seoul, Korea

Brenda Kruger, MD
CANSAs Colorectal Cancer Research Consortium, MRC Human Genetics Research Unit, Division of Human Genetics, Institute for Infectious Diseases and Molecular Medicine, University of Cape Town, Cape Town, South Africa

Andrew Latchford, BSc, MBBS, MRCP
Derriford Hospital, Derriford Road, Plymouth, PL6 8DH, Devon, UK
and Polyposis Registry, St Mark’s Hospital, Northwick Park, Harrow, Middlesex HA1 3UJ, UK
andylatch@doctors.org.uk

Henry T. Lynch, MD
Department of Preventive Medicine and Public Health, Creighton University, 2500 California Plaza, Omaha, NE 68178, USA
htlynch@creighton.edu

Jane F. Lynch, BSN
Department of Preventive Medicine and Public Health, Creighton University School of Medicine, Omaha NE, USA

Patrick M. Lynch, MD
MD Anderson Cancer Center, University of Texas, 1515 Holcombe Houston Boulevard, TX 77030, USA
plynch@mdanderson.org

Finlay Macrae
Colorectal Medicine and Genetics, The Royal Melbourne Hospital, Melbourne VIC, Australia
Finlay.Macrae@mh.org.au

Jukka-Pekka Mecklin
Department of Surgery, Jyväskylä Central Hospital, Jyväskylä, Finland
jukka-peka.mecklin@ksshp.fi

Gabriela Moeslein
HELIOS St. Josefs-Hospital Bochum-Linden, Axstr. 35, Bochum 44879, Germany
gabriela.moeslein@helios-kliniken.de