CONTEMPORARY CANCER RESEARCH

DNA Damage and Repair

Volume III: Advances from Phage to Humans

EDITED BY

Jac A. Nickoloff

Merl F. Hoekstra

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Volume 3

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Edited by

Jac A. Nickoloff

University of New Mexico, Albuquerque, NM

and

Merl F. Hoekstra

Qbiogene, Carlsbad, CA

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Preface

Even before we completed Volumes I and II of *DNA Damage and Repair* in 1998, three facts made it very clear that a third volume would be necessary. First, despite our best attempts at providing comprehensive coverage of this rather large and rapidly expanding field, we were unable to identify authors for several important topics. Volume III: *Advances from Phage to Humans* thus fills some of the gaps in the previous volumes, including DNA repair in bacteriophage and *Drosophila*, and the role of DNA repair in the generation of immune diversity. Second, the DNA repair field continues to grow explosively, and several topics needed updating soon after the first volumes were published. Such topics include the role of homologous recombination in mammalian cells, and the new biochemistry and cell biology of DNA double-strand break repair, which has provided key information about protein function in this important biological process. Third, as might be expected from such an active field, there are several new areas of research that were not even imagined prior to 1998, including the finding that proteins involved in nonhomologous end-joining were also involved in gene silencing and telomere function, and the discovery that the breast cancer susceptibility genes, *BRCA1* and *BRCA2*, have important roles in several aspects of DNA repair.

The DNA repair field grew from basic studies in genetics and cell biology. These approaches are increasingly complemented by biochemical approaches that provide detailed descriptions of complex processes at the molecular level and identify functional interactions among the various proteins involved in each repair pathway. Although early work provided provocative hints that DNA repair processes were conserved from bacteria to higher eukaryotes, a full appreciation of this conservation was not possible until many more genes were isolated and sequenced, and their gene products characterized at the biochemical level. This area of research has in turn led to the understanding that functions carried out by a single protein in prokaryotes are often performed by several related proteins in eukaryotes, and that these protein family members are often found in multi-subunit complexes. Another new development in the field is that seemingly distinct DNA repair processes, such as mismatch repair and nucleotide excision repair, show functional overlap, particularly at the level of lesion recognition. Such overlap suggests that DNA repair processes form a complex network. It is likely that this network enables cells to respond appropriately to different quantities and qualities of DNA damage. As we stand on the threshold of the "New Age of Functional Genomics and Proteomics," it is clear that the next level of understanding will be a molecular description of DNA repair networks in various cell types, and how these networks produce the various cellular responses to different types of DNA damage. Of course, a discussion of the future of DNA repair research begs the question:

Will there there be a need for Volume IV? The answer of course is yes, but just when this task will be undertaken (and by whom) is not yet clear.

We thank all of the contributors for their considerable time and effort to produce the high-quality texts, and for their assistance in the development of the chapter titles and in reviewing draft manuscripts. We also thank our many colleagues, both within and outside our laboratories, for their continued support. And we again thank our families for their patience and understanding: Denise, Jake, Ben, Courtney, Debra, Brad, Lauren, Brielle, and Alexa.

Jac A. Nickoloff
Merl F. Hoekstra

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Contributors

COLIN A. BILL • *Department of Molecular Genetics and Microbiology, University of New Mexico School of Medicine, Albuquerque, NM*

SUSAN M. BAILEY • *Bioscience Division, Los Alamos National Laboratory, Los Alamos, NM*

CAROL BERNSTEIN • *Microbiology and Immunology, College of Medicine, University of Arizona, Tucson, AZ*

HARRIS BERNSTEIN • *Microbiology and Immunology, College of Medicine, University of Arizona, Tucson, AZ*

MARK A. BRENNEMAN • *Department of Molecular Genetics and Microbiology, University of New Mexico School of Medicine, Albuquerque, NM*

DEBRA A. BRESSAN • *Laboratory of Genetics, University of Wisconsin, Madison, WI*

JAYNE S. DANSKA • *Program in Developmental Biology, Hospital for Sick Children and Department of Immunology, University of Toronto, Toronto, Ontario, Canada*

TROY FIDDLER • *The Vollum Institute and Department of Molecular and Medical Genetics, Oregon Health Sciences University, Portland, OR*

CARLOS C. FLORES • *Laboratory of Genetics, University of Wisconsin, Madison, WI*

PAUL S. FREEMONT • *Imperial Cancer Research Fund Laboratories, Lincoln's Inn Fields, London, UK*

EDWIN H. GOODWIN • *Bioscience Division, Los Alamos National Laboratory, Los Alamos, NM*

MICHAEL A. GORMAN • *Imperial Cancer Research Fund Laboratories, Lincoln's Inn Fields, London, UK*

CYNTHIA J. GUIDOS • *Program in Developmental Biology, Hospital for Sick Children and Department of Immunology, University of Toronto, Toronto, Ontario, Canada*

JAMES E. HABER • *Rosenstiel Center and Department of Biology, Brandeis University, Waltham MA*

IAN D. HICKSON • *The Institute of Molecular Medicine, Imperial Cancer Research Fund Laboratories, University of Oxford, Oxford, United Kingdom*

JING HUANG • *The Vollum Institute and Department of Molecular and Medical Genetics, Oregon Health Sciences University, Portland OR*

MARIA JASIN • *Cell Biology and Genetics Program, Sloan-Kettering Institute and Cornell University Graduate School of Medical Sciences, New York, NY*

Teresa Johnson-Pais • *Department of Pediatrics, The University of Texas Health Science Center, San Antonio, TX*
Alan R. Lehmann • *MRC Cell Mutation Unit, Sussex University, Falmer, Brighton, UK*
Eva Y.-H. P. Lee • *Institute of Biotechnology and Department of Molecular Medicine, University of Texas Health Sciences Center at San Antonio, TX*
Richard S. Maser • *Laboratory of Genetics, University of Wisconsin, Madison, WI*
Julianne Meyne • *Bioscience Division, Los Alamos National Laboratory, Los Alamos, NM*
Martin Nemec • *Program in Developmental Biology, Hospital for Sick Children and Department of Immunology, University of Toronto, Toronto, Ontario, Canada*
Jac A. Nickoloff • *Department of Molecular Genetics and Microbiology, University of New Mexico School of Medicine, Albuquerque, NM*
Lauryl M. J. Nutter • *Program in Developmental Biology, Hospital for Sick Children; Department of Immunology, University of Toronto, Toronto, Ontario, Canada; John Radcliffe Hospital, Headington, Oxford, United Kingdom*
Noreen E. O'Regan • *Biology Department, Northeastern University, Boston, MA*
Elizabeth Ostermeyer • *The Vollum Institute and Department of Molecular and Medical Genetics, Oregon Health Sciences University, Portland, OR*
Chrystal K. Palaty • *Program in Developmental Biology, Hospital for Sick Children and Department of Immunology, University of Toronto, Toronto, Ontario, Canada*
John H. J. Petrini • *Laboratory of Genetics, University of Wisconsin, Madison, WI*
Galina Petukhova • *Institute of Biotechnology and Department of Molecular Medicine, University of Texas Health Sciences Center at San Antonio, TX*
Steven J. Sandler • *Department of Microbiology, University of Massachusetts, Amherst, MA*
Phyllis R. Strauss • *Biology Department, Northeastern University, Boston, MA*
Patrick Sung • I*nstitute of Biotechnology and Department of Molecular Medicine, University of Texas Health Sciences Center at San Antonio, San Antonio, TX*
Elaine M. Taylor • *MRC Cell Mutation Unit, Sussex University, Brighton, UK*
Mathew J. Thayer • *The Vollum Institute and Department of Molecular and Medical Genetics, Oregon Health Science University, Portland, OR*