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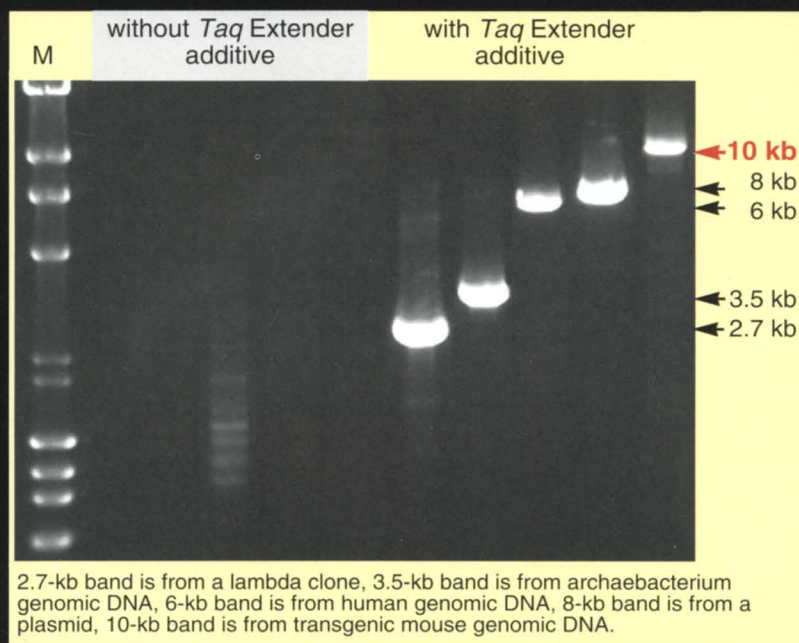
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## PCR Primer: A Laboratory Manual

Edited by Carl Dieffenbach, *National Institute of Allergy and Infectious Diseases*, Gabriela Dveksler, *Uniformed Services University of the Health Sciences*

From its first-published account in 1985, the polymerase chain reaction has become a standard research tool in a wide range of laboratories. Its impact has been felt in basic molecular biological research, clinical research, forensics, evolutionary studies, and the Human Genome Project. The PCR technique originally conceived by Nobel laureate Kary Mullis has proven to be exceptionally adaptable and has been transformed into a myriad array of methods, each with different applications.

*PCR Primer: A Laboratory Manual* introduces the complex world of PCR by beginning at an accessible level and then moving to more advanced levels of application. First, the practical requirements for performing PCR and other amplification techniques in the lab are introduced and then the basic aspects of the technique are explained by exploring important issues such as sample preparation, primer design, efficiency, detection of products, and quantitation. Protocols for a wide range of PCR and amplification techniques—each written by an expert investigator—are presented for cloning, sequencing, mutagenesis, footprinting, library construction and screening, exon trapping, differential display, and expression, and these include RT-PCR, RNA PCR, LCR, multiplex PCR, panhandle PCR, capture PCR, expression PCR, 3' and 5' RACE, immune PCR, in situ PCR, and ligation-mediated PCR. Each protocol is augmented by analysis and troubleshooting sections and complete references.

### CONTENTS

#### Introduction to PCR

Setting Up a PCR Laboratory (C.W. Dieffenbach et al.); A Standard PCR Protocol: Rapid Isolation of DNA and PCR Assay for B-Globin (M.T. Vahey et al.); Enzymatic Control of Carryover Contamination in PCR (J.L. Hartley, A. Rashchian); Ultraviolet Irradiation of Surfaces to Reduce PCR Contamination (R.W. Cone, M.R. Fairfax); Specificity, Efficiency, and Fidelity of the PCR (R.S. Cha, W.G. Thilly); Optimization and Troubleshooting in PCR (K.H. Roux); Long-Distance PCR (O.S. Foord, E.A. Rose)

#### Sample Preparation

Rapid Preparation of DNA for PCR Amplification (E.P. Dawson et al.); PCR Amplification from Paraffin-Embedded Tissues (C.E. Greer et al.); RNA Purification (J.J. Adamovicz, W.C. Gause)

#### Primer Design

General Concepts for PCR Primer Design (C.W. Dieffenbach

et al.); Design and Use of Mismatched and Degenerate Primers (S. Kwok et al.); Multiplex PCR (M.C. Edwards, R.A. Gibbs)

#### Detection of PCR Products: Quantitation and Analysis

Immunological Detection of PCR Products (J.G. Lazar); Quantitative PCR Using the AmpliSensor Assay (C.N. Wang); DNA Fingerprinting Using Arbitrarily Primed PCR (M. McClelland, J. Welsh); RNA Fingerprinting Using Arbitrarily Primed PCR (M. McClelland, J. Welsh); In Situ PCR (G. Nuovo); Single-strand Conformational Polymorphism (K. Fujita, J. Silver); Genetic Subtyping of Human Immunodeficiency Virus Using a Heteroduplex Mobility Assay (E.L. Delwart et al.); Sensitive and Fast Mutation Detection by Solid-phase Chemical Cleavage (L.L. Hansen et al.)

#### PCR Starting from RNA

Use of PCR to Quantitate Relative Differences in Gene Expression (W.C. Gause, J.J. Adamovicz); Quantitative Liquid Hybridization PCR Method Employing Storage Phosphor Technology (M.T. Vahey, M.T. Wong); Use of the SNUPE Assay to Quantitate Allele-specific Sequences Differing by a Single Nucleotide (J. Singer-Sam); Trapping Internal and 3'-Terminal Exons (P.E. Nisson et al.); Expression-PCR (D.E. Lanar, K.C. Kain)

#### PCR-mediated Cloning

Rapid Amplification of cDNA Ends (M.A. Frohman); Panhandle PCR (D.H. Jones); Detection and Identification of Expressed Genes by Differential Display (P. Warthoe et al.); Construction of Subtractive cDNA Library Using Magnetic Beads and PCR (A. Lonneborg); PCR-based Method for Screening DNA Libraries (D. Israel); Screening of YAC Libraries with Robotic Support (M.M. Blanchard, V. Nowotny); Phagemid Display Libraries Derived from PCR Immortalized Rearranged Immunoglobulin Genes (H.H. Hogrefe, B. Shopes)

#### PCR Sequencing

Direct Sequencing of PCR-amplified DNA (V.B. Rao); Cycle Sequencing (K. Kretz et al.)

#### Cloning of PCR Products

Cloning and Analysis of PCR-generated Fragments (G.L. Costa, M.P. Weiner); Strategies for Cloning PCR Products (R. Levis)

#### Mutagenesis by PCR

Mutagenic PCR (R.C. Cadwell, G.F. Joyce); PCR Mutagenesis and Recombination In Vivo (D.H. Jones); Mutagenesis and Synthesis of Novel Recombinant Genes Using PCR (A.N. Vallejo et al.); Rapid PCR Site-directed Mutagenesis (M.P. Weiner, G.L. Costa)

#### Alternative Amplification Technologies

Ligase Chain Reaction (M. Weidmann et al.); Optimization of 3SR-based Assays (T.R. Gingeras); One-tube Quantitative HIV-1 RNA NASBA (B. van Gemen et al.)

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# Manipulating the Mouse Embryo

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By Brigid Hogan, *Vanderbilt University Medical School*; Rosa Beddington, *National Institute for Medical Research, London*; Frank Costantini, *Columbia University*; Elizabeth Lacy, *Memorial Sloan-Kettering Cancer Center*

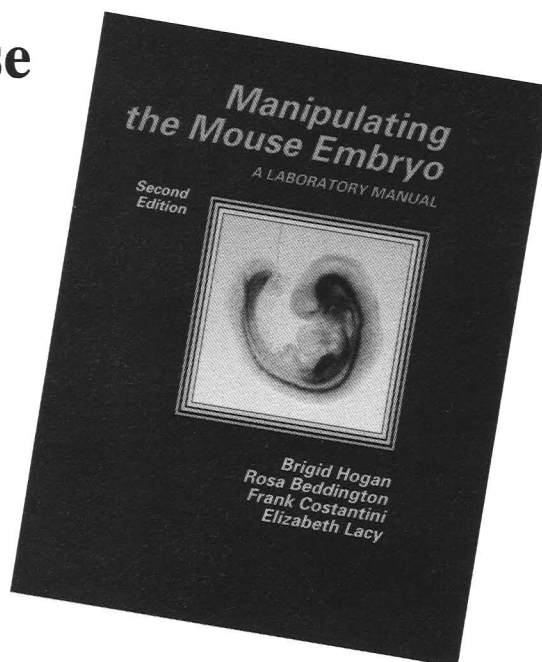
The 1986 publication of *Manipulating the Mouse Embryo* catalyzed the interaction between molecular biology and mammalian embryology. For the first time, detailed instructions on how to begin applying recombinant DNA technology to important questions about mammalian embryonic development were made available to a broad audience. The gathering pace of such studies in recent years has brought improvements to existing methods and fueled the creation of new and powerful technologies. The second edition of this classic manual has been completely revised and expanded to incorporate these advances. It contains new sections on the production and analysis of transgenic mice, the manipulation of preimplantation embryos to generate chimeras, the culture and manipulation of embryonic stem cells, including gene "knockouts," and techniques for visualizing genes, gene products, and specific cell types. As before, included with the protocols is a summary of current understanding of mouse development at a molecular level. In its new edition, this manual of proven distinction is again an authoritative and comprehensive source of technical guidance for experienced investigators and an essential resource for newcomers to mammalian genetics and embryology.

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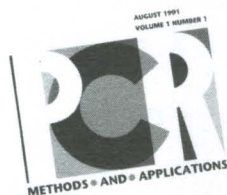
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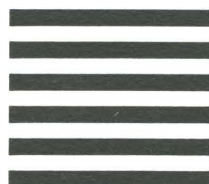
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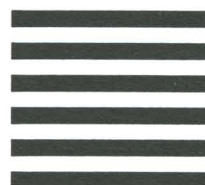
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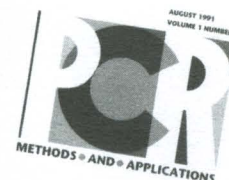
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- ☐ (1) Professor  
☐ (2) Graduate student  
☐ (3) Postdoctoral scientist  
☐ (4) Lab director  
☐ (5) Lab technician  
☐ (6) Medical student  
☐ (7) Undergraduate student  
☐ (8) Librarian  
☐ (9) Publisher

**Please check your employment category:**

- ☐ (1) University/college  
☐ (2) Research institute/foundation  
☐ (3) Hospital  
☐ (4) Medical school  
☐ (5) Industry  
☐ (6) Government  
☐ (7) Library/information center \*

**Please check your primary field of interest:**

- ☐ (1) Biochemistry
- ☐ (2) Cell biology
- ☐ (3) Developmental biology
- ☐ (4) Epidemiology
- ☐ (5) Genetics
- ☐ (6) Immunology
- ☐ (7) Microbiology
- ☐ (8) Molecular biology
- ☐ (9) Neurobiology
- ☐ (10) Plant biology
- ☐ (11) Pharmacology
- ☐ (12) Virology
- ☐ (13) Oncology
- ☐ (14) Other

**Please check title(s) that most closely describe(s) your position:**

- \_\_\_\_\_ (1) Professor  
\_\_\_\_\_ (2) Graduate student  
\_\_\_\_\_ (3) Postdoctoral scientist  
\_\_\_\_\_ (4) Lab director  
\_\_\_\_\_ (5) Lab technician  
\_\_\_\_\_ (6) Medical student  
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