
Preface

Microarray technology provides a highly sensitive and precise technique for obtaining information from biological samples, with the added advantage that it can handle a large number of samples simultaneously that may be analyzed rapidly. Researchers are applying microarray technology to understand gene expression, mutation analysis, and the sequencing of genes. Although this technology has been experimental, and thus has been through feasibility studies, it has just recently entered into widespread use for advanced research.

The purpose of *DNA Arrays: Methods and Protocols* is to provide instruction in designing and constructing DNA arrays, as well as hybridizing them with biological samples for analysis. An additional purpose is to provide the reader with a broad description of DNA-based array technology and its potential applications. This volume also covers the history of DNA arrays—from their conception to their ready off-the-shelf availability—for readers who are new to array technology as well as those who are well versed in this field. Stepwise, detailed experimental procedures are described for constructing DNA arrays, including the choice of solid support, attachment methods, and the general conditions for hybridization.

With microarray technology, ordered arrays of oligonucleotides or other DNA sequences are attached or printed to the solid support using automated methods for array synthesis. Probe sequences are selected in such a way that they have the appropriate sequence length, site of mutation, and T_m . The target biological sample is selected for the disease of interest by amplifying that particular sequence by PCR or other techniques. This amplified DNA target is made to hybridize with presynthesized sequences on solid supports. Hybridized arrays are read with CCD cameras and reports are generated with computer-aided technology.

The first chapter by Professor Southern describes a brief history of DNA array technology followed by two more chapters (2, 3) giving detailed reviews of basic principles in specific areas of interest. Chapter 4 deals with ethical issues related to genetic analysis. Chapter 5 describes a unique way of synthesizing arrays using the photolithographic approach; it also includes a

discussion of the synthesis of modified monomers and their use. Chapter 6 demonstrates genotyping using DNA Mass Array™ methodology. The next two chapters (7, 8) mainly discuss printing or spotting technologies for array synthesis. Chapters 9 and 10 discuss sample preparation (DNA, RNA) and the conditions used during hybridization. Chapter 11 deals with sequence analysis using sequencing-by-hybridization (SBH). Chapter 12 provides information on antisense reagents, a future drug market that will be used to study the effect of these molecules by using array hybridization. Chapter 13 specifically describes HLA-DQA typing techniques. Application of array technologies in gene expression analysis is highlighted in Chapter 14. These technologies go one step further toward making it possible for the expression of genes via DNA arrays. Chapter 15 is devoted to data extraction and data analysis, also known as bioinformatics. Chapter 16 focuses on application of confocal microscopes in detecting microspots. Chapter 17 discusses commercialization and business aspects of biochip technology.

Once again, we think *DNA Arrays: Methods and Protocols* will provide information to all levels of scientists from novice to those intimately familiar with array technology. We would like to thank all the contributing authors for providing manuscripts. I thank John Walker for editorial guidance and the staff of Humana Press in making it possible to include a large body of available DNA microarray technologies in one single volume. Finally, my thanks to my family, especially to Sushma Rampal who is the light of my life and who is solely responsible for my happiness on this earth, and colleagues for their help in completing this volume.

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