

Methods in Molecular Biology™

VOLUME 170

DNA Arrays

Methods and Protocols

Edited by
Jang B. Rampal



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Dna Arrays Methods And Protocols Methods In Molecular Biology

Martin Dufva



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DNA Arrays Jang B. Rampal, 2008-02-02 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

Methods in Molecular Biology: DNA arrays: Methods and protocols John M. Walker, 1984 **The ELISA Guidebook**

John R. Crowther, 2008-02-04 John R Crowther provides today's premier practical guide to the understanding and application of ELISA. Updating and greatly expanding his widely appreciated earlier publication *ELISA Theory and Practice* 1995, this important work introduces chapters on such major new topics as checkerboard titrations, quality control of testing kit production and control, novel monoclonal antibodies, validation of assays, statistical requirements for data examination and epidemiological considerations. With its numerous worked examples, detailed instructions and extensive illustrations, *The ELISA Guidebook* offers a powerful synthesis of all the basic concepts and practical experimental details investigators need to understand, develop and apply the new ELISA methodology successfully in day to day basic and clinical research.

Biostatistical Methods Stephen W. Looney, 2008-02-03 Leading biostatisticians and biomedical researchers describe many of the key techniques used to solve commonly occurring data analytic problems in molecular biology and demonstrate how these methods can be used in the development of new markers for exposure to a risk factor or for disease outcomes. Major areas of application include microarray analysis, proteomic studies, image quantitation, genetic susceptibility and association, evaluation of new biomarkers and power analysis and sample size. **DNA Microarrays for Biomedical Research** Martin Dufva, 2011-01-26 DNA microarray technology has revolutionized research in the past decade. Initially an application for mRNA expression studies, the technology now has spread to other applications such as comparative genomic hybridization, SNP and mutation analysis. In *DNA Microarrays for Biomedical Research Methods and Protocols*, experts explore these now

commonly used applications addressing probe design strategies fabrication issues and providing practical examples of detailed methods for generation of high quality DNA microarray data Chapters incorporate information on some of the largest providers of microarray including Affymetrix Illumina and Agilent and their use on a variety of applications Composed in the highly successful Methods in Molecular Biology series format each chapter contains a brief introduction step by step methods a list of necessary materials and a Notes section which shares tips on troubleshooting and avoiding known pitfalls Authoritative and highly practical DNA Microarrays for Biomedical Research Methods and Protocols presents a variety of protocols which can be easily reproduced allowing researchers to gain surprising insight into the complex world of DNA microarray technology

Transgenesis Techniques Alan R. Clarke, 2008-02-05 The past decade has witnessed a spectacular explosion in both the development and use of transgenic technologies Not only have these been used to aid our fundamental understanding of biologic mechanisms but they have also facilitated the development of a range of disease models that are now truly beginning to impact upon our approach to human disease Some of the most exciting model systems relate to neurodegenerative disease and cancer where the availability of appropriate models is at last allowing radically new therapies to be developed and tested This latter point is of particular significance given the current concerns of the wider public over both the use of animal models and the merits of using genetically modified organisms Arguably advances of the greatest significance have been made using mammalian systems driven by the advent of embryonic stem cell based strategies and more recently by cloning through nuclear transfer For this reason this new edition of Transgenesis Techniques focuses much more heavily on manipulation of the mammalian genome both in the general discussions and in the provision of specific protocols

Microarray Methods and Protocols Robert S. Matson, 2009-01-20 A Step by Step Guide to Present and Future Uses of Microarray Technology Microarray technology continues to evolve taking on a variety of forms From the spotting of cDNA and the in situ synthesis of oligonucleotide arrays now come microarrays comprising proteins carbohydrates drugs tissues and cells With contributions from microarray experts

Posttranslational Modification of Proteins Christoph Kannicht, 2008-02-04 Christoph Kannicht and a panel of highly experienced researchers describe readily reproducible methods for detecting and analyzing the posttranslational modifications of protein particularly with regard to protein function proteome research and the characterization of pharmaceutical proteins

Protein Structure, Stability, and Folding Kenneth P. Murphy, 2008-02-04 In Protein Structure Stability and Folding Kenneth P Murphy and a panel of internationally recognized investigators describe some of the newest experimental and theoretical methods for investigating these critical events and processes Among the techniques discussed are the many methods for calculating many of protein stability and dynamics from knowledge of the structure and for performing molecular dynamics simulations of protein unfolding New experimental approaches presented include the use of co solvents novel applications of hydrogen exchange techniques temperature jump methods for looking at folding events and new strategies for mutagenesis experiments Unique

in its powerful combination of theory and practice Protein Structure Stability and Folding offers protein and biophysical chemists the means to gain a more comprehensive understanding of some of this complex area by detailing many of the major techniques in use today *Biological Microarrays* Ali Khademhosseini, Kahp-Yang Suh, Mohammed Zourob, 2010-10-28 Recent developments in microarray technology have changed the landscape of biology and biomedical research and they have revolutionized RNA and DNA research In *Biological Microarrays Methods and Protocols* expert researchers explore exciting new developments in the field providing a comprehensive approach to biological microarrays that conveys not only the state of the art fundamentals but also includes applications of the most innovative methods Chapters address both the application of biological microarrays including DNA RNA aptamer proteins tissues oligonucleotides carbohydrates biomaterials cells bacteria and virus microarrays and also explore the different techniques used for generating microarray platforms Composed in the highly successful *Methods in Molecular Biology*™ series format each chapter contains a brief introduction step by step methods a list of necessary materials and a Notes section which shares tips on troubleshooting and avoiding known pitfalls Wide ranging and revolutionary *Biological Microarrays Methods and Protocols* serves as a primary source for academics practitioners and professionals in related fields including biologists biotechnologists biochemists analytical chemists and biomedical physical and microsystems engineers to name a few appealing to all of those interested in the present and future state of biological microarray research *PCR Detection of Microbial Pathogens* Konrad Sachse, Joachim Frey, 2003 Hands on laboratory experts present a set of classic PCR based methods for the identification and detection of important animal and food microbial pathogens including several zoonotic agents These proven techniques can be precisely applied to a wide variety of microbes among them *Campylobacter* spp *Chlamydiae* toxigenic *Clostridia* *Escherichia coli* STEC *Listeria monocytogenes* *Mycoplasmas* *Salmonellae* and *Yersinia enterocolitica* Additional chapters review the specificity and performance of diagnostic PCR analysis the pre PCR processing of samples the critical aspects of standardizing PCR methods and the general issues involved in using PCR technology for microbial diagnosis *Tiling Arrays* Tin-Lap Lee, Alfred Chun Shui Luk, 2013 In *Tiling Arrays Methods and Protocols* expert researchers in the field detail many of the methods which are now commonly used to study tiling microarrays in genomic discovery These include methods and applications for transcriptional regulation expression genetic and epigenetic regulation as well as techniques and skills on tiling microarray data analysis Written in the highly successful *Methods in Molecular Biology* series format chapters include introductions to their respective topics lists of the necessary materials and reagents step by step readily reproducible laboratory protocols and key tips on troubleshooting and avoiding known pitfalls Authoritative and practical *Tiling Arrays Methods and Protocols* seeks to provide scientists with a comprehensive and down to earth approach to maximize results

Protein Arrays Eric Fung, 2008-02-03 *Protein Arrays Methods and Protocols* is an introduction to protein array technology and its application to the multiplexed detection of proteins Although protein array technology has some roots in

gene array technology it can only be described as a distant relative Unlike DNA with its established rules of base pairing and therefore predictable biochemical behavior proteins are rich with diversity Proteins can be large or small compact or extended basic or acidic hydrophobic or hydrophilic and so on Just as importantly their behavior is determined by the environment in which they reside and so the composition of the buffer in which experiments are performed has a dramatic impact on the outcome of the experiment Thus if the goal is to simultaneously measure the expression of a large number of proteins these variables must be addressed Not to be deterred scientists have created a variety of solutions to successfully detect and characterize multiple proteins simultaneously It is the intent of this volume to introduce to the reader a set of technological solutions to the diversity problem as well as to provide the reader with some examples of practical applications of these technologies

Statistical Methods for Microarray Data Analysis Andrei Y. Yakovlev, Lev Klebanov, Daniel Gaile, 2013-02-06 Microarrays for simultaneous measurement of redundancy of RNA species are used in fundamental biology as well as in medical research Statistically a microarray may be considered as an observation of very high dimensionality equal to the number of expression levels measured on it In Statistical Methods for Microarray Data Analysis Methods and Protocols expert researchers in the field detail many methods and techniques used to study microarrays guiding the reader from microarray technology to statistical problems of specific multivariate data analysis Written in the highly successful Methods in Molecular Biology™ series format the chapters include the kind of detailed description and implementation advice that is crucial for getting optimal results in the laboratory Thorough and intuitive Statistical Methods for Microarray Data Analysis Methods and Protocols aids scientists in continuing to study microarrays and the most current statistical methods

Tumor Suppressor Genes Wafik S. El-Deiry, 2008-02-03 It has become clear that tumors result from excessive cell proliferation and a corresponding reduction in cell death caused by the successive accumulation of mutations in key regulatory target genes over time During the 1980s a number of oncogenes were characterized whereas from the 1990s to the present the emphasis has shifted to tumor suppressor genes TSGs It has become clear that oncogenes and TSGs function in the same pathways providing positive and negative growth regulatory activities The signaling pathways controlled by these genes involve virtually every process in cell biology including nuclear events cell cycle cell death cytoskeletal cell membrane angiogenesis and cell adhesion effects Mutations in tumor suppressor genes have been identified in familial cancer syndromes and the same genes in many cases have been found to be mutationally inactivated in sporadically occurring cancers In their normal state TSGs control cancer development and progression as well as contribute to the sensitivity of cancers to a variety of therapeutics Understanding the classes of TSGs the biochemical pathways they function in and how they are regulated provides an essential lesson in cancer biology We cannot hope to advance our current knowledge and to develop new and more effective therapies without understanding the relevant pathways and how they influence the present approaches to therapy Moreover it is important to be able to access not only the powerful tools now available to discover these genes but

also their links to cell biology and growth control

DNA Arrays Jang B. Rampal, 2001-03-16 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

Capillary Electrophoresis of Nucleic Acids Keith R. Mitchelson, Jing Cheng, 2008-02-05 The development of PCR, which enables extremely small amounts of DNA to be amplified, led to the rapid development of a multiplicity of analytical procedures that permit use of this new resource for the analysis of genetic variation and for the detection of disease-causing mutations. The advent of capillary electrophoresis (CE) with its power to separate and analyze very small amounts of DNA has also stimulated researchers to develop analytical procedures for the CE format. The advantages of CE in terms of speed and reproducibility of analyses are manifold. Furthermore, the high sensitivity of detection and the ability to increase sample throughput with parallel analysis has led to the creation of a full range of analysis of DNA molecules from modified DNA adducts and single-strand oligonucleotides through PCR-amplified DNA fragments and whole chromosomes. *Capillary Electrophoresis of Nucleic Acids* focuses on analytical protocols that can be used for detection and analysis of mutations and modification from precise DNA loci through entire genomes of organisms. Important practical considerations for CE, such as the choice of separation media, electrophoresis conditions, and the influence of buffer additives and dyes on DNA mobility, are discussed in several key chapters and within particular applications.

Tiling Arrays Tin-Lap Lee, Alfred Chun Shui Luk, 2013-08-24 In *Tiling Arrays: Methods and Protocols*, expert researchers in the field detail many of the methods which are now commonly used to study tiling microarrays in genomic discovery. These include methods and applications for transcriptional regulation, expression, genetic, and epigenetic regulation, as well as techniques and skills on tiling microarray data analysis. Written in the highly successful *Methods in Molecular Biology* series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents.

step by step readily reproducible laboratory protocols and key tips on troubleshooting and avoiding known pitfalls Authoritative and practical Tiling Arrays Methods and Protocols seeks to provide scientists with a comprehensive and down to earth approach to maximize results Cell-Based Microarrays Ella Palmer,2010-11-24 As a high throughput method for analyzing gene function cell based microarrays have proven to be of vital importance allowing high throughput analysis of over expression and knock down of proteins In Cell Based Microarrays Methods and Protocols experts in the field provide an up to date synopsis of cell based microarrays and meticulous coverage of all aspects of the array including emerging technology Beginning with a detailed overview of the whole subject area the volume continues with protocols for over expression arrays and downstream functional assays infectious disease research increasing transfection efficiencies as well as the development of cell based array technology by use of microfluidic image cytometry for the analysis of small diagnostic samples with few cells Written in the highly successful Methods in Molecular Biology™ series format chapters include introductions to their respective topics lists of the necessary materials and reagents step by step readily reproducible laboratory protocols and notes on troubleshooting and avoiding known pitfalls Comprehensive and cutting edge Cell Based Microarrays Methods and Protocols serves as a key resource for molecular biologists geneticists immunologists and chemists and supplies scientists with access to set up a technology that is truly high throughput for the functional analysis of proteins

Microarrays Jang B. Rampil,2007-07-27 Microarray Technology Volumes 1 and 2 present information in designing and fabricating arrays and binding studies with biological analytes while providing the reader with a broad description of microarray technology tools and their potential applications The first volume deals with methods and protocols for the preparation of microarrays The second volume details applications and data analysis which is important in analyzing the enormous data coming out of microarray experiments Among the topics discussed in Volume 1 Synthesis Methods are matrices in the synthesis of microarrays array optimization processes array based comparative genomic hybridization 60 mer oligonucleotide probes bifunctional reagents NTMTA and NTPAC and high density arrays using digital microarray synthesis platforms Other topics include multiplex ligation dependent probe amplification MLPA hybridization conditions in situ synthesized oligo arrays peptide arrays high density replication tools HDRT protocols for the quantification of oligo hybridization glyco bead arrays and an investigation into the emerging nano technology Microarray Technology Volumes 1 and 2 provide ample information to all levels of scientists from novice to those intimately familiar with array technology

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