

Gel Electrophoresis of Protein – From Basic Science to Practical Approach

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1. Introduction

1.1 Electrophoresis theory

Electrophoresis is the process of moving charged molecules in a solution by applying an electric field. During electrophoresis, mobility is dependent on the charge, shape and size of the molecules. It is influenced by the type, concentration and pH of the buffer, and by the temperature and field strength (Figure 1). This technique is used chiefly for the analysis and purification of large molecules, such as proteins and nucleic acids, as well as for simpler charged molecules, including charged sugars, amino acids, peptides, nucleotides and simple ions (Westermeyer, 2001). The electrophoresis of macromolecules is carried out by applying a thin layer of a sample to a porous matrix. Under the influence of an applied voltage, different molecules in the sample move through the matrix at different velocities. The matrix can be composed of different materials, including paper, cellulose acetate or gels made of polyacrylamide. Polyacrylamide is the most common matrix for separating proteins and small proteins (Westermeyer, 2001). The main fields of the application of electrophoresis are biological and biochemical research, protein chemistry, pharmacology, forensic medicine, clinical investigations, and veterinary science and food control as well as molecular biology. Currently, the technique of electrophoresis is largely applied for genome and proteome analysis (Westermeyer et al., 2008).

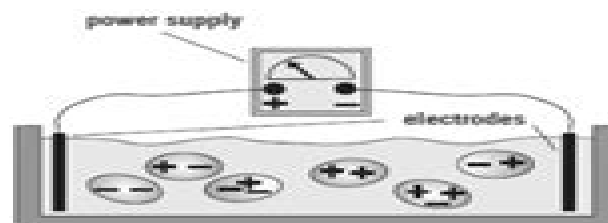


Fig. 1. The basic principle of electrophoresis: charged molecules are moved towards the opposite electrode in a solution by applying an electric field.

Gel Electrophoresis Of Proteins A Practical Approach

Vladimir Torchilin, Volkmar Weissig



Gel Electrophoresis Of Proteins A Practical Approach:

Gel Electrophoresis of Proteins B. D. Hames, David Rickwood, 1994 *Gel Electrophoresis of Proteins* B. D.

Hames, 1998-10-01 This new edition of *Gel Electrophoresis of Proteins* is a completely new text with eight of the ten chapters written by new authors. It presents the best methods, hints and tips for core procedures such as one dimensional polyacrylamide gel electrophoresis, isoelectric focusing, two dimensional gel electrophoresis, preparative gel electrophoresis and peptide mapping, complete with the latest refinements and updates of the procedures. In addition, it describes major new techniques which have come to the fore since the previous edition. Thus there are chapters on capillary gel electrophoresis, sequence analysis of gel resolved proteins, fluorophore labelled saccharide electrophoresis and analysis of protein-protein interactions by gel electrophoresis. One thing has not changed: The emphasis is still on describing the best methods in step by step detail with copious advice to ensure that each method works first time in the reader's hands. The first two editions of *Gel Electrophoresis of Proteins A Practical Approach* each gained a strong reputation as easy to follow laboratory manuals written by experienced researchers for researchers. The methods were presented in a clear, accessible format and had been fully tested to ensure success in the lab. This new edition will strengthen the reputation of the book still further. It is a must have for all those who currently use gel electrophoresis or who plan to do so. **Gel Electrophoresis of Proteins**, 1982

Gel Electrophoresis of Protein - From Basic Science to Practical Approach Gholamreza Kavooosi, 2012 *Gel Electrophoresis of Protein From Basic Science to Practical Approach* **Gel Electrophoresis of Proteins** B. David Hames, 2023 This text presents the best methods, hints and tips on core procedures for running protein gels that will be widely applicable in the laboratory situation. The book's contributors are researchers writing primarily for researchers. Guide to Protein

Purification Murray P. Deutscher, 1990 *Guide to Protein Purification* designed to serve the needs of the student, experienced researcher and newcomer to the field is a comprehensive manual that provides all the up to date procedures necessary for purifying, characterizing and handling proteins and enzymes in one source. Key Features: Detailed procedures newly written for this volume; Extensive practical information; Rationale and strategies for protein and enzyme purification; Personal perspectives on enzyme purification by eminent researchers. Among the Topics Covered: General methods for handling proteins and enzymes; Extraction, subcellular fractionation and solubilization procedures; Comprehensive purification techniques; Specialized purification procedures; Protein characterization; Immunological procedures; Computer analysis of protein structure. Protein Analysis and Purification Ian M. Rosenberg, 2006-12-22 How one goes about analyzing proteins is a constantly evolving field that is no longer solely the domain of the protein biochemist. Investigators from diverse disciplines find themselves with the unanticipated task of identifying and analyzing a protein and studying its physical properties and biochemical interactions. In most cases the ultimate goal remains understanding the role(s) that the target protein is playing in cellular physiology. It was my intention that this manual would make the initial steps in the discovery process less time

consuming and less intimidating This book is not meant to be read from cover to cover The expanded Table of Contents and the index should help locate what you are seeking My aim was to provide practically oriented information that will assist the experimentalist in benchtop problem solving The appendices are filled with diverse information gleaned from catalogs handbooks and manuals that are presented in a distilled fashion designed to save trips to the library and calls to technical service representatives The user is encouraged to expand on the tables and charts to fit individual experimental situations This second edition pays homage to the computer explosion and the various genome projects that have revolutionized how benchtop scientific research is performed Bioinformatics and In silico science are here to stay However the second edition still includes recipes for preparing buffers and methods for lysing cells

Liposomes: A Practical Approach Vladimir Torchilin, Volkmar Weissig, 2003-06-05 This book is an up to date and unique collection of experimental protocols from an area of pharmaceutical research that is essential for the development of new highly specific drugs as well as for the exploration of completely new therapeutic approaches to disease treatments

Protein Expression, 1999-05-20 Protein Expression A Practical Approach and its companion volume Post translational Modification A Practical Approach complete the mini series of Practical Approach books covering the synthesis and subsequent processing of proteins Protein Expression A Practical Approach details the expression of cloned DNA or RNA templates in all the major in vivo and in vitro systems The in vivo systems covered are cultured mammalian cells the yeasts *Saccharomyces cerevisiae* and *Pichia pastoris* baculovirus *Xenopus* oocytes and prokaryotic cells Cell free systems of both eukaryotes and prokaryotes are described including the prokaryotic systems that offer coupled transcription translation There is also a chapter on monitoring protein expression The post translational fate of proteins is covered in Post Translational Processing A Practical Approach

Principles and Reactions of Protein Extraction, Purification, and Characterization Hafiz Ahmed, Hafiz Ahmed PhD, 2017-07-27 Principles and Reactions of Protein Extraction Purification and Characterization provides the mechanisms and experimental procedures for classic to cutting edge techniques used in protein extraction purification and characterization The author presents the principles and reactions behind each procedure and uses tables to compare the different

RNA-Protein Interactions : A Practical Approach Christopher W.J. Smith, 1998-07-09 RNA protein interactions play a fundamental role in gene expression and protein synthesis Recent research into the role of RNA in cells has elucidated many more vital interactions with proteins This book provides an up to date and comprehensive guide to a wide range of laboratory procedures to investigate the interactions between RNA and proteins RNA protein interactions play a vital role in gene transcription and protein expression Interactions such as the synthesis of mRNA by RNA polymerases to the essential modification of RNA by the proteins of the spliceosome complex and the highly catalytic action of the ribosome in protein synthesis are established as being fundamental to the function of RNA Recent research into for example the role of RNA as a catalyst has elucidated many more interactions with proteins that are vital to cell function

RNA Protein Interactions A Practical Approach provides a clear

and comprehensive guide to the experimental procedures used in studying RNA protein interactions The approaches covered range from those initially used to detect a novel RNA protein interaction various biochemical and genetic approaches to purifying and cloning RNA binding proteins through to methods for an in depth analysis of the structural basis of the interaction The volume includes a number of procedures that have not previously been covered in this type of manual These include the production of site specifically modified RNAs by enzymatic and chemical methods and in vivo screening for novel RNA protein interactions in yeast and E coli This is the first volume to gather in one place this wide array of approaches for studying RNA protein interactions As is customary for the Practical Approach series the writing is characterized by a clear explanatory style with many detailed protocols This informative book will be a valuable aid to laboratory workers in biochemistry and molecular biology graduate students postdoctoral and senior scientists whose research encompasses this field

Analytical Techniques in Immunochemistry Terry M. Phillips, 1991-12-23 Explores the principles and presents step by step recipes for isolating and measuring biological materials using modern immunochemical methods including such new procedures as high performance immunoaffinity chromatography capillary electrophoresis and blotting Also includes clear drawings of

Biochemistry David E. Metzler, Carol M. Metzler, 2001-03-23 Biochemistry The Chemical Reactions of Living Cells is a well integrated up to date reference for basic biochemistry associated chemistry and underlying biological phenomena Biochemistry is a comprehensive account of the chemical basis of life describing the amazingly complex structures of the compounds that make up cells the forces that hold them together and the chemical reactions that allow for recognition signaling and movement This book contains information on the human body its genome and the action of muscles eyes and the brain It also features thousands of literature references that provide introduction to current research as well as historical background twice the number of chapters of the first edition and each chapter contains boxes of information on topics of general interest Publisher description

Handbook of Biogeneric Therapeutic Proteins Sarfaraz K. Niazi, 2002-08-15 More than 20 billion dollars worth of biopharmaceuticals are scheduled to go off patent by 2006 Given the strong political impetus and the development of technological tools that can answer the questions regulatory authorities may raise it is inevitable that the FDA and EMEA will allow biogeneric or biosimilar products Even with all the regulato

Methods for General and Molecular Microbiology C. A. Reddy, Terry J. Beveridge, John A. Breznak, George Marzluf, 2007-08-17 A first source for traditional methods of microbiology as well as commonly used modern molecular microbiological methods Provides a comprehensive compendium of methods used in general and molecular microbiology Contains many new and expanded chapters including a section on the newly important field of community and genomic analysis Provides step by step coverage of procedures with an extensive list of references to guide the user to the original literature for more complete descriptions Presents methods for bacteria archaea and for the first time a section on mycology Numerous schematics and illustrations both color and black and white help the reader to easily understand the topics

presented **Diagnostic Bacteriology Protocols** Jenny Howard, David M. Whitcombe, 2008-02-03 Enhanced public awareness of microbiological issues and increased governmental regulation have ensured that microbiology and bacteriology remain important from the academic laboratory to a broad range of industrial environments Since the techniques used in bacteriology vary widely and have advanced rapidly of late it has become increasingly desirable to gather a collection of up to date protocols from a comprehensive range of disciplines into a single volume **Diagnostic Bacteriology Protocols** thus aims to provide a wide variety of up to date protocols for the identification and differentiation of bacteria from pure or mixed cultures and for the study of bacteria at the genus through to subspecies levels In addition we aim to provide methods covering a range of complexities some requiring little or no special equipment others exploiting recent advances in sophisticated instrumentation or novel nucleic acid based technology We also present techniques to study a variety of aspects of bacteria from the features of whole cells and their growth through their enzyme activities and structural components to nucleic acid based analysis

Protein Purification Jan-Christer Janson, 2012-01-03 The authoritative guide on protein purification now completely updated and revised Since the Second Edition of *Protein Purification* was published in 1998 the sequencing of the human genome and other developments in bioscience have dramatically changed the landscape of protein research This new edition addresses these developments featuring a wealth of new topics and several chapters rewritten from scratch Leading experts in the field cover all major biochemical separation methods for proteins in use today providing professionals in biochemistry organic chemistry and analytical chemistry with quick access to the latest techniques Entirely new or thoroughly revised content includes High resolution reversed phase liquid chromatography Electrophoresis in gels Conventional isoelectric focusing in gel slabs and capillaries and immobilized pH gradients Affinity ligands from chemical and biological combinatorial libraries Membrane separations Refolding of inclusion body proteins from *E. coli* Purification of PEGylated proteins High throughput screening techniques in protein purification The history of protein chromatography

The Protein Protocols Handbook John M. Walker, 1996 145 concise step by step protocols for the analysis of proteins and peptides Provides more than three times as many protocols than the competitors manuals in the incomparable *Methods in Molecular Biology*™ style at an affordable price Combined in a large 7 x 10 inch format for easy benchtop use An indispensable reference for industry based researchers professors and their students *A Practical Guide to Membrane Protein Purification* Gebhard von Jagow, 2013-10-22 *A Practical Guide to Membrane Protein Purification* is written especially for researchers who have some familiarity with separation of water soluble proteins but who may not be aware of the pitfalls they face with membrane proteins This guide presents techniques in a concise form emphasizing the aspects unique to membrane proteins The book explains the principles of the methods permitting researchers and students new to this area to adapt these techniques to their particular needs The second volume in the series this book is an essential manual for investigations of structure and function of native membrane proteins as well as for purification of these proteins for

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Susan R. Mikkelsen, Eduardo Cortón, 2016-03-07 A timely accessible survey of the multidisciplinary field of bioanalytical chemistry Provides an all in one approach for both beginners and experts from a broad range of backgrounds covering introductions theory advanced concepts and diverse applications for each method Each chapter progresses from basic concepts to applications involving real samples Includes three new chapters on Biomimetic Materials Lab on Chip and Analytical Methods Contains end of chapter problems and an appendix with selected answers

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