

LABORATORY EXERCISE #3. Detection of genetically modified food products by gel electrophoresis

Introduction

PCR products of differing lengths can be separated from each other based on size by an analytical method called gel electrophoresis. In this method charged macromolecules (such as DNA, RNA or proteins) migrate through a porous gel typically made from agarose (polysaccharide polymer derived from sea weed) or polyacrylamide when an electrical current is applied. The DNA sample is loaded into a well within the gel and placed near the anode (negative charge). As DNA has a very high negative charge due to the presence of the ionized phosphate groups on its backbone, it will migrate away from the negative anode toward the positively charged cathode as electrophoresis takes place. During the migration, smaller DNA fragments will pass through the gel pores more easily and thus migrate through the gel faster. Larger DNA molecules take longer to get through the pores and will migrate slower. The separated DNA "bands" or fragments can be visualized within the gel by staining with **ethidium bromide**. This dye intercalates (inserts) itself into the DNA and will fluoresces under ultraviolet light. In other words, DNA fragments will appear as fluorescent bands in the gel when exposed to UV light (Fig 1).

Concept check: If you compared two DNA fragments, one of 200-base pairs (bp) and the other of 1000 bp, which fragment will appear lower on the gel/have migrated faster?

Q: During gel electrophoresis, DNA is separated based on what two properties?

A: Size and charge

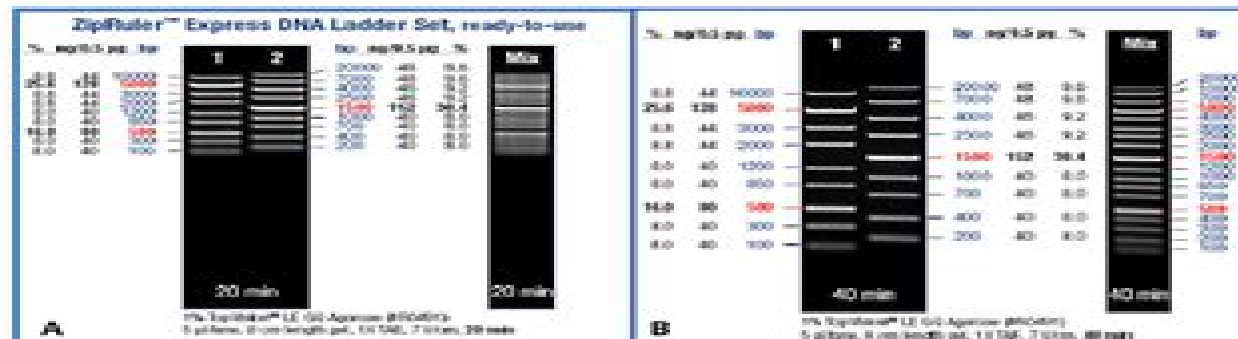


Figure 1. DNA fragments of known size are separated on an agarose gel for 20 min (A) or 40 min (B). By comparing the results, you can see how at 20 min, the DNA fragments are not well separated but by 40 min, the individually sized fragments are well separated and the size is easily determined. Figure adapted from Biogen.

Electrophoresis Laboratory Manual

Dietmar Tietz



Electrophoresis Laboratory Manual:

Food Analysis Laboratory Manual S. Suzanne Nielsen, 2010-03-20 This second edition laboratory manual was written to accompany Food Analysis Fourth Edition ISBN 978 1 4419 1477 4 by the same author The 21 laboratory exercises in the manual cover 20 of the 32 chapters in the textbook Many of the laboratory exercises have multiple sections to cover several methods of analysis for a particular food component of characteristic Most of the laboratory exercises include the following introduction reading assignment objective principle of method chemicals reagents precautions and waste disposal supplies equipment procedure data and calculations questions and references This laboratory manual is ideal for the laboratory portion of undergraduate courses in food analysis

Electrophoresis S. T. Nerenberg, 1966 *Nucleic Acid Electrophoresis* Dietmar Tietz, 2012-12-06 Electrophoresis is a powerful method to analyze nucleic acids DNA RNA Various sophisticated techniques such as capillary electrophoresis pulsed field electrophoresis fingerprinting using RFLP and RAPD DNA sequencing and mobility shift assay are described in detail The required apparatus appropriate use preparation of probes gel staining interpretation of results tricks for troubleshooting manufacturers addresses helpful Internet resources as well as specific applications e g in legal medicine microbiology and agriculture are presented by leading experts

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Handbook of Detection of Enzymes on Electrophoretic Gels Gennady P. Manchenko, 2002-12-26 Still widely used as gene markers isozymes detected by zymogram techniques have proven valuable in a range of other biological applications over the last few years Along with these new applications many new techniques have also emerged Yet more than eight years since the Handbook of Detection of Enzymes on Electrophoretic Gels was first published

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bridging the gap between theoretical knowledge and hands on laboratory experience Covering a wide range of experiments and methodologies the manual equips readers with the necessary skills to conduct successful biochemical experiments and interpret their results accurately

Laboratory Manual For Genetic Engineering VENNISON, S. JOHN, 2009-01-01 This systematically designed laboratory manual elucidates a number of techniques which help the students carry out various experiments in the field of genetic engineering The book explains the methods for the isolation of DNA and RNA as well as electrophoresis techniques for DNA RNA and proteins It discusses DNA manipulation by restriction digestion and construction of recombinant DNA by ligation Besides the book focuses on various methodologies for DNA transformation and molecular hybridization While discussing all these techniques the book puts emphasis on important techniques such as DNA isolation from Gram positive bacteria including *Bacillus* sp the slot lysis electrophoresis technique which is useful in DNA profile analysis of both Gram negative and positive bacteria plasmid transduction in *Bacillus* sp and the conjugal transfer of plasmid DNA in cyanobacteria *Bacillus* and *Agrobacterium tumefaciens* This book is intended for the undergraduate and postgraduate students of biotechnology for their laboratory courses in genetic engineering Besides it will be useful for the students specializing in genetic engineering molecular biology and molecular microbiology

KEY FEATURES Includes about 60 different experiments Contains several figures to reinforce the understanding of the techniques discussed Gives useful information about preparation of stock solutions DNA protein conversions restriction enzymes and their recognition sequences and so on in Appendices

Laboratory Handbook of Chromatographic and Allied Methods Otakar Mikeš, 1979

Laboratory Protocols in Applied Life Sciences Prakash Singh Bisen, 2014-02-26 As applied life science progresses becoming fully integrated into the biological chemical and engineering sciences there is a growing need for expanding life sciences research techniques Anticipating the demands of various life science disciplines *Laboratory Protocols in Applied Life Sciences* explores this development This book covers a wide spectrum of areas in the interdisciplinary fields of life sciences pharmacy medical and paramedical sciences and biotechnology It examines the principles concepts and every aspect of applicable techniques in these areas Covering elementary concepts to advanced research techniques the text analyzes data through experimentation and explains the theory behind each exercise It presents each experiment with an introduction to the topic concise objectives and a list of necessary materials and reagents and introduces step by step readily feasible laboratory protocols Focusing on the chemical characteristics of enzymes metabolic processes product and raw materials and on the basic mechanisms and analytical techniques involved in life science technological transformations this text provides information on the biological characteristics of living cells of different origin and the development of new life forms by genetic engineering techniques It also examines product development using biological systems including pharmaceutical food and beverage industries *Laboratory Protocols in Applied Life Sciences* presents a nonmathematical account of the underlying principles of a variety of experimental techniques in disciplines including Biotechnology Analytical

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Human Molecular Biology Laboratory Manual Stefan Surzycki, 2008-04-15
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Starch Gel Electrophoresis of Conifer Seeds M. Thompson Conkle, 1982
Electrophoresis of Enzymes Gunter M. Rothe, 2012-12-06 The electrophoresis of enzymes and isoenzymes is a well established technique in biochemical clinical environmental microbiological botanical and forensic laboratories and classical electrophoresis is presently undergoing a remarkable revival This book compiles facts and methods on enzyme electrophoresis widely dispersed in hundreds of publications The author summarizes them in clearly readable tables in many carefully worked out electrophoresis and more than 140 staining protocols The exhaustive practical experience of the author and the wealth of material summarized and reviewed makes this book a must for every enzyme laboratory It will supply the practitioner with profound information on state of the art enzyme electrophoresis

Current Catalog National Library of Medicine (U.S.), 1979 Includes subject section name section and 1968 1970 technical reports

Saibo denki eido jikkenho Takashi Yamada, 1973

Zone Electrophoresis Ivor Smith, 2013-10-22 Chromatographic and Electrophoretic Techniques Volume II Zone Electrophoresis Second Edition presents tried and tested methods of zone electrophoresis which has been carried out on commercially available apparatus offering many advantages to the majority of laboratories This book is divided into 14 chapters and begins with a brief introduction to the general principles of zone electrophoresis The subsequent chapters deal with the principles instrumentation and applications of various methods of zone electrophoresis including low and high voltage paper cellulose acetate thin layer agar and starch gel and preparative block electrophoresis The remaining chapters cover other zone electrophoresis methods such as acrylamide gel disc acrylamide flat gel and continuous electrophoresis This book is of value to analytical chemists and biologists

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