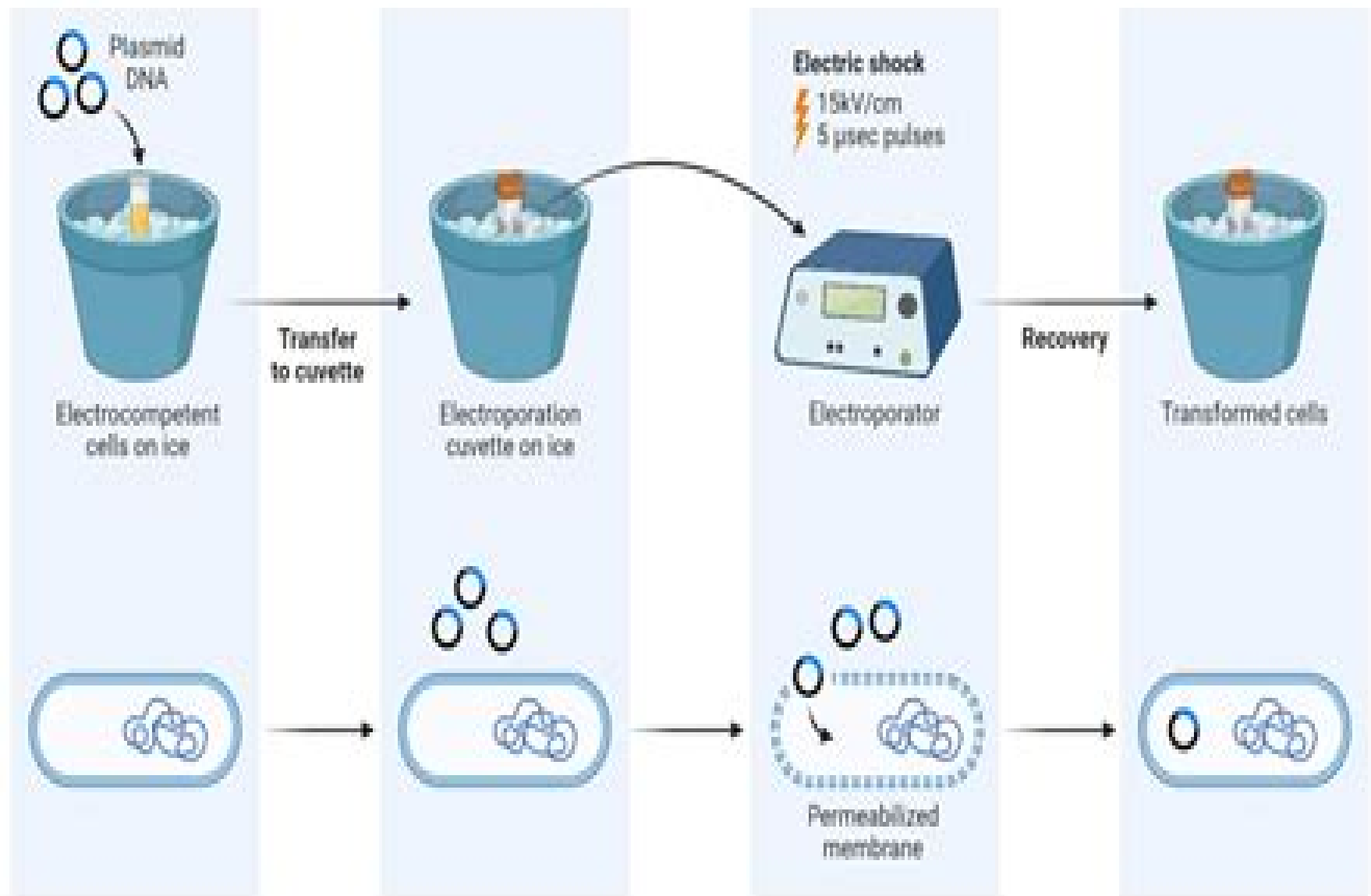


# Electroporation



# Electroporation And Electrofusion In Cell Biology

**C.A. Jordan, E. Neumann, A.E. Sowers**



## **Electroporation And Electrofusion In Cell Biology:**

**Electroporation and Electrofusion in Cell Biology** C.A. Jordan,E. Neumann,A.E. Sowers,2013-11-11 Cells can be funny Try to grow them with a slightly wrong recipe and they turn over and die But hit them with an electric field strong enough to knock over a horse and they do enough things to justify international meetings to fill a sizable book and to lead one to speak of an entirely new technology for cell manipulation The very improbability of these events not only raises questions about why things happen but also leads to a long list of practical systems in which the application of strong electric fields might enable the merger of cell contents or the introduction of alien but vital material Inevitably the basic questions and the practical applications will not keep in step The questions are intrinsically tough It is hard enough to analyze the action of the relatively weak fields that rotate or align cells but it is nearly impossible to predict responses to the cell shredding bursts of electricity that cause them to fuse or to open up to very large molecular assemblies Even so theoretical studies and systematic examination of model systems have produced some creditable results ideas which should ultimately provide hints of what to try next Guide to Electroporation and Electrofusion Donald C. Chang,Bruce M. Chassy,James Saunders,Arthur E. Sowers,2012-12-02 Electroporation is an efficient method to introduce macromolecules such as DNA into a wide variety of cells Electrofusion results in the fusion of cells and can be used to produce genetic hybrids or hybridoma cells Guide to Electroporation and Electrofusion is designed to serve the needs of students experienced researchers and newcomers to the field It is a comprehensive manual that presents in one source up to date easy to follow protocols necessary for efficient electroporation and electrofusion of bacteria yeast and plant and animal cells as well as background information to help users optimize their results through comprehension of the principles behind these techniques Covers fundamentals of electroporation and electrofusion in detail Molecular events Mechanisms Kinetics Gives extensive practical information The latest applications Controlling parameters to maximize efficiency Available instrumentation Presents applications of electroporation and electrofusion in current research situations State of the art modifications to electrical pulses and generators Application of electroporation and electrofusion to unique alternative cell and tissue types Gives straightforward detailed easy to follow protocols for Formation of human hybridomas Introduction of genetic material into plant cells and pollen Transfection of mammalian cells Transformation of bacteria plants and yeast Production of altered embryos Optimization of electroporation by using reporter genes Comprehensive and up to date Convenient bench top format Approximately 125 illustrations complement the text Complete references with article titles Written by leading authorities in electroporation and electrofusion **Animal Cell Electroporation and Electrofusion Protocols** Jac A. Nickoloff,2008-02-03 The ability to introduce macromolecules into animal cells including DNA RNA proteins and other bioactive compounds has facilitated a broad range of biological studies from biochemistry and biophysics to molecular biology cell biology and whole animal studies Gene transfer technology in particular will continue to play an essential role in

studies aimed at improving our understanding of the relationships between the gene structure and function and it has important practical applications in both biotechnology and biomedicine as evidenced by the current intense interest in gene therapy. Although DNA and other macromolecules may be introduced into cells by a variety of methods including chemical treatments and microinjection, electroporation has proven to be simpler to perform, more efficient and effective with a wider variety of cell types than other techniques. The early and broad success of electric field mediated DNA transfer soon prompted researchers to investigate electroporation for transferring other types of molecules into cells including RNA, enzymes, antibodies and analytic dyes. Animal Cell Electroporation and Electrofusion Protocols begins with three chapters that describe the theoretical and practical aspects of electroporation including a review of the commercially available instrumentation. These introductory chapters will be of particular interest to those new to electric field technologies and to those developing protocols for as yet untested species or cell types. Nineteen chapters follow that present well tested protocols for electroporation of proteins and DNA into insect, fish and mammalian cells. Electroporation and Electrofusion in Cell Biology C.A. Jordan, E. Neumann, A.E. Sowers, 1989-05-31. Cells can be funny. Try to grow them with a slightly wrong recipe and they turn over and die. But hit them with an electric field strong enough to knock over a horse and they do enough things to justify international meetings to fill a sizable book and to lead one to speak of an entirely new technology for cell manipulation. The very improbability of these events not only raises questions about why things happen but also leads to a long list of practical systems in which the application of strong electric fields might enable the merger of cell contents or the introduction of alien but vital material. Inevitably the basic questions and the practical applications will not keep in step. The questions are intrinsically tough. It is hard enough to analyze the action of the relatively weak fields that rotate or align cells but it is nearly impossible to predict responses to the cell shredding bursts of electricity that cause them to fuse or to open up to very large molecular assemblies. Even so, theoretical studies and systematic examination of model systems have produced some creditable results, ideas which should ultimately provide hints of what to try next. Plant Cell Electroporation And Electrofusion Protocols Jac A. Nickoloff, 2008-02-02. Gene transfer is an essential technology for improving our understanding of gene structure and function. Although there are many methods by which DNA may be introduced into cells including heat and chemical treatments and microinjection, electroporation has been found to be the most versatile gene transfer technique. Electroporation is effective with a wide variety of cell types including those that are difficult to transform by other means. For many cell types, electroporation is either the most efficient or the only means known to effect gene transfer. The early and broad success of electric field mediated DNA transfer soon prompted researchers to investigate electroporation for transferring other types of molecules into cells including RNA, enzymes, antibodies and analytic dyes. The first section of Plant Cell Electroporation and Electrofusion Protocols includes two chapters that serve as a guide to theoretical and practical aspects of electroporation and will be of particular interest to those developing protocols.

for as yet untested species or cell types and a third chapter that describes commercially available electroporation instruments The remaining chapters describe well tested protocols for DNA electrotransfection electroporation of other biomolecules or cell electrofusion These chapters also include brief discussions of alternatives to electric field based methods citing the advantages and limitations of the various methods for achieving specific goals      **Electrical**

**Manipulation of Cells** Paul T. Lynch, M.R. Davey, 2012-12-06 Electrical Manipulation of Cells provides an authoritative and up to date review of the field covering all the major techniques in a single source The book features broad coverage that ranges from the mechanisms of action of external electrical fields on biological material to the ways in which electrical stimuli are employed to manipulate cells Bringing together the work of leading international authorities the book covers membrane breakdown gene delivery electroporation electrostimulation cell movement hybridoma production plant protoplasts electrorotation and stimulation and electromagnetic stimulation For each topic the authors discuss the relevance of the approach to the current state of the art of biotechnology Electrical Manipulation of Cells is an unmatched source of information for anyone involved in the manipulation of cells particularly biotechnologists cell biology microbiologists biophysicists and plant scientists For researchers the book provides technical material that can be employed in their own work Students will gain thorough appreciation of the applications of this important technique      **Handbook of Biological**

**Effects of Electromagnetic Fields, Third Edition - 2 Volume Set** Charles Polk, Elliot Postow, 1995-12-21 The first edition of this book has been recognized as the standard reference on biological effects of electric and magnetic fields from DC to microwaves But much has changed in this science since the book's original publication in 1986 With contributions from eighteen leading researchers this latest edition includes authoritative discussions of many new developments and will quickly become the new must have resource handbook Dielectric properties of biological tissue are thoroughly examined followed by chapters on physical mechanisms and biological effects of static and extremely low frequency magnetic fields New chapters on topics that were treated very briefly in the first edition now receive extensive treatment These topics include electric and magnetic fields for bone and soft tissue repair electroporation and epidemiology of ELF health effects The chapter on computer methods for predicting field intensity has been substantially revised to describe new numerical techniques developed within the last few years and includes calculations of power absorbed in the human head from cellular telephones The chapter discussing experimental results on RF interaction with living matter now contains information on effects of very high power very short duration pulses A new appendix on safety standards is based on the latest publications of governmental as well as quasi governmental organizations such as the U S Council on Radiation Protection in the United States Europe and Australia With all its revisions this updated version of the CRC Handbook of Biological Effects of Electromagnetic Fields provides the most comprehensive overview available of this rapidly changing science      **Handbook**

**of Biochemistry and Molecular Biology**, 2010-05-21 Edited by renowned protein scientist and bestselling author Roger L

Lundblad with the assistance of Fiona M Macdonald of CRC Press this fourth edition of the Handbook of Biochemistry and Molecular Biology represents a dramatic revision the first in two decades of one of biochemistry's most referenced works. This edition gathers a wealth of information not easily obtained including information not found on the web. Offering a molecular perspective not available 20 years ago it provides physical and chemical data on proteins, nucleic acids, lipids, and carbohydrates. Presented in an organized, concise, and simple to use format, this popular reference allows quick access to the most frequently used data. Covering a wide range of topics from classical biochemistry to proteomics and genomics, it also details the properties of commonly used biochemicals, laboratory solvents, and reagents. Just a small sampling of the wealth of information found inside the handbook: Buffers and buffer solutions; Heat capacities and combustion levels; Reagents for the chemical modification of proteins; Comprehensive classification system for lipids; Biological characteristics of vitamins; A huge variety of UV data; Recommendations for nomenclature and tables in biochemical thermodynamics; Guidelines for NMR measurements for determination of high and low pKa values; Viscosity and density tables; Chemical and physical properties of various commercial plastics; Generic source based nomenclature for polymers; Therapeutic enzymes. About the Editors: Roger L. Lundblad, Ph.D. Roger L. Lundblad is a native of San Francisco, California. He received his undergraduate education at Pacific Lutheran University and his PhD degree in biochemistry at the University of Washington. After postdoctoral work in the laboratories of Stanford Moore and William Stein at the Rockefeller University, he joined the faculty of the University of North Carolina at Chapel Hill. He joined the Hyland Division of Baxter Healthcare in 1990. Currently, Dr. Lundblad is an independent consultant and writer in biotechnology in Chapel Hill, North Carolina. He is an adjunct Professor of Pathology at the University of North Carolina at Chapel Hill and Editor in Chief of the Internet Journal of Genomics and Proteomics. Fiona M. Macdonald, Ph.D. F.R.S.C. Fiona M. Macdonald received her BSc in chemistry from Durham University, UK. She obtained her PhD in inorganic biochemistry at Birkbeck College, University of London, studying under Peter Sadler. Having spent most of her career in scientific publishing, she is now at Taylor and Francis and is involved in developing chemical information products.

Electromanipulation of Cells Ulrich Zimmermann, Garry A. Neil, 1996-02-16. Electromanipulation of Cells is the first comprehensive, balanced overview of this dynamic discipline. Edited by leading authorities in the field, the book surveys state-of-the-art research as well as recent practical applications of electric field technologies.

Biological and Medical Aspects of Electromagnetic Fields, Fourth Edition Ben Greenebaum, Frank Barnes, 2018-11-01. The two volumes of this new edition of the Handbook cover the basic biological, medical, physical, and electrical engineering principles. They also include experimental results concerning how electric and magnetic fields affect biological systems, both as potential hazards to health and potential tools for medical treatment and scientific research. They also include material on the relationship between the science and the regulatory processes concerning human exposure to the fields. Like its predecessors, this edition is intended to be useful as a reference book but also for introducing the reader to bioelectromagnetics or some of its aspects.

FEATURES

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*Transgenic Plant Research* Alan R. Lindsey, 2022-01-26 This text is split into four main sections gene transfer techniques transgenic approaches to gene isolation manipulation of plant development biochemistry and physiology and predictability of transgene expression

Electrical Trauma E. G. Cravalho, J. F. Burke, 1992-10-22 This comprehensive 1992 treatise was the first on electrical trauma in humans

Emerging Electromagnetic Medicine Mary E. O'Connor, Richard H.C. Bentall, John C. Monahan, 2012-12-06 Emerging Electromagnetic Medicine presents the latest research findings in the field of electromagnetic radiation The book discusses the research of current active researchers in terms of synthesizing and sharing their ideas on the use of electromagnetic fields in diagnostic and therapeutic medicine now and in the future including the benefits and risks involved The book consists of three parts prefaced by a brief historic perspective Section I describes the theoretical concerns and actual mechanisms involved Section II covers current preclinical studies performed in vivo and in vitro concerning the biological action of the electromagnetic radiation and Section III reports on actual clinical applications of electromagnetic therapy and also the current machinery used to do so

*Charge and Field Effects in Biosystems*—2 M.J. Allen, F.M. Hawkrigde, S.F. Cleary, 2012-12-06

**Interfacial Phenomena in Biological Systems** Max Bender, 1991-05-23 Integrating information from physics chemistry and the biological sciences presents a comprehensive survey of surface phenomena in living bodies for readers at an advanced undergraduate or higher level in medicine dentistry pathology and orthopedy Considers such surfaces as skin vascular are

*Biological and Medical Aspects of Electromagnetic Fields* Frank S. Barnes, Ben Greenebaum, 2018-10-03 Biological and Medical Aspects of Electromagnetic Fields examines potential health hazards exposure standards and medical applications of electromagnetic EM fields The second volume in the bestselling and newly revised Handbook of Biological Effects of Electromagnetic Fields Third Edition this book draws from the latest studies on the effects of exposure to electric and magnetic fields In addition to extensive reviews of physiological effects the book contains now separate reviews of behavioral and cognitive responses to various exposures The book also describes an approach to setting standards for exposure limits and explores a few of the beneficial uses of EM fields in medical applications both diagnostics and in treatment Biological and Medical Aspects of Electromagnetic Fields provides a practical overview of the experiments and methods used to observe ELF and RF fields and the possible useful and hazardous implications of these observations

**Permeability and Stability of Lipid Bilayers** E.

Anibal Disalvo, Sidney A. Simon, 2017-12-14 This book presents a comprehensive and coherent picture of how molecules diffuse across a liquid that is on average only two molecules thick It begins by characterizing bilayers structurally using X ray diffraction and then mechanically by measuring elastic moduli and mechanisms of failure Emphasis is placed on the stability and mechanical properties of plant membranes that are subject to very large osmotic and thermal stresses Using this information the transport of molecules of increasing complexity across bilayers is analyzed Recombinant DNA

Methodology II Ray Wu, 2012-12-02 The critically acclaimed laboratory standard for forty years Methods in Enzymology is one of the most highly respected publications in the field of biochemistry Since 1955 each volume has been eagerly awaited frequently consulted and praised by researchers and reviewers alike More than 250 volumes have been published all of them still in print and much of the material is relevant even today truly an essential publication for researchers in all fields of life sciences Methods for DNA isolation and cloning Synthesizing complementary DNA cDNA Cleaving and manipulating DNA Selecting useful reporter genes Constructing vectors for cloning genes Constructing expression vectors Site directed mutagenesis and gene disruption Identifying and mapping genes Transforming animal and plant cells Sequencing DNA Amplifying and manipulating DNA and PCR Detecting DNA protein interaction **11th Mediterranean Conference on**

**Medical and Biological Engineering and Computing 2007** Tomaz Jarm, Peter Kramar, Anze Zupanic, 2007-10-24 Biomedical engineering today is a well recognized area of research It brings together bright minds from diverse disciplines ranging from engineering physics and computer sciences on one side to biology and medicine on the other side With valuable assistance of members of the International Advisory Committee and Scientific Program Committee the co organizing institutions and societies our sponsors and distinguished invited lecturers we will ensure that the research and development presented at MEDICON 2007 plenary meetings scientific sessions and workshops will truly be relevant and up to date The MEDICON conferences are international events of high scientific standards with long lasting tradition held every third year in one of the Mediterranean countries under the auspices of the International Federation for Medical and Biological Engineering Electrotechnologies for Extraction from Food Plants and Biomaterials Eugene Vorobiev, Nikolai

Lebovka, 2009-02-28 Recently the electrotechnologies based on the effects of pulsed electric fields PEF such as ohmic heating OH and DC electric field have gained real interest in the field of food processing These techniques efficiently enhance methods of extraction from food plants and dehydration of biosolids The PEF and pulsed OH techniques preserve the nutritional functional structural and sensory properties of products better than conventional extraction technologies The electrofiltration and electro osmotic dewatering can be very effective for the separation of bioproducts and dehydration of food wastes The first source book in the field this book gives an overview the fundamental principles of electrical techniques electrophysical properties of foods and agricultural products application of various emerging electrotechnologies for enhancing the solid liquid separation and drying processes extraction techniques of pigments processing methods of different



in plant tissues and biosolids electro osmotic dewatering and electrofiltration of biomaterials recent industrial scale gains and other aspects Each chapter is complementary to other chapters and addresses the latest efforts in the field

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