
Preface

Pulsed electric fields have been applied to living systems *in vitro* for a host of delivery applications since the early 1980s. It has been established that the primary effect that electrical treatment has on cells is an induced increase in the permeability of membranes to exogenous molecules. This state of increased permeability was noted to be temporary and could be induced with little or no effect on cell viability. This physical phenomenon was termed electroporation. Numerous published studies have shown that electroporation can be applied to any cell type. These studies also exploited the phenomenon to deliver drugs, DNA, antibodies, proteins, and fluorescent molecules. The use of electricity to mediate delivery of these molecule types *in vitro* has proven to be an invaluable research tool for biological and biomedical scientists.

Many of the *in vitro* applications for electrically mediated delivery have tremendous potential for the treatment of human disease. For example, the efficient delivery of drugs and plasmid DNA has strong implications for improving standard therapies, as well as gene therapies. This potential was realized about 12 years ago when electric pulses were used to deliver drugs to tumor cells *in vivo*. Since then, the utility of *in vivo* electroporation for the delivery of molecules has been demonstrated through new applications that have been developed with increasing frequency each year. *Electrochemotherapy, Electrogenethrapy, and Transdermal Drug Delivery: Electrically Mediated Delivery of Molecules to Cells* provides review and protocol chapters that completely cover this relatively new scientific discipline.

This volume is arranged into four sections. The first provides reviews of critical aspects of electroporation, chemotherapeutic agent delivery, gene delivery, and transdermal transport. This collection of chapters provides information about the history, current state, and future implications of the work that has been accomplished using electric fields to deliver molecules *in vivo*. The remaining three sections of the volume focus on protocols used for the delivery of molecules into cells and through the skin. The protocol chapters are divided into sections based on their relevance to chemotherapeutic agent delivery, gene delivery, and transdermal delivery.

The organization of *Electrochemotherapy, Electrogenethrapy, and Transdermal Drug Delivery* was designed to provide the reader with a com-

plete review of in vivo electroporation for the delivery of molecules in order to instill an understanding of the subject as well as an appreciation for the potential health-related applications. This volume is designed to be a convenient review for the novice in the field as well as an update for scientists that are already familiar the use of electric fields in vivo. All of the work in this discipline has required the development of specific new protocols that include animal models, electrical generators, specialized electrodes, and novel methods. Thus, the protocols section has been collected to provide sufficient detailed information for researchers to use or modify for their own needs.

In closing, the editors wish to thank all of the authors for their contributions to this text and to the field of electrically mediated delivery. Every author has contributed significantly to this young but promising field. Based on the highly successful clinical trials using electrochemotherapy, promising gene therapy results in animals, and encouraging transdermal delivery progress, it seems inevitable that this field will expand further into the clinical domain in the near future.

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