Electroporation Protocols for Microorganisms
Methods in Molecular Biology™

John M. Walker, Series Editor

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Preface

Electroporation is one of the most widespread techniques used in modern molecular genetics. It is most commonly used to introduce DNA into cells for investigations of gene structure and function, and in this regard, electroporation is both highly versatile, being effective with nearly all species and cell types, and highly efficient. For many cell types, electroporation is either the most efficient or the only means known to effect gene transfer. However, exposure of cells to brief, high-intensity electric fields has found broad application in other aspects of biological research, and is now routinely used to introduce other types of biological and analytic molecules into cells, to induce cell–cell fusion, and to transfer DNA directly between different species.

The first seven chapters of Electroporation Protocols for Microorganisms describe the underlying theory of electroporation, the commercially available instrumentation, and a number of specialized electroporation applications, such as cDNA library construction and interspecies DNA electrotransfer. Each of the remaining chapters presents a well developed method for electrotransformation of a particular bacterial, fungal, or protist species. These chapters also serve to introduce those new to the field the important research questions that are currently being addressed with particular organisms, highlighting both the major advantages and limitations of each species as a model organism, and explaining the roles that electroporation has played in the development of the molecular genetic systems currently in use. Microorganisms continue to play key roles in the development of our understanding of basic biological processes, as well as being important human, plant, and animal disease vectors. Because electroporation has such broad application, protocols for all microorganisms that have been successfully electrotransformed could not be included in this volume. However, protocols are included for a diverse array of bacterial, fungal, and
protist species, including many that are important in human disease, and most chapters provide literature references for electroporation protocols of related species.

Although many of the procedures for electrotransformation of different organisms are similar, subtle differences are often important, especially when an experimental design requires optimum transformation. For example, electroporation efficiency is often strongly affected by growth conditions and growth phase at the time of cell harvest. Therefore, each chapter provides detailed information about growth conditions for the particular organism. Because specific approaches are not always successful, comparisons of procedures used with similar (or even quite different) organisms might provide valuable insight to researchers working to solve a particular problem. In addition, the chapter on electroporation theory can be used to develop new protocols or modify existing ones. In sum, I feel that this volume will be an especially valuable resource for molecular geneticists working with the widest variety of cell systems, both with respect to technical hints and troubleshooting advice, which are presented as "Notes" at the end of each protocol, and as a guide to the various applications of electroporation in different model systems.

I want to express my gratitude to all of the contributors, for both their timely submissions and their many suggestions. I also want to thank Debra Horensky for clarifying many fine points of microbial taxonomy, and for assistance in the selection of topics relevant to human disease. And I thank John Walker for his considerable assistance and thoughtful advice.

Jac A. Nickoloff
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