ION CHANNELS

Volume 1

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Volume 1

Edited by

Toshio Narahashi

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PREFACE

A wealth of information has been accumulated about the function of ion channels of excitable cells since the extensive and pioneering voltage clamp studies by Hodgkin, Huxley, and Katz 36 years ago. The study of ion channels has now reached a stage at which a quantum jump in progress is anticipated. There are many good reasons for this. Patch clamp techniques originally developed by Neher and Sakmann 12 years ago have made it possible to study the function of ion channels in a variety of cells. Membrane ionic currents can now be recorded practically from many types of cells using the whole-cell patch clamp technique. The opening and closing of individual ion channels can be analyzed using the single-channel patch clamp method. Techniques have also been developed to incorporate purified ion channels into lipid bilayers to reconstitute an "excitable membrane." Advanced techniques developed in molecular biology, genetics, and immunology, such as gene cloning and the use of monoclonal antibodies, are now being applied to the study of ion channels.

A variety of drugs have now been found or are suspected to interact with ion channels to exert therapeutic effects. In addition to the classical examples, as represented by local anesthetics, many other drugs, including calcium antagonists, psychoactive drugs, cardiac drugs, and anticonvulsants, have been shown to alter ion channel function. For certain pesticides such as pyrethroids and DDT, sodium channels are clearly the major target site. Many diseases of excitable tissues are known to be associated with, if not caused by, dysfunction of ion channels; these include cardiac arrhythmias, angina pectoris, multiple sclerosis, myotonia, and epilepsies, to mention only a few. Channel dysfunction can now be studied because of theoretical and technological developments in this area.

The time is therefore ripe to begin a series of books dealing with current developments in the study of ion channels. Each chapter in the series will be written by an expert in the respective field and will cover state-of-the-art information based on the research progress made by the author and by other

investigators. Therefore, each volume will serve as a useful reference not only for experts in the field but also for those who wish to gain updated knowledge of ion channels.

Toshio Narahashi

Chicago

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