
PREFACE

Voltage-gated calcium channels are essential mediators of a range of physiological functions, including the communication between nerve cells, the regulation of heart beat, muscle contraction, and secretion of hormones such as insulin. Consequently, these channels are critical pharmacological targets in the treatment of a variety of disorders, such as epilepsy, hypertension, and pain. Voltage-gated calcium channels have therefore been subject to intense study by numerous investigators over the past few decades, and an immense body of work has accumulated. In this book, we provide the first comprehensive overview of our current state of knowledge concerning this exciting field of research. Leading off with a general review of calcium signaling and techniques to measure calcium channel activity, the book delves into a provocative overview of the history of the calcium channel field, contributed by one of the key pioneers in the field, Dr. Richard Tsien. This is followed by an in depth review of the biochemical and molecular biological characterization of calcium channel genes by Drs. Catterall and Snutch whose research has resulted in major advances in the calcium channel field. A number of chapters are dedicated towards various aspects of calcium channel structure and function, including channel gating, permeation, modulation and interactions with members of the exocytotic machinery—contributed by both established leaders and rising stars in the field. The next series of chapters is concerned with pharmacological and physiological aspects of voltage-gated calcium channels including genetic diseases linked to calcium channel genes. The book concludes with an overview of the effects of targeted calcium channel gene disruption in mice.

Over the past two decades, considerable progress has been made in terms of understanding the molecular physiology of voltage-gated calcium channels, yet, the work is far from complete. Identification of novel small organic calcium channel inhibitors remains a key priority towards treating diseases linked to these channels, and only recently has the first crystal structure of a calcium channel subunit been solved. Over the next decade, one may expect that current knowledge about the molecular structure of calcium channels will be used to understand, in detail, the function of these channels in their native cellular environment and in human physiology, and my fellow contributors and I look forward to being part of this effort.

Gerald W. Zamponi, Ph.D.