HANDBOOK
of
RECEPTORS
and
CHANNELS

LIGAND- and VOLTAGE-GATED ION CHANNELS

Edited by

R. Alan North

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The Editor

R. Alan North is Principal Scientist at the Glaxo Institute for Molecular Biology in Geneva, Switzerland. Dr. North graduated B.Sc. (Physiology, 1969), M.B., Ch.B. (Medicine, 1969), and Ph.D. (Pharmacology, 1973) from the University of Aberdeen. He served as House Officer and Registrar in the Aberdeen Hospitals and is a registered medical practitioner in the United Kingdom. During 18 years in the U.S., Dr. North held appointments as Associate Processor of Pharmacology at Loyola University Stritch School of Medicine, Chicago; Professor of Neuropharmacology at the Massachusetts Institute of Technology, Cambridge; and Senior Scientist at the Vollum Institute of Oregon Health Sciences University, Portland. He has also held Fellowships or Visiting Professorships at the Max Planck Institute for Psychiatry in Munich; the John Curtin School of Medical Research at the Australian National University, Flinders University in Adelaide; the Bogomoletz Institute of Physiology in Kiev; the Johann Wolfgang Goethe Universitaet in Frankfurt; and the University of Melbourne. Dr. North has received several prizes and awards including the Gaddum lectureship of the British Pharmacological Society.

Dr. North's professional interests are reflected in his membership of the Physiological Society, The Society of General Physiologists, The British Pharmacological Society, The Society for Neuroscience, and the American Society for Pharmacology and Experimental Therapeutics. His work has been centered around a quantitative understanding of drug and transmitter action at the level of single cells and single molecules, primarily by electrical measurements. His extensive publications deal with the drug and neurotransmitter receptors, structure and function of potassium channels, drug abuse and drug dependence, the physiology of the autonomic and enteric nervous systems, pain mechanisms, psychoactive drugs, and mental illness.

Abstract

The last 10 years have witnessed an explosive increase in our understanding of the molecular and cellular diversity of membrane ion channels. This volume presents a current view of this information in a readily available format. It is an authoritative and comprehensive picture of the structure and function of each of the known classes of these ion channels. Each chapter provides up-to-date amino acid sequences (with data base accession numbers), current views of secondary, tertiary, and quaternary channel structure, and evolutionary relationships among channels. The relationship between primary structure and channel properties such as ligand binding, permeation, and gating have been elucidated by several approaches — from mutagenesis to modelling; these are clearly presented. Three chapters deal with voltage-gated channels (Potassium, K. G. Chandy and G. A. Gutman; Sodium, A. L. Goldin; Calcium, A. Stea, T. W. Soong, and T. P. Snutch), five describe the main families of ligand-gated channels (Nicotinic Acetylcholine, J. Lindstrom; 5-Hydroxytryptamine, J. J. Lambert, J. A. Peters, and A. G. Hope; Excitatory Amino Acids, R. Sprengel and P. H. Seeburg; γ-Aminobutyric Acid, R. F. Tyndale, R. W. Olsen, and A. J. Tobin; Glycine, D. Langosch), and one chapter covers cyclic nucleotide-gated cation channels (K.-W. Yau and T.-Y. Chen). The volume is an important source of information for researchers and students in molecular and cell biology, whether their primary interest be the physiology of membrane currents or the structure of membrane proteins.

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