Handbook of Neurochemistry

SECOND EDITION

Volume 6
RECEPTORS IN
THE NERVOUS SYSTEM

Edited by
Abel Lajtha

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Foreword

A major advance in the biological sciences in the past decade has been the biochemical identification of cell membrane receptors. The existence of receptor substances on the surface of cells that recognize and bind to extracellular molecules was proposed at the beginning of the century by the pharmacologist and immunologist Paul Ehrlich and the physiologist J. N. Langley. Since then, receptors have been found to play an important role in numerous physiological and pathological processes. Over the years many attempts have been made to physically isolate and chemically characterize receptors, but because of the receptors' extremely low concentration and membrane localization, these efforts have met with limited success. Yet, despite the failure to characterize receptor substances, the concept of the presence of such molecules has had considerable heuristic value. Using pharmacological, physiological, and immunologic approaches, researchers have identified several specific receptors, e.g., α- and β-adrenergic, nicotinic and muscarinic cholinergic, and histaminergic. With the characterization of various types of receptors on cell membranes, many drugs were developed that proved to be experimentally and therapeutically useful.

It was only in the early 1970s that methods for the specific measurement, chemical characterization, and physical isolation of cell membrane receptors were developed. These advances were made possible by the availability of ligands with high specific radioactivity that retained their biological activity and of experimental procedures that differentiated between specific and nonspecific binding of ligands. Another reason for the rapid advances in receptor research was the recognition that experimental data had to fulfill certain criteria, including the following: (1) structural and steric binding properties of agonists and antagonists should be consistent with their biological activity; (2) ligand binding to the receptor should show high affinity and saturability at concentrations that elicit a biological response; and (3) the specific binding should be greatest in tissues responsive to selective agonists.

Once suitable radioactive ligands were available, and rigorous criteria for the characterization of interaction of ligands with their receptors were established, many previously unrecognized receptors were found. Among the more significant were opiate, neuropeptide, and benzodiazepine receptors. Many of these discoveries were especially important to neurochemistry and opened a new dimension in this field.

This volume presents examples of the richness and variety of receptor research that is especially relevant to neurochemistry. In spite of the many advances concerning receptors, what we know is just the tip of the iceberg. We are just beginning to understand how receptors transduce their specific information through membranes. Receptors are in a dynamic state, continuously changing the cell's responsiveness to its environment. There is much to be learned about how these changes come about. With the development of powerful new technologies and instrumentation, the next decade in receptor research promises to be even more exciting than the past one.

Julius Axelrod

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