Book Review

THE UPTAKE AND STORAGE OF NORADRENALINE IN SYMPATHETIC NERVES. By Leslie L. Iversen. Pp. xiv + 253 (including Index). Cambridge University Press, London, 1967. U.K. 57s. 6d.; U.S.A. $11.00.

In the last decade, the application of new technical methods has uncovered much information about autonomic pharmacology. The use of electron microscopy and the widespread exploitation of histochemical methods, especially the catecholamine fluorescence method, has given a much clearer picture of the structures at nerve-effector cell junctions. Examination of sub-cellular components, separated by sucrose density-gradient centrifugation, has provided information on the biochemical properties of some of the structures revealed by the microscope. The more recent availability of radioactive-labelled drugs of high specific activity has enabled the techniques of autoradiography and scintillation counting to be profitably exploited in studying drug localization and distribution. The almost frenzied application of these new methods to the investigation of adrenergic mechanisms is responsible for the exciting new developments in the understanding of what happens during neuro-effector cell transmission in the sympathetic nervous system.

While enzymatic destruction of acetylcholine is still thought to be an important part of the process for terminating the action of the mediator of cholinergic nerves, in recent years it has been realized that enzymatic destruction of the mediator is not the major process terminating action at adrenergic nerve terminals. It is currently believed that removal of the noradrenaline from the synaptic biophase is effected by an active process, residing in the membrane of the nerve terminal, by which means the noradrenaline is taken up again into the intraneuronal storage pools.

New information has been accumulating rapidly and the timely appearance of this concise book, which summarizes existing methods and results and assesses critically the conclusions which may be drawn from them, is particularly welcome. Dr Leslie Iversen was invited by the Cambridge University Press to expand his PhD thesis into a monograph. The title belies the scope of the book; the author deals with more than just the uptake and storage of noradrenaline and in fact covers a good deal of what is currently known of adrenergic mechanisms (including the adrenal medulla). This is a bonus to the general reader and ensures that the new information can be appreciated in the context of less recent discoveries.

The book starts with brief descriptions of the methods which have been used to obtain the results referred to later. The methods for extraction and isolation of catecholamines from tissue and fluids, chromatographic separation, fluorimetric assay, histochemical techniques and the use of radioactive-labelled materials are all dealt with in turn and there is a useful list of references at the end of this chapter. In the next three chapters, Dr Iversen describes the discovery of the sympathetic neurotransmitter and the distribution, storage and metabolism of the catecholamines (he emphasizes the non-specificity of the enzyme normally known as dopa decarboxylase by indicating his preference for the term aromatic L-amino acid decarboxylase). There follows a chapter on the release of noradrenaline from adrenergic nerves which leads logically to Dr Iversen's main concern, and the aspect of the problems of adrenergic mechanisms to which his own researches have made fundamental contributions, namely the fate of the transmitter after release. Chapters 7 and 8 consider firstly the uptake and storage of catecholamines and then the mechanisms of action of drugs which interfere with or

modify these processes. Great care is taken to distinguish between storage and uptake and it is pointed out that the two terms are often, wrongly, used synonymously. In these chapters the author is on familiar ground and is largely describing his own discoveries and those of his collaborators, both here and in the United States.

It is apparent that, with few exceptions, most of the evidence has been obtained from isolated hearts of rats or rabbits (no doubt because of the ease with which these organs can be isolated and perfused through their blood vessels). It would now seem timely to discover whether the hypothesis is of general application by enquiring whether the findings apply to a wider range of sympathetically innervated organs.

The morphological and functional subdivisions of the distribution of noradrenaline within adrenergic nerves is one of the more speculative aspects of adrenergic mechanisms: here the interpretations are based much more on inference than on direct measurement and an honest re-appraisal of the situation, including the author's own scheme for noradrenaline storage pools, is presented in Chapter 9. The last chapter is the least satisfactory, being devoted to catecholamines in the central nervous system, a topic which could more profitably be presented in a monograph of its own, than in the space of twenty pages.

Dr Iversen's book is easy to read and is of a convenient size. It should now be in the possession of all research workers in the field, even those who followed the developments by reading the original papers. Others to whom the book can be recommended are students reading for degrees in pharmacology and physiology; they are fortunate to have such a concise monograph available to them.

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