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SECTION III

Measurement and Detection of Catecholamines and Related Compounds

A. INTRODUCTORY REMARKS

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This morning's session will be concerned with methodical advances in three directions: 1) assay of catecholamines; 2) estimation of metabolites; and 3) fluorescence microscopy.

1) We will be hearing details about instantaneous bioassay in blood which is superfused over isolated organs and then returned to the donor animal. The technique is particularly useful for following the dynamics of adrenal medullary activity. Bioassay of individual catecholamines, previously separated chromatographically, has been somewhat improved since 1958 by substitution of the pithed rat for the rat treated with a ganglion blocker in assays measuring pressor activity. The discovery of good β-blockers with little or no sympathomimetic activity such as pronethalol has increased the pithed rat's sensitivity to adrenaline: a measurable response is obtained by injecting 1 ng of adrenaline and sometimes less (9).

2) A useful advance in the chemical estimation of catecholamines by fluorimetry is based on the discovery by Welsh (10) that these compounds can be easily acetylated. Stable derivatives are formed from the amines as well as from their metabolites; the acetates can be separated chromatographically and estimated individually (4, 5). This method has proved particularly useful for the estimation of very small amounts of dopamine (8). The whole field of technical developments will be reviewed by Drs. Häggendal, Weil-Malherbe, and Sandler.

3) The last section of this morning's session will deal with the great strides made by fluorescence microscopy in recent years. It is particularly sad that Professor Hillarp, who has played such a role in the recent advances, is no longer with us. His stimulating influence will, however, be felt in today's reports on the subject. In the first catecholamine symposium there is, I believe, only one reference to this technique (2). This is a reference to Eränkö's discovery of discreet regions in the adrenal medulla of many species which were characterized by an intense fluorescence in ultraviolet light provided the tissue had been fixed in formaldehyde. These regions contained only noradrenaline, and no fluorescence was found in those parts of the medulla in which the final product was adrenaline. We now know that conditions can be found when tissue elements containing adrenaline can also be made to fluoresce. By the effort of many workers the technique has been improved to a degree that hardly any tissue is found from which this fluorescence is completely absent. Its localization in nerve terminals

of the brain was demonstrated (1) in 1962, and the first pictures of fluorescent cells in a superior cervical ganglion appeared in 1963 (3, 6). One of the most unorthodox and intriguing findings so far is that of adrenergic endings impinging on cells giving rise to adrenergic axons; these occur in all sympathetic ganglia, and are particularly frequent in the prevertebral ganglia (7). It is obvious that the fluorescence technique has brought unexpected findings with respect to central adrenergic neurones and that we will have to revise our views on the peripheral sympathetic system as well.

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