It is hoped that these results will be found reproducible with strains of the virus of poliomyelitis other than the ones that have been tested.

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Facts and Theories About Sympathins

Marrazzi and Marrazzi (*Science*, November 28, 1947, pp. 520–521) have introduced in the discussion on sympathins a regrettable confusion between facts and theory.

The *fact* is that Cannon and Rosenblueth (*Amer. J. Physiol.*, 1933, **104**, 557) observed more excitatory than inhibitory effects as compared with adrenaline during humoral transmission of certain sympathetic nerve stimulations. They never *demonstrated* that there was a purely excitatory and a purely inhibitory sympathin; and they have never been able to obtain more inhibitory than excitatory effects!

The elaborate theory built around this fact was not convincing, although it was accepted by a majority of Anglo-Saxon physiologists. We pointed out as early as 1933 that it was possible to give different interpretations of the phenomenon observed by Cannon and Rosenblueth, without postulating a combination of adrenaline with a hypothetical compound E or I in the cell. We suggested the following possibility: sympathin I = adrenaline; sympathin E = nor-adrenaline.

It is now evident from the work of von Euler (*Science*, April 23, p. 422), and that of many others mentioned by him, that one finds in suitable extracts of mammalian nerves and tissues a powerful amine which mimics more closely the actions of nor-adrenaline than those of adrenaline. We have confirmed von Euler's observations (*Arch, int. Physiol.*, 1947, 55, 73) with the important addition, however, that in certain tissues (human coronary arteries and nerves, for instance) the substance extracted has the properties of adrenaline and not of nor-adrenaline (or arterenol or dimethylated adrenaline) (Fig. 1). It must not be forgotten that the power of the adrenal medulla of the vertebrates to synthetize *l*-adrenaline is not unique. The parotid gland of tropical toads is rich in *l*-adrenaline (and recent observations from this laboratory show that it may contain other phenolic amines); certain cells in the abdominal ganglion of annelids synthetize an amine which has not been isolated in chemically pure state, but possesses in the utmost detail the properties of adrenaline (J. F. Gaskell. *J. gen. Physiol.*, 1919, 2, 73; Z. M. Bacq. *Biol. Rev.*, 1947, 22, 73). Von Euler has confirmed the conclusion of Leowi (*Arch. ges. Physiol.*, 1936, **237**, 504) that the sympathomimetic substance extracted from the frog's heart is adrenaline, the methylated amine.

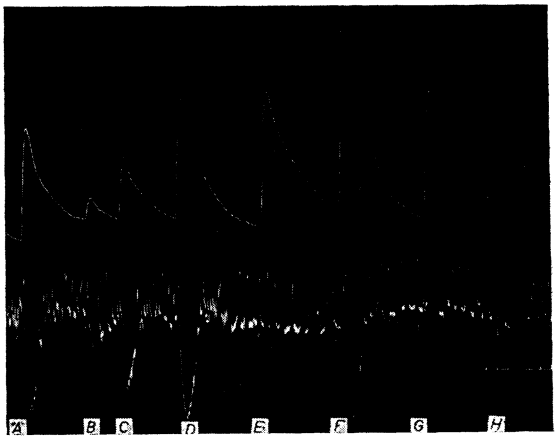

FIG. 1. Nonpregnant cat, Dial, curare. *Above*: nictitating membrane denervated 12 days previously. *Below*: uterus. Time in minutes. A, purified extract of 0.23 gm of human coronary nerves and arteries; B, *l*-adrenaline, 0.25 μg; C, *l*-adrenaline, 0.5 μg; D, *l*-adrenaline, 1 μg; E, *dl*-nor-adrenaline, 1 μg; F, G, H, purified extract of 0.75, 0.19, and 0.075 gm of horse spleen, respectively. This shows that the substance in the spleen acts very much like nor-adrenaline, but that the purified extract from human coronaries acts like adrenaline.

It seems to us that the best way to give a reasonable interpretation of these facts is to accept the idea that many tissues synthetize aminated derivatives of catechol, that the synthesis of adrenaline goes through arterenol—in other words, that the methylation of the nitrogen is the last step in this synthesis, according to Blaschko (*J. Physiol.*, 1942, **101**, 337), and that this methylation does not occur in certain tissues.

The facts (not the theory) point to the existence of two highly active sympathomimetic substances: nor-adrenaline and adrenaline. Thus, von Euler's suggestion that our nomenclature be changed from sympathin E and sympathin I to sympathin N and sympathin A is logical; it would avoid further confusion until our knowledge of the relation between adrenaline and nor-adrenaline has sufficiently improved to remove all doubt.

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