THE EFFECTS OF CENTRALLY-ADMINISTERED ADRENALINE ON RAT BLOOD PRESSURE - MODIFICATION BY SELECTIVE β-ADRENORECEPTOR BLOCKADE

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Drugs like propranolol, whose major pharmacological property is a competitive blockade of β-adrenoreceptors, play an important part in the management of essential hypertension, although the precise mechanism, or mechanisms by which they lower blood pressure remains obscure. In the course of investigating the possibility of a centrally-mediated component in the antihypertensive process, we have recently shown (Clough et al 1981) that when introduced into the lateral cerebral ventricles (i.c.v.) of the anaesthetised rat, doses of adrenaline that are ineffective alone produce a marked pressor response in the presence of central β-receptor blockade. These results suggest that adrenaline exerts within the brain both an excitatory and an inhibitory effect on blood pressure, and that the inhibitory effect is mediated via β-receptors; the experiments reported here explore further the central interaction between β-receptor blocking drugs and adrenaline.

Male Wistar rats (Alderley Park strain) weighing 220-270g were anaesthetised with thiobutobarbitone sodium ('Inactin', BYK Ltd.) 150mg kg^{-1} i.p. Blood pressure was recorded from a carotid artery and heart rate was derived from the blood pressure pulse. All drugs were injected through a 30 gauge stainless steel cannula inserted by means of a David Kopf stereotoxic instrument into the left lateral cerebral ventricle (co-ordinates A3.29, L4.4, H-0.4mm, Konig & Klippel); they were dissolved in artificial C.S.F. and injected at a rate of 2μl min^{-1} in volumes not exceeding 10μl. Figure 1 illustrates the effect on mean arterial pressure (MAP) of 20μg adrenaline i.c.v., alone and 10 minutes after the i.c.v. injection of propranolol, atenolol and ICI 118551, 30μg. Propranolol is considered to be equipotent on β_1 and β_2 receptors, while atenolol has some selectivity for β_1 receptors (Ablad et al 1973). On the other hand ICI 118551 has a selective action on β_2 receptors (O'Donnell & Wanstall 1980). These results therefore suggest that the central inhibitory effect of adrenaline on cardiovascular responses may be mediated by adrenoreceptors of the β_2 type.

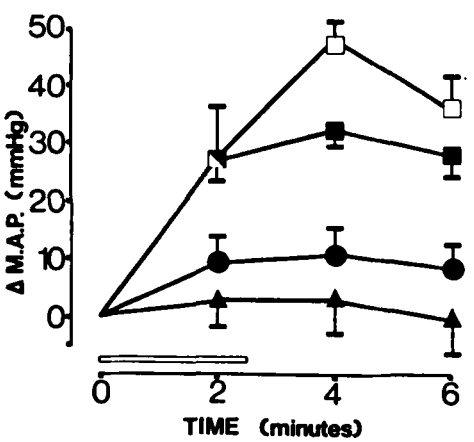

Figure 1.

Effect of 20μg i.c.v. adrenaline on blood pressure. Pretreatment with artificial CSF - ▲ (n=7); 30μg ICI 118551 HCl - □ (n=6); 30μg propranolol HCl - ■ (n=7); 30μg atenolol - ● (n=6) Means ± SEM. Horizontal bar = adrenaline injection.

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Ablad, B. et al (1973) Life Sci 12: 107-119.
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O'Donnell, S.R. & Wanstall, J.C. (1980) Life Sci 27: 671-677.

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