EFFECTS OF CENTRALLY INJECTED β-BLOCKERS ON THE PRESSOR RESPONSES TO ELECTRICAL STIMULATION IN THE POSTERIOR HYPOTHALAMUS AND MEDIAL RAPHE NUCLEUS OF THE ANAESTHETISED RAT

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Although β-blockers have been used for many years to control high blood pressure, their mechanism of action remains unknown. One possibility is that at least part of their antihypertensive activity is mediated via the central nervous system. For example, Lewis & Haeusler (1975), using conscious rabbits, observed a decrease in preganglionic sympathetic nerve activity and blood pressure following intravenous propranolol. However, in the rat, experiments in which β-blockers have been injected into the cerebral ventricles (i.c.v.) have yielded conflicting results with respect to blood pressure modulation. It has long been recognised that the hypothalamus is intimately involved in the autonomic control of the circulation and that electrical stimulation in the posterior hypothalamus (PH) can evoke elevations of blood pressure (Folkow & Rubinstein 1966). More recently, Smits et al (1978), using anaesthetised rats, obtained pressor responses following stimulation in the medial raphe nucleus (MRN). In the present investigation we have looked at the effects of i.c.v. β-blockers on the pressor responses produced by electrical stimulation in these two brain areas.

Male Wistar rats (Alderley Park strain) weighing 220-270g were prepared as described previously (Clough et al 1981). Monopolar electrodes fashioned from electrolytically sharpened and insulated stainless steel wire, had exposed tip lengths of 20-40μm. Negative-going square-wave pulses, delivered via a constant current device, were applied to the stimulating electrode, the indifferent electrode being secured to the subcutaneous tissue exposed by the scalp incision. Stimulus parameters were-pulse width 2msec; current 200μA; train duration 5 seconds; frequency 20-80Hz. Coordinates of the PH and MRN were A3.5, L1.0, H-2.5mm and A0.35, L0, H-2.5mm, respectively (König & Klippel). Stimulation at both sites induced frequency-dependent increases in systolic blood pressure - Table 1.

Table 1. Pressor responses to electrical stimulation (mean ± SEM).

	SYSTOLIC PRESSOR RESPONSE (mmHg)				
	Frequency (Hz)				
AREA	20	40	60	80	
Posterior hypothalamus	3 ± 1	34 ± 4	66 ± 5	—	(n = 5)
Medial raphe nucleus	—	16 ± 2	42 ± 2	57 ± 4	(n = 15)

Propranolol HCl, 100μg i.c.v., failed to affect the pressor responses to PH stimulation, while 50μg failed to modify the responses to MRN stimulation. Atenolol, 50μg i.c.v., did not alter the responses to MRN stimulation except at the highest frequency (80Hz), where the response was significantly increased (paired t-test; $P<0.05$). These results suggest that any β-receptor capable of modifying pressor responses evoked in this way are not accessible to drugs injected i.c.v.

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