The effects of vasodilator drugs on vascular responses to sympathetic nerve stimulation

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It was found previously that adrenergic neuron blocking agents demonstrate different inhibitory effects on transmission of vasoconstrictor impulses at low and high stimulation frequencies (Green & Robson, 1964; Kisin, 1976). In the present study the effects of some direct and indirect (ganglion blocking drugs, alpha adrenoceptor blocking drugs) vasodilators on the basal tone and vascular responses to lumbar sympathetic nerve stimulation (from 0.5 Hz to 20 Hz) were studied in the perfused (constant-discharge pump) hind-limb of anaesthetized cats.

The effects of these drugs in comparison with effects of adrenergic neuron blocking agents are shown in Table 1. The gangion blocking agents preferentially inhibited the responses to high-frequency stimulation, the drugs acting directly on the vascular smooth muscle those to low-frequency stimulation, while the alpha adrenoceptor blocking agents affected them to the same degree at all frequencies. There was no parallelism between the respective changes in the basal vascular tone and the vasoconstrictor responses to the stimulation under the influence of direct vasodilators. It may be that different mechanisms are responsible for these two effects.

Table 1 The inhibitory effects of vasodilators on vasoconstrictor responses to sympathetic nerve stimulation

Drugs and doses		*n*	*Suppression of responses to stimulation, changes in %*		*Predominance*
			0.5 imp/s	*20 imp/s*	
Ganglion blocking agents	Hexamethonium (2.5 mg/kg, i.v.)	10	20*	70***	P.S.H.
	Pempidine (1 mg/kg, i.v.)	9	34**	64***	P.S.H.
Adrenergic neuron† blocking agents	Bretylium (10 mg/kg, i.p.) +	9	5 NS	65***	P.S.H.
	Reserpine (0.25 mg/kg, i.p.) +	8	67***	0	P.S.L.
	Methyldopa (300 mg/kg, i.p.) + +	9	70***	64***	E.S.
Alpha adrenoceptor blocking agents	Phentolamine (1 mg/kg, i.v.)	7	50**	50***	E.S.
	Dihydroergotoxine (0.025 mg/kg, i.v.)	7	54**	51***	E.S.
Vasodilators acting directly on the vascular smooth muscle	Papaverine (0.4 mg/min, i.a.)	7	74***	30**	P.S.L.
	Aminophylline (2 mg/min, i.a.)	7	72***	38**	P.S.L.
	Benzadole (0.2 mg/min, i.a.)	7	60**	12 NS	P.S.L.
	Glyceryl trinitrate (0.1 mg/min, i.a.)	10	33*	2 NS	P.S.L.

P.S.L. —predominant suppression of responses to low-frequency stimulation.
E.S. —equal degree of suppression.
P.S.H. —predominant suppression of responses to high-frequency stimulation.
† —data from Kisin, 1976.
n —number of experiments. *–$P<0.05$; **–$P<0.01$; ***–$P<0.001$.
\+ —24 h in advance. + + 5 h in advance.

References

GREEN, A.F. & ROBSON, R.D. (1964). Comparison of the effects of bretylium, guanethidine and bethanidine on smooth muscle responses to different rates of sympathetic nerve stimulation. *Br. J. Pharmac. Chemother.*, **22**, 349–355.

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