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Antagonism of some spasmogens of the rat seminal vesicle

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The rat seminal vesicle was studied to see if it could be used to differentiate mechanisms of action of smooth muscle relaxation and to determine the type of adrenoceptors present. Concentration response curves were obtained with three agonists, noradrenaline bitartrate (NA), acetylcholine bromide (ACh) and potassium chloride (KCl). ACh and KCl spasm was not attributable to α-adrenoceptor activation as shown by the effects of phentolamine (20–200 nM) and cocaine (0·1–1,000 μM). Using phentolamine (20–200 nM), propranolol (0·1 mM) and practolol (0·01 mM) evidence was obtained that the adrenoceptors appeared to be entirely α. Since the rat seminal vesicle responds by contraction to these three agonists this property was used to compare the differential potency of four smooth muscle relaxants (see Table 1). These were papaverine (PAP), procaine hydrochloride (PR), theophylline (TH—as aminophylline) and isoprenaline sulphate (ISO). The failure of propranolol and practolol to inhibit the relaxant action of ISO (against KCl) strongly suggests that this effect was not due to activation of β-adrenoceptors.

TABLE 1. *Differential potency of smooth muscle relaxants*

	NA	ACh	KCl	IC_{50} mM (KCl)
Pap	0·5	1·0	1·0	0·03
Pr	2·4	25·8	1·0	1·7
Th	7·4	27·7	1·0	25·2
Iso	23·9	0·7	1·0	20·3
Na_2SO_4	0·3	1·2	1·0	34·3
EC_{50}	100 μM	100 μM	150 mM	

IC_{50}=Concentration producing 50% of maximum inhibition.
EC_{50}=Concentration producing 50% of maximum effect.
Each value is the mean of six experiments.

The mechanism of ISO relaxation was investigated by comparing its action with sodium sulphate (Na_2SO_4) to test the hypothesis that ISO produced relaxation because of its sulphate anion. The differential potency of Na_2SO_4 did not support this hypothesis for inhibition of NA. By comparing the inhibition of KCl (150 mM) and potassium sulphate (K_2SO_4) (150 mM) spasm by Na_2SO_4 it was obvious that Na_2SO_4 relaxation was independent of sulphate concentration over a five-fold range. IC_{50} for Na_2SO_4 against KCl was 34 mM and for K_2SO_4 was 40 mM. The inhibitory action of ISO cannot be explained by the sulphate anion. Changes in pH and osmolarity comparable to those produced by ISO did not inhibit seminal vesicle spasm.

It is concluded that the rat seminal vesicle contains adrenoceptors of the α type alone and the inhibitory action of isoprenaline remains unexplained.

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