Characterization of the β-adrenoceptors in guinea-pig lung mast cells

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Attempts to characterize the β-adrenoceptor mediating the inhibition of antigen-induced histamine release from lung mast cells have not yielded unambiguous results. Some reports indicate this receptor to differ from both cardiac and tracheal vascular receptors (Assem & Schild, 1971; Malta & Raper, 1975; Sörenby, 1977). Recently, Barrett-Bee & Lees (1978) suggested this receptor to have a hybrid nature similar to that proposed previously for adipocyte β-adrenoceptors (Harms, Zaagsma & van der Wal, 1974). In a study of guinea-pig central and peripheral airways we recently reported on the presence of both β_1 and β_2-adrenoceptors in the trachea whereas in the lung strip preparation a homogenous β_2-adrenoceptor population was detected (Zaagsma *et al.*, 1979).

This study was initiated to characterize the β-adrenoceptors involved in the anti-anaphylactic response by β-adrenoceptor agonists using chopped lung tissue of ovalbumin-sensitized guinea pigs. The experimental procedure including the histamine assay was essentially that of Barrett-Bee & Lees (1978). (−)-Noradrenaline (NA) was chosen as the β_1-selective agonist and (−)-adrenaline (A) and (−)-isoprenaline (ISO) as the β_2-selective agonists; the β_1-selective antagonist was practolol and H35/25, the β_2-selective antagonist. Agonists were given 2 min, antagonists 4 min before antigen challenge.

All agonists caused a dose-dependent inhibition of the ovalbumin-induced histamine release which was competitively antagonized both by practolol and H35/25. pD_2 and pA_2 values are summarized in Table 1; for comparison the corresponding data on the relaxation of lung strip preparations induced by β-adrenoceptor stimulation are also included.

No preferential blockade by practolol of the NA-response and by H35/25 of the A-response was observed, as was the case with the lung strip; this demonstrates the receptor population to be homogenous. Both the pA_2 values of the two antagonists and the pD_2 values of NA and A are congruent with a β_2-character of the mast cell receptors. Considerably higher pD_2 values of A and ISO were noticed for the anti-anaphylactic effect as compared to the lung strip relaxation response, however.

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Table 1 pD_2 and pA_2 values of the inhibition of antigen-induced histamine release from chopped lung tissue of ovalbumin sensitized guinea pigs. Between brackets: corresponding parameters of the relaxation of the isolated, phenoxybenzamine (10 μM) pretreated, guinea-pig lung strip preparation

			H35/25		*Practolol*	
	$pD_2 \pm$ s.e. mean	n	$pA_2 \pm$ s.e. mean	n	$pA_2 \pm$ s.e. mean	n
(−)-noradrenaline	5.93 ± 0.09	13	6.20 ± 0.11	14	4.86 ± 0.11	7
	(5.40 ± 0.05	24)	(6.39 ± 0.06	24)	(5.00 ± 0.05	37)
(−)-adrenaline	8.22 ± 0.24	6	6.53 ± 0.30	5	4.82 ± 0.17	8
	(6.93 ± 0.05	27)	(6.36 ± 0.03	30)	(4.84 ± 0.03	42)
(−)-isoprenaline	8.92 ± 0.09	9	6.50 ± 0.12	6	4.70 ± 0.10	9
	(7.75 ± 0.05	30)	(6.39 ± 0.04	29)	(4.91 ± 0.06	22)

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