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# Tracheal responsiveness to both isoprenaline and beta $_2$-adrenoreceptor blockade by propranolol in cigarette smoke exposed and sensitized guinea pigs

Boskabady, M.H.[ab] , Kiani, S.[a], Aslani, M.R.[a]

[a] Department of Physiology, Ghaem Medical Centre, Mashhad University of Medical Sciences, Mashhad, Iran

[b] Department of Physiology, Ghaem Medical Centre, Mashhad, 91735, Iran

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## Abstract

Objective: Airway hyperresponsiveness is the main feature of asthma and also exists in cigarette smokers. In previous studies we have shown increased airway responsiveness to isoprenaline in asthmatic patients and smokers. In this study, tracheal responsiveness to isoprenaline and β-adrenergic receptor blockade was investigated in animals exposed to cigarette smoke (AECS) with or without sensitization by ovalbumin (OA). Methodology: Guinea pigs were exposed to cigarette smoke over a 3-month period with or without sensitization by injection and inhalation of OA. Tracheal responses in AECS, AECS + sensitized and control animals (n = 7 for each group) to isoprenaline in the absence and presence of 20 nmol/L propranolol were measured and EC $_{50}$ was established. The propranolol blockade (concentration ratio minus one (CR-1)) was calculated (post-propranolol EC $_{50}$/EC $_{50}$) - 1. Results: The tracheal response of AECS and AECS + sensitized guinea pigs to isoprenaline was significantly higher than that of control animals (EC $_{50}$: 4.24 ± 0.54, 3.66 ± 0.53 and 7.71 ± 0.68.79 μmol for AECS, AECS + sensitized and control animals, respectively) ($P < 0.001$). There was no significant difference in EC $_{50}$ between AECS and AECS + sensitized. CR-1 was also significantly higher in the trachea of AECS and AECS + sensitized compared with controls (13.39 ± 2.22 and 15.35 ± 2.95 vs. 3.10 ± 0.6, $P < 0.05$ in both cases). There was no significant difference in CR-1 between AECS and AECS + sensitized. There was a significant correlation between the tracheal response to isoprenaline (EC $_{50}$) and CR-1 ($r = -0.731$, $P < 0.001$). There was no significant difference in tracheal maximum response to isoprenaline between the three groups of animals. Conclusions: The results of this study indicate an increased tracheal response to a β $_2$-adrenergic stimulating drug and enhanced β $_2$- adrenergic blockade by propranolol in both AECS and AECS + sensitized. These results suggest similar increase in airway responsiveness to β $_2$-adrenergic agonists and β $_2$-receptor blockade in AECS and AECS + sensitized guinea pigs. © 2006 The Authors.

## Author keywords

Beta $_2$-adrenoreceptor blockade; COPD; Guinea pig; Tracheal responsiveness

## Indexed Keywords

EMTREE drug terms: isoprenaline; ovalbumin; propranolol

EMTREE medical terms: adrenergic receptor blocking; analytic method; animal experiment; animal model; article; cigarette smoking; comparative study; concentration (parameters); controlled study; correlation coefficient; female; guinea pig; male; nonhuman; priority journal; sensitization; statistical significance; trachea

MeSH: Adrenergic beta-Agonists; Animals; Female; Guinea Pigs; Immunization; Isoproterenol; Male; Ovalbumin; Propranolol; Tobacco Smoke Pollution; Trachea
Medline is the source for the MeSH terms of this document.

Chemicals and CAS Registry Numbers: isoprenaline, 299-95-6, 51-30-9, 6700-39-6, 7683-59-2; ovalbumin, 77466-29-6; propranolol, 13013-17-7, 318-98-9, 3506-09-0, 4199-09-1, 525-66-6;Adrenergic beta-Agonists; Isoproterenol, 7683-59-2; Ovalbumin, 9006-59-1; Propranolol, 525-66-6; Tobacco Smoke Pollution

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