

400 µg fenoterol; (C) 200 µg oxitropium bromide; and (D) a combination of (B) and (C). The exercise protocol consisted in a 10 W·min⁻¹ progressively increasing load on a bicycle until severe dyspnoea and/or exhaustion. Minute ventilation (\dot{V}_E) and derivatives (tidal volume (V_T), mean inspiratory flow (\dot{V}_T/T_i), inspiratory time as a fraction of total breath duration (V_i/V_{tot}), breathing frequency (B_f)), gas exchange (oxygen uptake (\dot{V}_{O_2}) and carbon dioxide production (\dot{V}_{CO_2}) and dyspnoea with a visual analogue scale were monitored on a breath-by-breath computer program.

This population showed mild increase in FEV₁ (in %

of control value) for B +15% ($p<0.01$), C +23% ($p<0.01$), D +23% ($p<0.01$). In spite of these minimal changes in FEV₁, no significant effect could be detected in the maximal load achieved in ventilatory adaptation during exercise and in the dyspnoeic profile when characterized by a dyspnoeic threshold (DT) and an increasing linear ramp after DT (analysis of variance).

This study suggests that in severe stable COPD acute inhalation of β -mimetics and atropinics, alone or in combination, slightly improves lung function tests without improving exercise performance and exercise-induced dyspnoea.

Bronchial hyperreactivity in healthy preretired coke oven workers

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Coke oven workers are exposed to dust and irritant gases, and are thus at risk of developing chronic bronchitis. Noxious gases, such as sulphur dioxide, nitrogen dioxide and ozone, may cause bronchial hyperreactivity (BHR) in man. BHR has been poorly investigated in iron-steel workers. We therefore compared BHR to inhaled histamine in asymptomatic, recently preretired coke oven (OW, $n=20$) and blast furnace workers (FW, $n=29$) from an iron-steel plant in the Liège area. Both groups were matched by age (mean = 57 yrs), smoking habits (80% smokers or ex-smokers) and number of years spent at work (mean = 26 yrs). All of the subjects had a clinical examination and chest X-ray within normal limits. Bronchial reactivity was studied by histamine aerosol challenge (Cockcroft *et al.*, 1977). Doubling concentrations of histamine acid phosphate (0.03–16 mg·l⁻¹) were inhaled for 2 min, at 5 min intervals, until there was a fall in forced expired volume in one second (FEV₁) of 20%, or until the maximal concentration was inhaled. The provocative concentration of histamine required to produce a 20% fall in FEV₁ (PC₂₀ histamine) was calculated from the dose-response curve.

Histamine challenge was positive in 13 OW (65%) and in only 5 FW (17%). Mean histamine PC₂₀ was

3.93±1.58 mg·ml⁻¹ in OW and 4.6±0.96 mg·ml⁻¹ in FW (table 1). With the exception of one subject, positive challenges were found only in smokers and ex-smokers. The data show an increased prevalence of bronchial hyperreactivity in healthy preretired coke oven workers by comparison with blast-furnace workers. This suggests that the combination of smoking and pollution from the coke-ovens may cause a long-lasting bronchial hyperresponsiveness in man.

Table 1. – Results of histamine challenge

	Coke oven workers	Blast furnace workers
n	20	29
Number positive	13 (65%)	5 (17%)*
Mean PC ₂₀ histamine mg·ml ⁻¹	9.93±1.58	4.6±0.96
Baseline FEV ₁ % pred	91±13	95±16
Smokers and ex-smokers	12/13	5/5

*: $p<0.01$ (Chi-squared test); FEV₁: forced expiratory volume in one second; PC₂₀: provocative concentration producing a 20% fall in FEV₁.

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Characteristics of the bronchial obstructive response induced by inhalation of endotoxins

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Lipopolysaccharides (LPS), the major part of endotoxins from Gram-negative bacteria, are substances able to activate the humoral and cellular inflammatory systems present in the airways. In normal subjects a

significant forced expiratory volume in one second (FEV₁) decrease was demonstrable after inhalation of 200 µg LPS [1] but not after 20 µg [1, 2]. However, the latter induces a significant bronchial obstruction in both allergic and non-allergic asthmatics [2], suggesting that the degree of LPS-induced bronchial response could be associated to nonspecific bronchial responsiveness rather

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