# Effects of chronic administration of β-blocker on airway function in a rat model heart failure

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Lung function abnormalities, both at rest and during exercise, are frequently observed in patients with chronic heart failure, also in the absence of respiratory diseases (Borst MM et al., 1999). It has been documented that, in heart failure, chronic adrenergic stimulation down-regulates β-adrenergic receptors (βARs) (Matera MG et al., 2010). This study was designed to investigate whether a treatment with a β-blocker, metoprolol, could ameliorate the modified airway responsiveness in a rat model of heart failure (HF).

Male Wistar rats (225-250 g; n=30) were randomly assigned to three experimental groups: sham-operated rats (SHAM; n=10), rats with heart failure (HF; n=10) and rats treated for 10 weeks with metoprolol 100mg/Kg/die after myocardial infarction (HF+MET; n=10). Myocardial infarction was induced by surgical occlusion of the left anterior descendent coronary artery; heart failure was evaluated after 10 weeks and resulted in increase in plasma norepinephrine and epinephrine, in main arterial blood pressure and in lung wet weight indicating congestion.

In pulmonary tissues, $\beta_2$-receptor mRNA levels were significantly decreased in HF group but the treatment with metoprolol significantly enhanced these levels. Relaxation of tracheal strips in response to isoprenaline and salbutamol was significantly reduced in HF group; in tracheal rings of rats treated with metoprolol, the relaxant effects of salbutamol were significantly enhanced (SHAM Emax 12.01±0.72; HF Emax 5.84±2.14; HF+MET Emax 21.01±1.81).

In heart failure, the down-regulation of pulmonary $\beta_2$-receptors result in a significant attenuation of cAMP-mediated airway relaxation. These effect has been reversed by a treatment with metoprolol, suggesting a potential role of β-blockers in the treatment of patients suffering from heart failure and chronic obstructive airway diseases.

References

1. Borst MM et al. (1999). J Am Coll Cardiol 34:848-56.
2. Matera MG et al. (2010). Pulm Pharmacol Ther. 23:1-8.