

Poster presentation

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Effect of exercise training on endothelium-dependent relaxing response and cGMP concentration in pulmonary artery from rats submitted to lung ischemia/reperfusion

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Background

The aim of this work was to evaluate whether physical exercise influences the relaxing responses to acetylcholine in pulmonary artery from rats submitted to lung ischemia/reperfusion (IR).

Methods and results

Expression of endothelial and neuronal NOS (eNOS and nNOS), p47phox subunit of NAD(P)H oxidase, and Cu/Zn superoxide dismutase (SOD-1) in the pulmonary artery, together with measurement of cyclic GMP (cGMP) concentration have been performed to further elucidate the improvement of endothelium-dependent relaxing response by regular physical exercise after lung IR. Male Wistar rats were divided into three groups: sham operated-sedentary (SHAM/SD); ischemia/reperfusion sedentary (IR/SD) and ischemia/reperfusion trained (IR/TR). Run training was performed for 5 days/week, each session of 60 min, at a speed of 1.2 km/h and 0% grade during 8 weeks. Left pulmonary IR was performed by occluding the pulmonary artery, bronchus and pulmonary vein for 90 min and reperfusion for 120 min. After that, pulmonary arteries were isolated and the relaxing responses to acetylcholine, at the pEC₈₀ level, were obtained. Protein expression for eNOS, nNOS, SOD-1, p47phox subunit of NAD(P)H oxidase, and cGMP concentration were determined. The relaxing responses for acetylcholine in pulmo-

nary artery, at the pEC₈₀ level, were significantly increased in IR/TR (6.48 ± 0.04) group as compared to sedentary

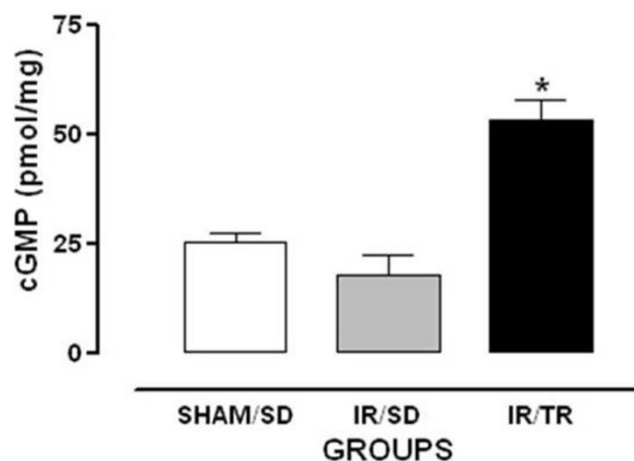


Figure 1
Cyclic GMP (pmol/mg) content in basal levels of pulmonary artery with intact endothelium. Data are means ± SEM of $n = 5-6$ animals per group. SHAM/SD: sham operated sedentary, IR/SD: ischemia/reperfusion sedentary, IR/TR: ischemia/reperfusion trained rats. * IR/TR vs SHAM/SD and IR/SD.

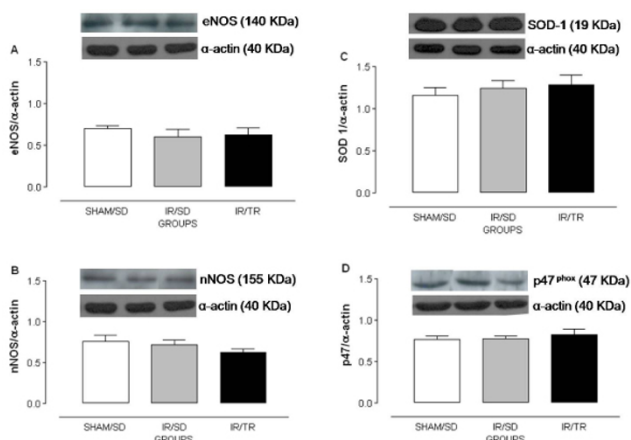


Figure 2
Representative Western Blot (top) and quantitative analysis (bottom; in arbitrary units-AU) for eNOS (panel A), nNOS (panel B), Cu/Zn SOD-I (panel C) and p47^{phox} (panel D) protein expression. α -actin was used as the internal control for eNOS, nNOS, Cu/Zn SOD-I and p47^{phox} protein expression. Data are means \pm SEM of $n = 5-6$ animals per group. SHAM/SD: sham operated sedentary, IR/SD: ischemia/reperfusion sedentary, IR/TR: ischemia/reperfusion trained. Molecular weight was inserted.

animals (SHAM/SD: 6.15 ± 0.03 and IR/SD: 6.12 ± 0.03 groups). This improvement of relaxing response was positively associated with a marked increase on cGMP concentration in IR/TR group as compared to sedentary groups, approximately 110 and 190% for SHAM/SD and IR/SD group, respectively (Figure 1). Either lung IR or exercise training failed to provoke any alterations in the protein expression for eNOS, nNOS, SOD-1 and p47^{phox} subunit of NAD(P)H oxidase (Figure 2).

Conclusion

Our study is the first to show that aerobic exercise training prior to lung IR promotes beneficial effect in the endothelium-dependent relaxing response that was partially associated with increase in cGMP concentration in rat pulmonary artery suggesting that physical exercise might be an important and additional approach to prevent the deleterious effect of lung IR.

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