Acute Exercise Attenuates Cardiac Dysfunction After Ischemia/Reperfusion in Isolated Rat Heart

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Purpose: Regular bouts of endurance exercise can protect the heart against ischemia/reperfusion (I/R) injury. However, the effects of acute exercise immediately before I/R events on myocardial dysfunction remain unclear. This study examined (1) whether a single session of acute exercise reduced cardiac dysfunction after I/R, and (2) whether a single exercise session up-regulated the intracellular signaling pathways involved in cardioprotection in the rat heart.

Methods: Male Sprague-Dawley rats were divided into a sedentary control (CON) group and an exercise (EX) group. Rats in the EX group underwent one 30-min session of treadmill running. Following exercise, hearts were excised and subjected to Langendorff perfusion. To evaluate cardiac function during I/R, hearts from both groups were exposed to global ischemia (20 min) followed by reperfusion (45 min). Using western blotting, phosphorylation of Akt, protein kinase C- ϵ (PKC ϵ) and glycogen synthase kinase 3- β (GSK-3 β) in the hearts were analyzed.

Results: Cardiac function was significantly higher in the EX group compared with the CON group for 5–20 min after reperfusion ($p < 0.05$). Phosphorylation of Akt, PKC ϵ and GSK-3 β in hearts of EX rats showed significant increases compared with CON rats ($p < 0.05$). Exercise did not change expression levels of heat shock protein 72 in the heart.

Conclusions: Acute exercise prior to I/R attenuated cardiac dysfunction in the isolated rat heart. The attenuation might be due to exercise-induced activation of cardioprotective intracellular signaling.

Key words: running exercise, Langendorff perfusion, cardiac function, intracellular signaling, heat shock protein

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