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The effect of voluntary exercise training on LPS-induced TNF-alpha after exhaustive exercise

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ABSTRACT

OBJECTIVES: Acute strenuous exercise attenuates inflammatory cytokine production. The attenuation after strenuous exercise is due to the effect of catecholamine. Voluntary exercise training has many beneficial effects, for example enhanced immune function at rest. However, little is known that the influence of voluntary exercise training on pro-inflammatory cytokine in response to pathogen. In this study, we investigated the effect of voluntary exercise training on production of tumor necrosis factor (TNF)-alpha in response to lipopolysaccharide (LPS) after strenuous exercise.

METHODS: Female F344 rats were divided into two groups, voluntary training and sedentary. The voluntary trained rats engaged in wheel running for 10 weeks, while the sedentary rats remained in their cages. After 10 weeks, all rats were treated an exhaustive exercise or a rest for 2 h. The exhaustive exercise was a treadmill running exercise until exhaustion. To measure catecholamine and TNF-alpha concentrations, and TNF-alpha mRNA expression in tissue in response to LPS, the rats received an injection of LPS and were killed 1 h after the LPS injection.

RESULTS: Running time until exhaustion in voluntary trained rats was significantly longer than that in sedentary rats ($p < 0.01$). Plasma adrenaline after exhaustive exercise was significantly higher than that in sedentary rats ($p < 0.01$). LPS-induced TNF-alpha concentration in plasma significantly differs by presence or absence of voluntary training and exhaustive exercise ($p < 0.01$, respectively). Although voluntary training significantly reduced the protein content of TNF-alpha in kidney at rest ($p < 0.05$), exhaustive exercise did not affect TNF-alpha in response to LPS in kidney. Also, neither the exhaustive exercise did affect in mRNA expression of TNF-alpha in kidney in trained rats.

CONCLUSION: These results suggest that voluntary exercise training may have little effect on the improvement of TNF-alpha response after exhaustive exercise, although voluntary training has a role in reducing LPS-induced TNF-alpha content at rest in kidney.