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Effect of exercise without diet on functional capacity of peritoneal macrophages and TNF- α levels in blood and in adipose tissue in the obese Zucker rat model of the metabolic syndrome

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Metabolic syndrome (MS) is a disorder associated with obesity and involves risk factor for type-II diabetes mellitus and a state of “low grade of inflammation”. The first molecular link between inflammation and obesity was TNF- α . This pro-inflammatory cytokine has been reported to be over-expressed and over-produced in the adipose tissues of rodent models of obesity and obese humans, and it has been involved in the insulin resistance. Exercise (with or without caloric restriction) is an accepted non-pharmacological therapeutic strategy in the management of MS, since it improves diabetic status, insulin sensitivity, and immune response. Based on the anti-inflammatory effects of exercise, it has been also proposed as a mean to control the low-grade inflammation in the obese Zucker rat model of MS.

The purpose of the present study has been to evaluate the effect of a program of habitual exercise (running, 5 days/week for 35 min at 35 cm/s for 14 weeks) on the circulating concentration of TNF- α and the phagocytic and microbicide capacities against *Candida albicans* of peritoneal macrophages from obese Zucker rats (fa/fa), using lean Zucker rats (Fa/fa) as reference values. Taking into account that previous studies in our laboratory did not find an increased release of TNF- α by peritoneal macrophages from obese Zucker rats, we also evaluated the adipose tissue levels of this cytokine.

Results showed that, although circulating TNF- α was only detected in a small number of animals, obese rats presented higher values of this cytokine in serum with respect to lean rats, but not differences were determined between sedentary and exercised obese rats. Adipose tissue from obese sedentary animals showed higher levels of TNF- α than those observed in lean rats, and these levels increased after the habitual program of exercise performed by the obese Zucker rats. Finally, peritoneal macrophages from obese sedentary rats showed lower capacity for killing *C. albicans* than macrophages from lean rats. This functional capacity of macrophages was higher in the exercised group of obese animals compared to sedentary ones.

In conclusion, peritoneal macrophages from animals with MS have a lower microbicide capacity which is improved with the program of habitual exercise. However, at the tested intensity, the habitual exercise could contribute to the insulin resistance by the exercise-induced increase of TNF- α in the adipose tissue of obese animals.

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