

Pro-inflammatory cytokines responses to acute exercise in athletes and sedentary controls: association with body composition and insulin sensitivity

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Introduction

Recent research in the biology of adipose tissue indicates that it is far more than a simply an energy storage organ, and it is in fact an active endocrine organ secreting numerous pro- and anti-inflammatory cytokines (Galic, 2010). Balance between pro- and anti-inflammatory cytokines is necessary for the physiological functioning of the immune system (Mündermann, 2016). A chronic systemic inflammation is one of the causes of insulin resistance in obesity.

Objectives

The aim of this study was to investigate the pro-inflammatory cytokines and visfatin response to a single bout acute exercise in athletes and non-athletes, as well as the possible relationship pro-inflammatory cytokines with body composition and insulin sensitivity.

Methods

Fifteen athletes with high percentage of body fat (the elite water polo players) and fifteen sedentary subjects participated in this study (age (years) 20±2; 20±1, respectively).

All subjects were exposed to:

1. Anthropometric measurements:

- Body mass (kg) - digital scale on a flat floor, participants wearing minimal clothing
- Body height (cm) - tape measure and a set square while the subjects were standing straight against a wall without shoes
- BMI was calculated using body weight (in kilograms) divided by body height squared (in meters)
- Body fat percentage was calculated using a digital body fat scale Tanita

2. exercise test on treadmill in order to examine acute changes of cytokines.

Blood samples were obtained at baseline levels, immediately after the exercise test and 30 minutes after recovery. Separated serum or plasma were used for cytokines (MIF, IL-17 and IFN γ) and hormone (visfatin, insulin) ELISA analysis and glucose measurement. Insulin resistance index (HOMA-IR) was calculated.

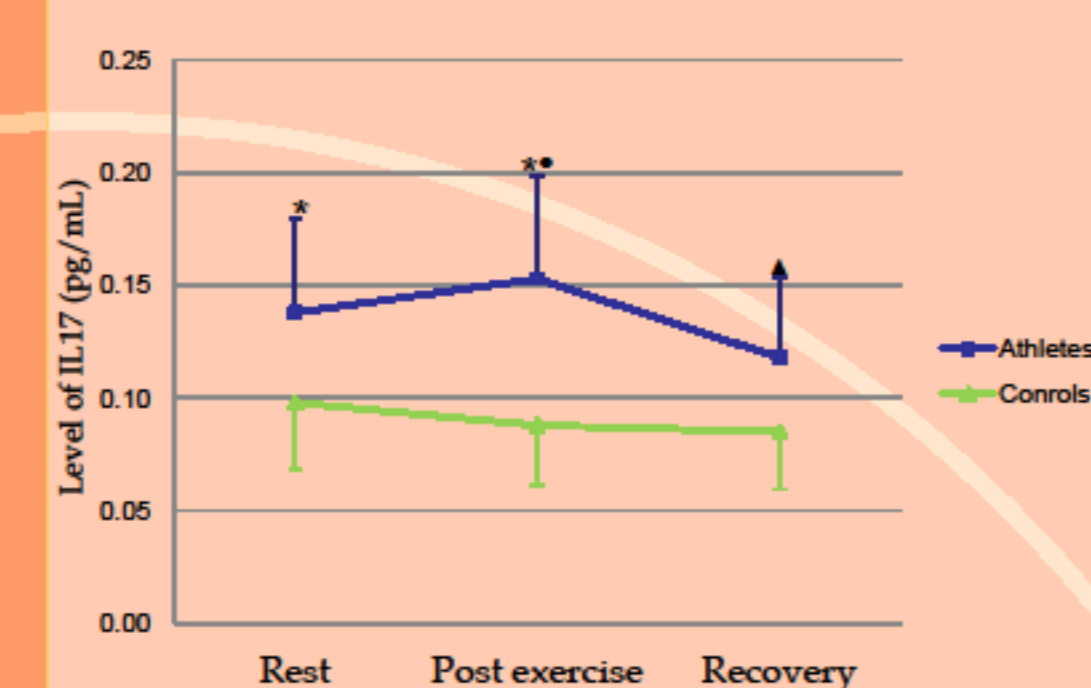
Results

Table 1. Anthropometric characteristic of the groups

	Athletes (n=15)	Control (n=15)	p
BM (kg)	99.8±11.5	90.2±10.4	0.028
BH (cm)	194.4±5.4	184.1±5.7	0.000
BMI (kg/m ²)	26.5±2.7	26.5±2.9	ns
BF% (%)	16.7±2.9	16.5±2.0	ns

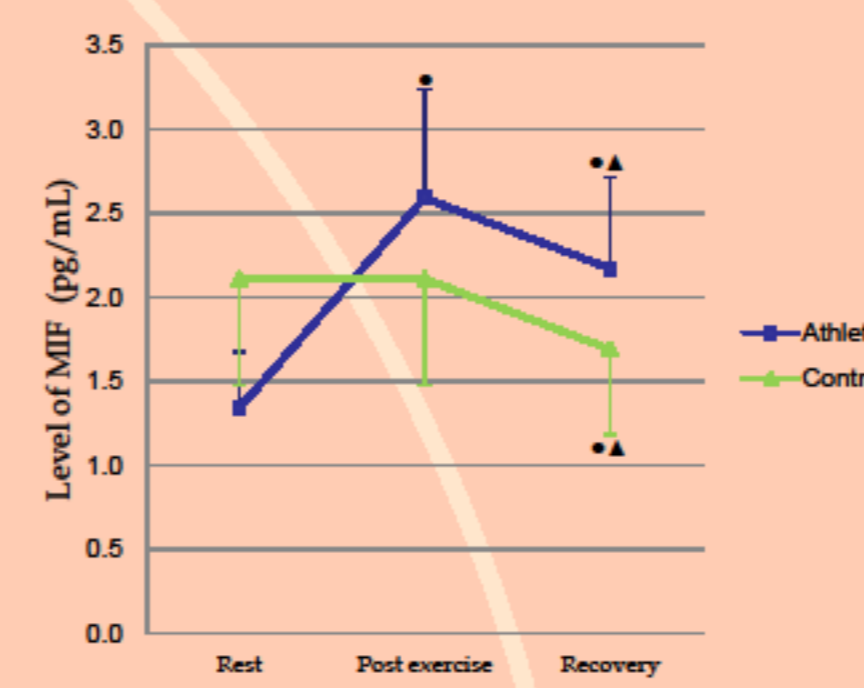
Data are means±SD; BM, body mass; BH, body high; BMI, body mass index; BF%, body fat percentage; ns, non significant, *, p<0.05

Figure1. IL17 response to acute exercise



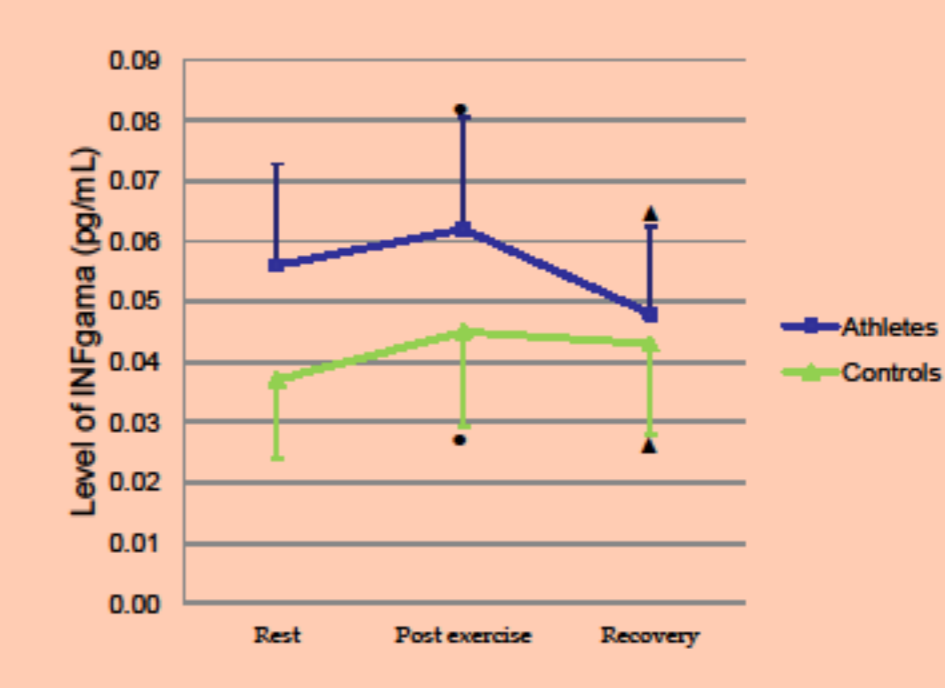
Data are means±SD *, p<0.05 compare to the controls, ●p<0.05 compare to the rest, ▲p<0.05 compare to the post exercise

Figure1. MIF response to acute exercise



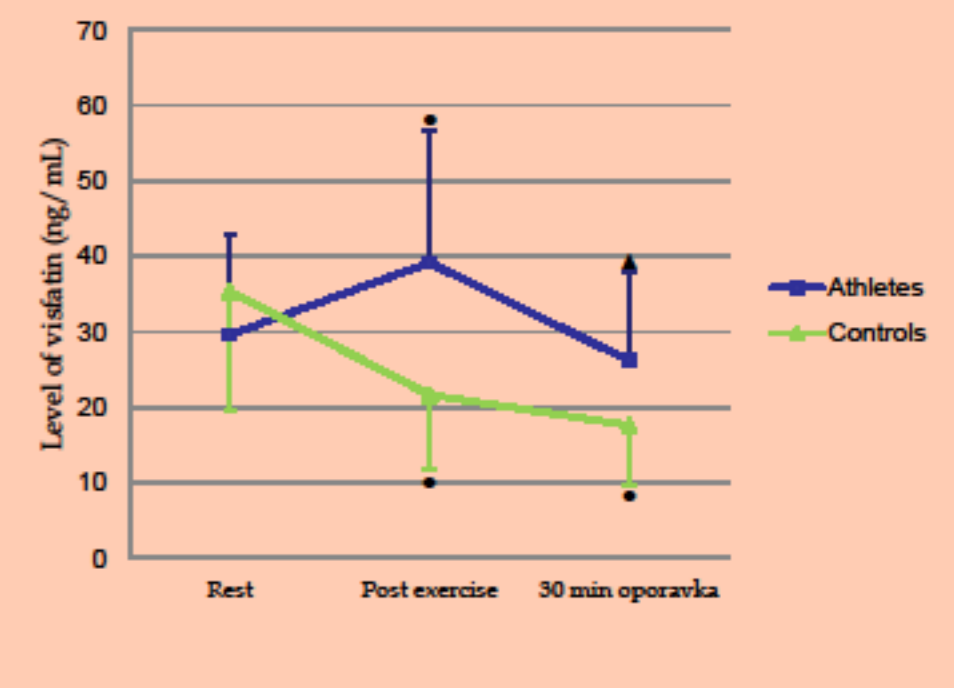
Data are means±SD *, p<0.05 compare to the controls, ●p<0.05 compare to the rest, ▲p<0.05 compare to the post exercise

Figure1. INFgama response to acute exercise



Data are means±SD *, p<0.05 compare to the controls, ●p<0.05 compare to the rest, ▲p<0.05 compare to the post exercise

Figure1. Visfatin response to acute exercise



Data are means±SD *, p<0.05 compare to the controls, ●p<0.05 compare to the rest, ▲p<0.05 compare to the post exercise

There is no significant correlation between the parameters of body composition and concentrations of pro-inflammatory cytokines in the baseline values in both groups.

In non-athletes, HOMA-IR was positively correlated with the level of IFN γ and IL-17 (p<0.05).

Conclusions

Our findings show that acute exercise leads to an increase in pro-inflammatory cytokines in athletes. The positive correlation between pro-inflammatory cytokines and HOMA IR in sedentary subjects may indicate reduced insulin sensitivity and increased risk of earlier development of the metabolic syndrome.

References:

1. Galic S, Oakhill JS, Steinberg GR. Adipose tissue as an endocrine organ. *Mol Cell Endocrinol.* 2010; 316(2): 129-39.
2. Mündermann A, Geurts J, Hügle T, Nickel T, Schmidt-Trucksäss A, Halle M, Hanssen H. Marathon performance but not BMI affects post-marathon pro-inflammatory and cartilage biomarkers. *J Sports Sci.* 2016 May 11:1-8.

