Positive association of pro-oxidative stress markers with adipose mass markers in pre- and early-pubertal boys

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OBJECTIVES

To investigate the association of adipocytokines with markers of oxidative stress at baseline and their changes and associations during exercise in normal weight and pre- and early-pubertal boys.

METHODS

Participants: Healthy pre-pubertal and early pubertal, normal weight and obese boys, (TABLE 1, FIGURE 1).

Protocol: The study was approved by the Institutional Review Board and was conducted in accordance with the Declaration of Helsinki as revised in 1996. Informed written consent was obtained from the parent/guardians of each child while children gave verbal consent to participate in the study. The protocol was performed in two trials separated at two weeks in a university endocrinology laboratory. Protocol flow-chart

First visit (subject selection and maximal oxygen consumption measurement)

Exclusion criteria: a) exercise additional to that included in the school time-table, b) nutritional intervention within the six months preceding this study, c) history of diabetes, insulin resistance, dyslipidemia, cardiovascular disease, and hypertension or other known chronic pathology.

Oxidative stress: BMI calculation and comparing to the standard BMI curves for the greek pediatric population, according to the International Obesity Task Force (IFT) criteria. Subjects were considered normal weight or obese when their BMI value for the age of 18 years was lower than 25 kg/m2 or between 30 and 35 kg/m2, respectively.

Participants: Subjects with a body mass index (BMI) ≥ 85% and < 125% were considered as pre-pubertal and ≥125% as early pubertal.

Maximum oxygen consumption (VO2max): Participants had their VO2max measured, by performing a graded exercise test on an electronically braked cycle ergometer (Monark 818E). Open-circuit spiro-ergometry via continuous breath-by-breath analysis (averaged every 30s) was used to measure VO2max with an automated on-line pulmonary gas exchange system (SensorMedics, Coraçao, USA). Heart rate, 12-lead electrocardiogram, blood pressure and ratings of perceived exertion were monitored continuously throughout testing and during recovery. VO2max was measured when subject reached exhaustion (a pedaling rate < 30 revolutions/min), at an intensity corresponding to 75% of their VO2max.

Immediately after the exercise bout a second (post-exercise) blood sampling was performed. Main Outcome Measures:

Markers of pro-oxidation: Thiorubatic acid reactive substances (TBARS) and protein carbonyls (PC).

Markers of anti-oxidation: Glutathione (GSH) and oxidized glutathione disulfide (GSSG), the enzymes glutathione peroxidase (GPX) and catalase and the so-called total antioxidant capacity (TAC).

Adipocytokines: adiponectin, leptin, NGAL, RBP, inflammatory markers: hsCRP and hsIL-6.

RESULTS

Table 1: Markers of oxidative stress and inflammation in normal weight and obese, pre- and early pubertal boys.

![Table 1](image1)

GOBLETS

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Conclusions

Pro-oxidation markers, inflammatory adipocytokines and leptin are increased in obese compared to normal weight pre- and early-pubertal boys whereas anti-oxidation markers are increased in normal weight boys. Post-exercise both pro- and anti-oxidative stress markers change significantly in normal and obese boys.

In all subjects pro- and anti-oxidative stress markers are positively and negatively correlated, respectively, with inflammatory adipocytokines and leptin, a marker of adipose mass. These findings indicate the deleterious association of pro-oxidation with adipose tissue in pre- and early-pubertal boys.

Oxidative stress in humans has been associated with obesity and resulting co-morbidities. Childhood obesity has been associated with oxidative stress even before co-morbidities occur.

Summary

This study supports the role of pro-oxidative stress markers and inflammatory adipocytokines in the development of childhood obesity. Future studies are needed to elucidate the underlying mechanisms and to identify potential therapeutic targets.