Title: Hypothalamic-pituitary-testicular axis response to sub-maximal aerobic exercise, in pre- and early-pubertal normal weight and obese boys

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Introduction: Puberty is a maturation period characterized by changes of the dynamically regulated HPG axis. Obesity in childhood and especially after the onset of puberty is a relatively hypogonadal state. Oxidative stress is a state of imbalance between pro- and anti-oxidation within the cell. Pro-oxidation refers to mitochondrial and non-mitochondrial mechanisms, which generate reactive oxygen and nitrogen species (RONS). Anti-oxidation refers to the adaptive activation of enzymatic and non-enzymatic mechanisms, which scavenge pro-oxidants and their products. Obese individuals present with increased pro-oxidation and decreased anti-oxidation as compared to normal-weight, even in childhood and in the transition to early puberty. A short bout of aerobic exercise represents a potent stimulus of energy substrate utilisation that leads to the activation of pro- and the recruitment of anti-oxidation, while also interfering with HPG axis dynamic equilibrium.

Objective: To investigate a putative association of gonadotrophin and testosterone concentrations with the increase of anti-oxidant capacity in early puberty, ninety-two pre- and early pubertal normal-weight and obese boys were studied at baseline and after an acute bout of sub-maximal (70% VO2max) aerobic exercise. The exercise bout was employed as a potent stimulus of energy substrate utilisation and a putative stimulus of testosterone.

Methods and Patients: In total 120 male pupils were initially selected for this study. Exclusion criteria: a) exercise additional to that included in the school time-table, b) dietary intervention in the six months preceding this study and c) medical history of other known chronic pathology.

Results: In total 92 normal-weight and obese subjects were called for a second visit (Table 1). Baseline blood sampling was performed followed by an acute bout of aerobic exercise on a stationary cycle ergometer until exhaustion at an intensity corresponding to 70% of VO2max. Post-exercise blood sampling was performed at the end of the exercise bout.

Conclusions: 1. An acute bout of aerobic exercise at 70% VO2max resulted in specific HPG axis changes in pre- and early pubertal boys. 2. In pre-pubertal boys baseline LH correlated positively with anti-oxidation, while in early pubertal normal-weight boys baseline testosterone correlated with anti-oxidation, suggesting a direct and/or indirect role of HPG maturation during puberty in anti-oxidation. 3. It appears that the maturation of the HPG axis during puberty in boys is positively associated with accentuation of anti-oxidation. 4. This association is stronger with the LH and testosterone concentrations and the recruitment of enzymatic and non-enzymatic mechanisms in specific pathologic entities.

Table 1: Anthropometric data of subjects. Measurements were compared among groups by employing factors ANOVA. Significant main effects were revealed by the Uneque N HSD post-hoc test. Statistical significance was set at P<0.05.

Table 2: Significant correlations between baseline LH, FSH and testosterone concentrations and baseline and changes (Δ) of concentrations of pro- and anti-oxidation markers.

References: