Hormonal concentrations at rest and induced by superset strength training session in long-term strength-trained and untrained middle-aged men

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Introduction
Although total and free testosterone concentrations can be increased in response to resistance exercise (1), results about resting concentration are controversial. Some studies investigating young subjects have demonstrated increase in resting testosterone as an adaptation to strength training (2), but other previous studies, including investigations in middle-aged and older men, have not found any significant changes in resting testosterone induced by resistance training (4). A possible limitation in previous studies investigating the adaptations of endocrine system to strength training in middle-aged men, can be the relative short-term training period, ranging between 8 and 24 weeks (3). The purpose of this study, was to investigate the serum hormonal concentrations, at rest and induced by heavy-resistance exercise in long-term strength-trained and untrained middle-aged men.

Methods
Twenty eight healthy strength-trained and untrained middle-aged men (40 ± 8 yr-old), participated in this study, matched in two different groups: Strength-trained group (SG, n = 13) and non-trained group (NG, n = 15). In the SG group, the subjects have been training for at least three years. Body composition was assessed using skinfolds. Maximal strength was assessed using the 1-RM test, in the following exercises: bench press, seated row, squat, and leg press 45°. Blood samples were collected at rest and induced by superset strength training protocol (SSTP) with intensity relative to 1-RM values. With these blood samples, Total (TT) and Free (FT) Testosterone, Dehydroepiandrosterone (DHEA), Cortisol (COR), and Sex Hormone Binding Globulin (SHBG) were determined. In addition, TT/COR ratio and Free androgen Index (FAI) by TT/SHBG ratio were calculated.

Results
The SG demonstrated significantly higher values in all muscle strength variables (p < 0.01). There was no difference between groups in resting hormonal values in TT, FT, DHEA, COR, and TT/COR. However, NG demonstrated higher IAL values at rest (p < 0.05). There were increases after SSTP in serum TT, TL, DHEA, COR, and FAI in NG, but just in FT and DHEA in SG (all values in p < 0.05). NG demonstrated higher values in FAI (fig.1) after training session (p < 0.05). There were positive correlations between low body strength and DHEA concentration at rest and induced by SSTP (r = 0.55 e 0.73, respectively, P < 0.05).

Discussion/Conclusion
Our results suggest that long-term strength-trained and untrained middle-aged men have different responses to heavy-resistance session training as demonstrated by lower response in SG. In addition, the lower resting FAI observed in SG group suggests that these subjects present an adaptation in their endocrine system. These differences can be related with increases in muscle androgenic receptors induced by strength training (6). It is possible that strength-trained men need a lower magnitude in acute anabolic response and less biologically active androgens (i.e., lower FAI) to have a better anabolic environment that can mediate the neuromuscular adaptations to training (5). However, the androgenic receptors were not measured in the present study, so this hypothesis remains speculative. Another explanation is the relationship between serum hormone and training characteristics, because lower volume and intensity, which were not controlled in this study, cannot result in changes in resting hormone concentrations. The correlation observed between DHEA and squat strength after training session suggests that, although the adrenal stores of this hormone alone do not have an important anabolic role in men, during the exercise this importance can increase.

References