Abstract: 51O

The role of testosterone in skeletal muscle adaptation to resistance training in pre-menopausal females

Sarah E. Alexander, Brad Aisbett, Glenn D Wadley, Severine Lamon

Institute of Physical Activity and Nutrition, Deakin University, Melbourne

Introduction: Testosterone is the major male sex hormone and promotes virilising traits. Testosterone is also present in females, albeit at concentrations 10-fold lower than in males. Testosterone positively regulates skeletal muscle mass and function in males[3] via binding to its receptor, the androgen receptor, and increasing muscle protein synthesis[4]. However, evidence is emerging that, when at physiological levels, total testosterone may not be related to muscle mass nor strength in pre-menopausal females[1,2]. This study aims to establish whether testosterone concentrations are predictive of the muscular adaptations that occur in response to 12 weeks of resistance training in pre-menopausal females.

Methods: Twenty non-resistance trained, pre-menopausal females (age 23.4 years ± 4.6) underwent 12 weeks of resistance training designed to maximally increase muscle size and strength. Thigh muscle cross sectional area, measured via peripheral quantitative computed tomography, and muscle strength, measured via leg press 1RM, were assessed before and after the training program. Sex hormone levels were assessed via ELISA. Muscle biopsies were collected before and after the training program. The muscle transcriptome was sequenced using RNASeq and the protein levels of the total and phosphorylated forms of the androgen receptor as well as common markers of muscle protein synthesis and degradation were analysed via western blot.

Results: The average testosterone concentration of participants at baseline was 1.99 ± 0.53 nmol/L and did not fluctuate with training. Lower limb strength and thigh muscle cross sectional area increased by 28.5 and 7.3%, respectively. Total testosterone was not significantly correlated to muscle strength or size at baseline, or with the changes that occurred with training. Free testosterone was positively related to the changes in muscle size and strength that occurred with resistance training and the protein and phosphoprotein levels of the androgen receptor were negatively related to muscle size and strength.

Conclusions: Twelve weeks of resistance training increased muscle size and strength in pre-menopausal females. Total testosterone levels were however not related to increases in muscle size or function, nor to downstream markers of protein synthesis. This suggests that total testosterone plays a minor role in the regulation of muscle growth and function in pre-menopausal females. Free testosterone may play a small role in the anabolic potential of skeletal muscle in females. Our results also suggest a possible negative regulation of muscle size and strength by the androgen receptor.

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