Effect of Growth Hormone and Resistance Exercise on Muscle Growth in Young Men

Growth hormone (GH) treatment in childhood increases net body protein. GH in adults reportedly increases fat-free mass (FFM). Whether the increase in FFM is due to an increase in muscle protein is unknown. Fiber size of skeletal muscle, whole muscle area, and muscle force-generating capability increase with heavy resistance exercise training (HRET). However, it is unclear how human skeletal muscle and whole body protein turnover are affected by HRET. The purpose of this double-blind, placebo-controlled study was to determine the effects of HRET on FFM, muscle size and strength, the rate of whole body protein turnover, and the rate of protein synthesis in the quadriceps muscle, and to examine whether GH supplementation enhances the anabolic response to HRET.

Sixteen subjects completed a 12-week study in which all underwent a HRET program. Seven received approximately 40 µg/kg/d of GH and 9 received placebo. Appropriate and eloquent studies of body composition were carried out to permit answering of the questions asked. As determined by hydrodensitometry, FFM increased significantly in both groups, but the increment was greater in the GH-treated group. Since FFM is principally water, total body water increased in proportion to FFM in the 2 groups. Chest and upper arm circumference increased in both groups, but thigh and mid-thigh circumference increased only in the GH-treated group. Muscle strength improved identically in both groups, as did increments in concentric force production. Whole body protein synthesis increased more in the GH-treated group, as did body protein balance.

The authors concluded that HRET increased FFM, muscle size, and muscle strength, and tended to increase the fractional rate of quadriceps muscle protein synthesis. GH treatment added to the training regimen (HRET) produced no significant further increase in muscle size, muscle strength, or fractional rate of muscle protein synthesis. The results indicate that pharmacologic doses of GH given to young men with normal GH secretory function do not enhance skeletal muscle protein accretion or muscle function more than resistance training without GH treatment. The greater increase in FFM and whole body protein synthesis rate observed in the GH-treated group indicates that these individuals accumulate additional lean tissue, but it is unlikely that this tissue was skeletal muscle protein. Therefore, the rationale for using GH to amplify exercise-induced muscle growth and thus enhance athletic performance appears to have no foundation in fact.

Yarasheski KE, Campbell JA, Smith K, et al. *Am J Physiol.* 1992;25:261-267.

Editor's comment: *Amen. A precise, lucid study that all aspiring potentially muscle-bound athletes should read.*

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