GROWTH HORMONE SUPPLEMENTATION AND EXERCISE: EFFECTS ON COLLAGEN EXPRESSION IN HUMAN MUSCLE AND TENDON

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GH (Growth Hormone) is used as doping within different sports. Increased fat metabolism and muscle anabolism offer possible explanations for GH’s ergogenic effects, however the precise mechanisms are debated. Studies in animals and patients with altered GH production strongly suggest a positive correlation between GH levels in plasma and metabolism of collagen in connective tissue. Such a correlation could partly explain GH’s ergogenic effects in athletes since connective tissue is a very important structure in skeletal muscle and tendon.

This study investigated the effect of recombinant human GH (rhGH) supplementation and exercise on expression of mRNA for connective tissue proteins collagen 1 and 3 in human skeletal muscle and tendon, in a double-blind, randomized, placebo-controlled crossover design.

10 healthy male subjects participated. Placebo or rhGH (0.33 – 0.50 mg/kg/day) was supplemented for 14 days. The order of placebo/rhGH supplementation was random and separated by a 4 months wash-out period. On the last day of the supplementation period the subjects performed a bout of strenuous one-legged kicking exercise (10 * 10 repetitions at 70% of 1 RM) and 24 hours after the exercise, tissue was sampled bilaterally from the patella tendon and the vastus lateralis muscle.

mRNA levels for collagen 1 and collagen 3 in tendon and muscle were measured by real-time RT-PCR.

In the vastus lateralis muscle collagen 1 and collagen 3 mRNA increased significantly in response to rhGH supplementation relative to placebo (p<0.05). The increase was significant in both the exercising and non-exercising leg. However, there was no significant difference between the exercising and non-exercising leg neither during GH nor during placebo supplementation. In the patella tendon there was a non-significant increase in collagen 1 (p=0.13) and collagen 3 (p=0.18) with rhGH supplementation and no significant difference between the exercising and non-exercising leg.

The results indicate a role for rhGH in increasing collagen content, thus strengthening connective tissue in skeletal muscle and tendon. This correlation offers a possible explanation for GH’s ergogenic effects and suggests a clinical potential for GH in the treatment of tendon and muscle injuries.

Keywords: Doping, Hormones, Exercise