



# Elevated Growth Hormone 120 Minutes Following a Single Low-Dose of Amino Acids in Healthy Subjects

Charmaine S Tam, William D Johnson, Jennifer Rood, Alok Gupta, Frank L Greenway\*  
Pennington Biomedical Research Center, LSU System, Baton Rouge, LA

Principal Investigator, Medical Director and Professor, Pennington Biomedical Research Center  
Email: frank.greenway@pbrc.edu

## ABSTRACT

**Background:** The use of amino acid supplements to provoke growth hormone (GH) secretion in athletes and entertainers now extends to the general public. Not only do they have a goal of building lean tissue and reducing fat, but also in improving skin quality and other rejuvenating qualities that they believe GH can provide. Despite increasing mainstream use, evidence for whether oral amino acids stimulate GH is not clear.

**Methods:** This was a cross-over, placebo-controlled randomized study. 16 (12 males; 32±14 years; 26.4±5.0 kg/m<sup>2</sup>) healthy subjects had serum GH measured at baseline and 15, 30, 60, 90 and 120 minutes after taking a single low dose proprietary amino acid supplement blend (Protovale™) or placebo.

**Results:** After 120 minutes, GH levels had increased 8-fold from baseline (0.17 to 1.33ng/ml) and were significantly higher than placebo (P=0.01). In addition, a significantly higher mean AUC was observed after taking the supplement [20.4 (95% CI: 19.9-21.0ng/ml) vs. 19.7 (95% CI: 18.7-20.6ng/ml); P=0.04].

**Conclusion:** Our results show that a single oral dose of these amino acids can significantly increase GH levels after 120 minutes in healthy men and women. Whether these GH changes persist over a longer duration or have other positive effects is being further examined.

## INTRODUCTION

TGH-deficient adults have marked reductions in lean body mass, and within months of GH treatment, gains in lean body mass, skin thickness and muscle mass were observed.<sup>1-3</sup> It is well-established that intravenous (IV) administration of some amino acids results in significant GH secretion<sup>4,5</sup> presumably via inhibition of somatostatin (SS), Figure 1, (also known as Growth Hormone Inhibiting Hormone). Such studies prompted testing of oral amino acids supplements (mainly arginine, lysine and orthinine) to stimulate GH secretion,<sup>6-10</sup> albeit with mixed results and limitations in the study's designs. Our aim was to rigorously determine whether oral amino

acids can stimulate GH secretion, since athletes, entertainers and even the general public commonly take these supplements and believe GH has rejuvenating properties.

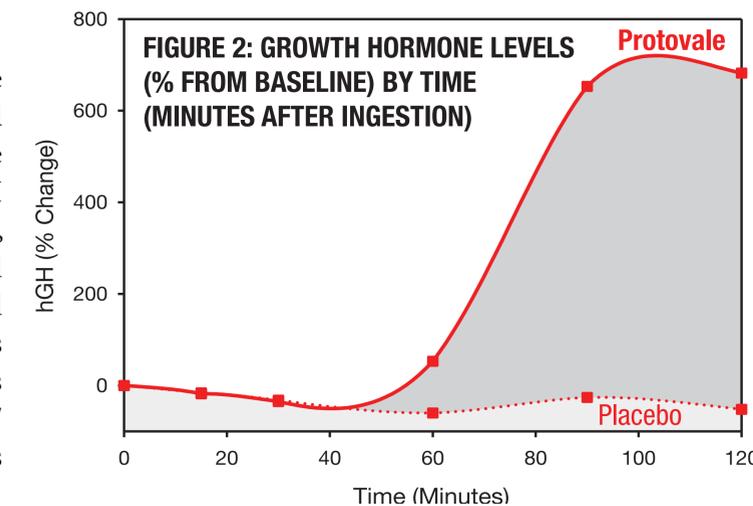
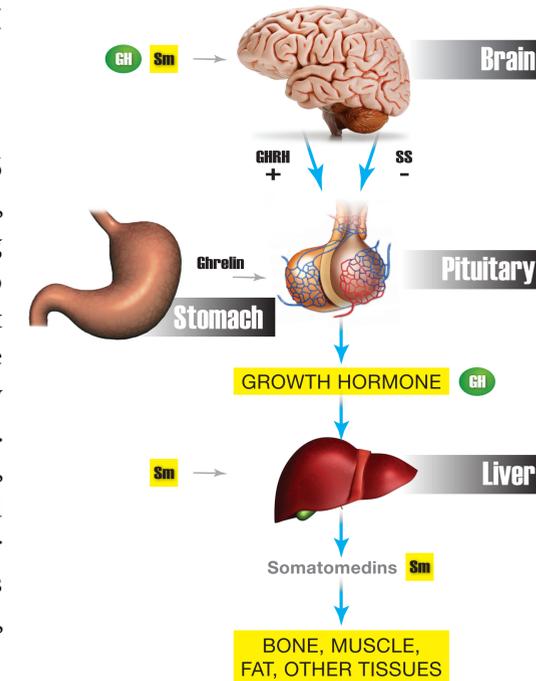
## METHODS

This cross-over, placebo controlled, double-blind study involved 16 healthy subjects [12 males, 4 females; 9 Caucasian, 6 African American, 1 other; mean age= 32±14 years; body mass index=26.4 ± 5.0 ranging from 19.1 to 36.8kg/m<sup>2</sup>] (IRB Number 10043). Each subject reported to the Inpatient Unit on two occasions one week apart. After an overnight fast, subjects had an IV line placed and baseline bloods samples were drawn at -30, -15, and 0 minutes. Subjects were then asked to swallow the capsules of supplement (Protovale™) or an identical looking placebo. Protovale™ is a novel 2.9g/dose blend of l-lysine HCl, l-arginine HCl, oxo-proline, N-acetyl-l-cysteine, l-glutamine, and schizonepeta (aerial parts) powder. Blood was drawn at 15, 30, 60 and 90 and 120 minutes for assay. Human GH was measured at each time point using the Siemens Immulite 2000 (intra-assay CV was 3.72%, inter-assay CV was 5.70%, and the detection limit for GH was 0.05ng/ml).

## RESULTS

Mean growth hormone increased 8-fold over baseline after the supplement from 0.17 at baseline to 1.33ng/ml at 120 minutes compared to a mean decrease of 52% after placebo from 0.93 to 0.45ng/ml (Figure 2). The mean change in GH levels from baseline to 120 minutes (GH at 120 minutes minus GH at 0 minutes), was 1.15 (95% CI: 0.17, 2.14) ng/ml after the supplement versus -0.48 (-1.47, 0.50) ng/ml after the placebo, demonstrating a statistically significant differential effect (P=0.01). After the supplement, the mean AUC for GH across 120 minutes was 20.43 (95% CI: 19.90, 20.95) ng/ml/min which was significantly higher (P=0.04) than placebo at 19.67 (18.74, 20.59) ng/ml/min. Overall, 120 minutes after taking the supplement, GH levels were significantly higher in both absolute levels and by AUC.

FIGURE 1: THE GROWTH HORMONE AXIS



## DISCUSSION and CONCLUSIONS

The absolute magnitudes of these results are somewhat difficult to directly compare among past studies, as commercial GH assays use different antibodies to target specific GH epitopes resulting in differential sensitivities towards specific isoforms and fragments of the GH molecule. This results in variability of the normal range of the GH measurements in different assays. Indeed, the same GH sample measured using different assays can vary 2-3 fold.<sup>11,12</sup> Yet mean levels of GH reached after the subcutaneous injection of 0.06 IU of HGH in the treatment of GH deficient subjects was 0.4ng/ml, a value that was clearly in the range of values seen in our study with oral amino acids.<sup>13</sup> Furthermore, our normalized percentage increase matches the magnitude increase of previous positive study results on GH secretion.<sup>6-10,13,14</sup>

Overall, we report an 8-fold increase, equivalent to 682%, in GH levels 120 minutes after a single oral supplement of Protovale™. Our study had a broad range of ages and BMI's and included both genders. An additional advantage of our study over previous GH evaluations is that it contained a placebo control group and was randomized and double-blinded. Future studies will examine whether regular increases in GH with oral amino acids increase strength and vitality.

This indeed may be the case, since elderly subjects administered oral GH secretagogues for 6 and 12 months have sustained increases in lean body mass and improved physical function.<sup>14</sup>

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