Effect of the Hyperimmune Egg Supplement on Anabolic Mediators of Muscle Repair

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Abstract

Hyperimmune egg (HIE) protein is a powdered, pure egg product derived from chicken hens immunized with more than 26 killed pathogens (e.g., Shigella, Staphylococcus, Escherichia coli, Salmonella, and Streptococcus) of human origin. Research has shown that protein supplementation enhances muscle growth However, only anecdotal evidence has only been available to suggest that HIE supplementation may improve performance and shorten recovery time after exercise. **PURPOSE:** The purpose of this study was to determine if HIE supplementation positively affected the GH→IGF-I axis and FAI to support muscle repair following exercise. **METHODS:** Twenty-four recreationally active males aged 23.6 ± 0.8 yrs, height 176 ± 2 cm, weight 69.2 ± 0.6 kg and 17.1 ± 1.5 % body fat were randomly assigned to either HIE (n=12) or an egg protein placebo (PLA) group (n=12). Participants abstained from their regular exercise routine for the duration of the study and were supplemented with 4.5 g·d^{-1} for 2 d, 9 g·d^{-1} for 2 d and 13.5 g·d^{-1} for 6 d. HIE and PLA supplements were identical in appearance and taste before and after mixing with 237 mL of low carbohydrate milk. Blood samples were collected following 20 min of seated rest on Days 1, 8, 9, 10 and 11. On days 1, 8 and 10, participants performed an exercise performance test battery. ANCOVA was used to determine significant differences between or within the groups during the 10 d of supplementation with initial differences between groups serving as a covariate. Significance was set at α = 0.05. **RESULTS:** hGH was 83.3% greater on Day 8 (P<0.05) and 90.1% greater on Day 10 (P<0.05) than Day 1. hGH significantly decreased -56.7% (P<0.05) from Day 8 to Day 9. IGF-I decreased in HIE (P>0.05) from Day 8 to Day 9 (-3.3 ± 2.4%) and Day 10 (-3.2 ± 3.2%). FAI significantly decreased on V10 (21.9%) and V11 (19.4%) from V1. **CONCLUSIONS:** The results suggest that oral supplementation of hyperimmune egg protein for 10 d resulted in significant changes in hGH and FAI and non-significant, yet promising alterations in IGF-I. Supplementation with HIE protein appears to stimulate beneficial hormonal responses necessary for muscle repair during recovery after exercise.

Introduction

Hyperimmune Egg (HIE) is a powdered, pure egg product derived from chicken hens immunized with more than 26 dead pathogens (e.g., Shigella, Staphylococcus, Escherichia coli, Salmonella, Pseudomonas, pneumonae, Haemophilis, and Streptococcus) of human origin.

Oral supplementation of HIE's immunomodulatory factors results in their digestion and absorption by the body. Once absorbed into the body these pathogens stimulate the autoimmune system.

Growth hormone (hGH), (i.e, somatotropin), released from the anterior pituitary is the most vital hormone for regulating and inducing growth and repair of tissue.

Insulin-like growth factor-1 (IGF-I) is a small unbranched peptide secreted primarily from the liver. It is a stimulator of tissue growth. Its levels in the blood plasma are greatly affected by the amount of GH being secreted.

The free androgen index (FAI) is a ratio of testosterone to sex-hormone binding globulin and can be used as an indicator of the amount of active testosterone in the blood.

Protein supplementation has been shown to stimulate muscle growth; however, the interaction of HIE protein with the GH→IGF-I axis and FAI to enhance muscle growth and repair is unknown.

Purpose

The purpose of this project was to determine if supplementation with hyperimmune egg protein for 10 days stimulated the GH→IGF-I axis and/or FAI to aid muscle repair following a bout of exercise-induced muscle damage.

Methods

Twenty four male participants were randomly assigned to one of two groups that orally supplemented with 4.5 g·d^{-1} for 2 d, 9 g·d^{-1} for 2 d and 13.5 g·d^{-1} for 6 d of either Hyperimmune Egg protein (HIE) or an egg protein placebo (PLA). HIE and PLA supplements were identical in appearance and taste before and after mixing with 237 mL of low carbohydrate milk.

On days 1, 8 and 10, participants performed three 5 min submaximal exercise bouts on a treadmill at 0%, 3% and 6% grade with constant speed (i.e., 6 mph) for each subject. Subsequently the subjects performed 1RM strength tests and 70% of 1RM muscular endurance tests for the bench press, squat, bent over row and should press. Following 15 min recovery each participant performed a 30 sec Wingate test using 7.5% of their own body mass. Participants abstained from their regular exercise routine for the duration of the study.

Blood samples were collected at the same time of day following 20 min seated rest on Days 1, 8, 9, 10 and 11. Samples were allowed to clot, centrifuged, and stored at -80 °C. Serum samples were analyzed in duplicate for hGH, IGF-I, and steroid hormone binding globulin (used to calculate the FAI) via enzyme-linked immunosorbant assay (ELISA) technique. Assay kits were purchased from Diagnostic Systems Laboratory (Webster, TX).

Subject Characteristics

Group	n	Age (years)	Height (cm)	Mass (kg)	Body Fat (%)
PLA	12	23.5 ± 1.2	175.6 ± 2.0	81.11 ± 4.25	18.2 ± 2.5
HIE	12	23.8 ± 1.2	175.9 ± 2.3	78.10 ± 2.58	16.1 ± 1.7

Statistical Analyses

A two-way analysis of covariance (ANCOVA) with repeated measures was used to determine significant differences between or within the groups during the 10 d of supplementation with initial differences between groups serving as a covariate.

Significant main effects or interactions were further analyzed using a Tukey's *post hoc* test. The α-level for significance was set at 0.05.

Results

Figure 1.

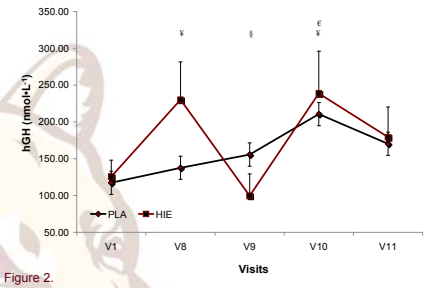

Figure 2.

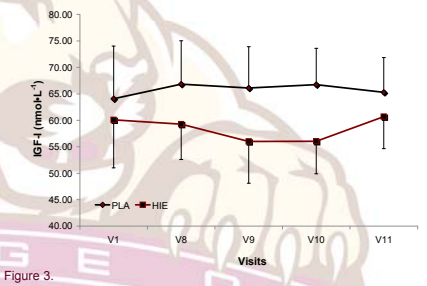

Figure 3.

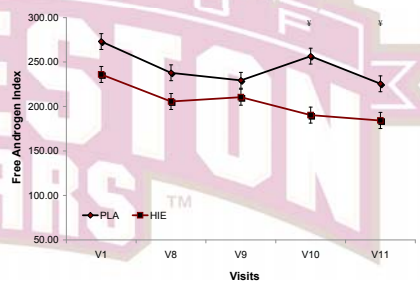

Figure Legend. Serum concentrations for human Growth Hormone (Figure 1), Insulin-like Growth Factor-I (Figure 2) and Free Androgen Index (Figure 3) during 10 days of Hyperimmune Egg protein or Placebo supplementation (mean ± SE). #, denotes HIE significantly different (P<0.05) from PLA. ¥, denotes HIE significantly different (P<0.05) from Day 1. §, denotes HIE significantly different (P<0.05) from Day 8. €, denotes PLA significantly different (P<0.05) from Day 1.

Discussion

The supplement dosing was titrated over 5 days in an effort to prevent previously reported gastrointestinal disturbances. No subjects in PLA and only one subject in HIE reported any signs or symptoms of gastrointestinal disturbance and no subjects in either group reported any other changes in health status during their 10 d study period.

Supplementation with hyperimmune egg protein for 7 d resulted in significant (P<0.05) increase in hGH. The significant decrease in hGH at Day 9 may have occurred due to an increased uptake by the liver as part of an increase in IGF-I secretion.

Circulating IGF-I was non-significantly decreased on Day 9 and 10. A potential increase in receptor binding in the muscle most likely accounts for the decreased circulating IGF-I levels.

The significant decrease in FAI at Day 10 and Day 11 is most likely attributed to an increase in intracellular testosterone binding. Total testosterone levels decreased (P>0.05) as well (data not presented).

These results provide support that HIE protein supplement may have caused greater recovery through increased anabolic hormonal responses. The enhanced recovery, measured by improved performance on repeated exercise tests, is most likely attributing to the significant increases in exercise performance (HIE vs. PLA: Submax HR ↓ 6%, anaerobic peak power ↑ 9%, muscular strength ↑ 3kg and Muscular endurance ↑ 2 reps).

Conclusions

The data suggest that oral supplementation of hyperimmune egg for 10 d resulted in significant alterations in hGH and FAI and non-significant but potentially important responses in IGF-I.

This data provides the foundation for future research necessary to fully understand the interactive mechanisms involved with stimulating the immune system and the hormonal agents related to muscle repair.

Acknowledgements

Support provided by the Summer Undergraduate Research with Faculty award through the Undergraduate Research and Creative Activities Program at the College of Charleston, Charleston, SC, and Legacy for *Life*, LLC, Melbourne, FL.

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