Hyperimmune Egg Protein Supplementation Stimulates the GH→IGF-I Axis

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Abstract

Polyvalent hyperimmune egg protein (HIE) 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. Prior research has documented significant increases in muscular strength, muscular endurance and anaerobic power, decreased muscle soreness and submaximal heart rate, and enhanced recovery with oral supplementation of HIE. **PURPOSE:** To determine if the significant improvements observed following 10 d of oral HIE supplementation may be explained by alterations in the growth hormone (GH)→insulin-like growth factor-I (IGF-I) axis. **METHODS:** With the use of a double-blind, balanced, matched-pairs study design 24 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. 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. On days 1, 8 and 10, participants performed an exercise performance test battery. Blood samples were collected on Days 1, 8, 9, 10 and 11 at the same time of day following 20 min of seated rest. A repeated measures ANCOVA with initial differences between groups serving as a covariate was used to determine significant main effects. Significant main effects were further explored using Tukey's HSD post-hoc test. Significance was set at P<0.05. **RESULTS:** GH increased 83.3% on Day 8 (P<0.05) and 90.1% on Day 10 (P<0.05) vs. Day 1 while GH decreased -56.7% (P<0.05) from Day 8 to Day 9, in HIE. IGF-I decreased in HIE (P>0.05) from Day 8 to Day 9 (-3.3%) and Day 10 (-3.2%). IGFBP-3 increased 31.5% (p<0.05) from Day 1 to Day 8 and decreased 9.4% (P<0.05) from Day 8 to Day 9 and Day 10 (-13.7%; P<0.05). **CONCLUSIONS:** The results suggest that oral supplementation with HIE for 10 d produced significant variations in GH and IGFBP-3 and non-significant but potentially meaningful alterations in IGF-I. HIE protein supplementation appears to have positively altered the bioavailability of IGF-I. Supplementation with HIE protein appears to beneficially stimulate the GH→IGF-I axis resulting in hormonal responses associated with enhanced muscle repair during recovery from prior exercise. **PRACTICAL APPLICATION:** The data from this study indicate that hyperimmune egg protein represents an effective protein-based supplement that enhances recovery through altering the GH→IGF-I axis. The enhanced recovery subsequently led to significant increases in muscular strength, muscular endurance and anaerobic power, decreased muscle soreness and submaximal heart rate, and enhanced recovery. Effects of long term utilization need to be identified.

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.

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

Purpose

The purpose of this project was to determine if the significant improvements observed (i.e. previously reported) following 10 d of oral HIE supplementation may be explained by alterations in the growth hormone (GH)→insulin-like growth factor-I (IGF-I) axis.

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

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 GH, IGF-I, IGFBP-1 and IGFBP-3 via ELISA.

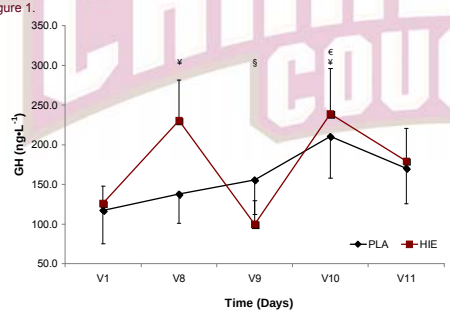
Statistical Analyses

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.



Results

Figure 2.

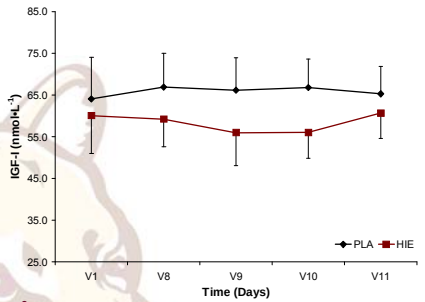


Figure 3.

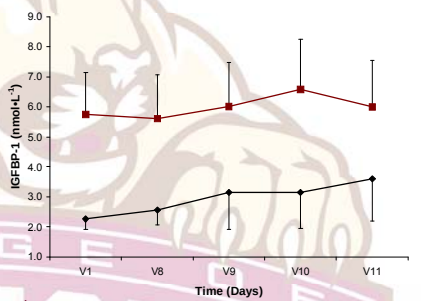


Figure 4.

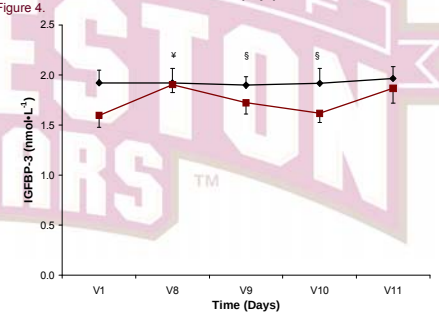


Figure Legend. Serum concentrations for Growth Hormone (Figure 1), Insulin-like Growth Factor-I (Figure 2), IGF Binding Protein 1 (Figure 3) and IGF Binding Protein 3 (Figure 4) during 10 days of Hyperimmune Egg (HIE) protein or Placebo (PLA) supplementation (mean ± SE). ¥, denotes HIE significantly 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 GH. The significant decrease in GH at Day 9 may have occurred due to an increased uptake by the liver.

Supplementation with hyperimmune egg protein for 7 d resulted in significant (P<0.05) increase in IGFBP-3. However following exercise IGFBP-3 was significantly (P<0.05) decreased for 48 hours which corresponded with a non-significant but expected decrease in circulating IGF-I. The decrease in circulating IGF-I most likely represents an increase in receptor binding at the muscle cell.

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. These results provide support that HIE protein supplement may have caused greater recovery through the GH→IGF-I axis. 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).

Practical Application

The data from this study indicate that hyperimmune egg protein represents an effective egg protein-based supplement that enhances recovery through altering the GH→IGF-I axis. The enhanced recovery led to significant increases in muscular strength, muscular endurance and anaerobic power, decreased muscle soreness and submaximal heart rate, and enhanced recovery. Effects of long term utilization need to be identified.

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