



Effect of the Hyperimmune Egg Supplement on Regulation of Insulin-like Growth Factor-I

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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 of human origin. Insulin-like growth factor-I (IGF-I) and IGF binding proteins (BP) -1 and -3 are involved in stimulating muscle repair. Anecdotal evidence suggests that HIE supplementation improves performance and shortens recovery time after exercise; however, the impact of HIE on IGF-I and IGFBP-1 and -3 is unknown. **PURPOSE:** The purpose of this study was to determine if supplementation with HIE would positively alter circulating IGF-I levels and IGF binding proteins-1 and -3 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 $\alpha = 0.05$. **RESULTS:** IGFBP-3 significantly increased from Day 1 to Day 8 (HIE: 31.5 ± 17.4 %, PLA 0.66 ± 4.6%; p<0.05) and significantly decreased (P<0.05) from Day 8 to Day 9 (-9.4 ± 5.6%) and Day 10 (-13.7 ± 5.5%). 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%). IGFBP-1 levels were not meaningfully altered. **CONCLUSIONS:** The results suggest that oral supplementation with HIE for 10 d produced noteworthy variations in IGFBP-3 and potentially meaningful variations in IGF-I. Although IGFBP-1 was unresponsive this finding may be a result of the exercise bout not producing a significant catabolic state due to the relatively long rest periods (~15 min) between the exercise tests. While the magnitude of the results were not as large as expected, a positive influence was observed indicating that HIE protein supplementation did positively alter the bioavailability of IGF-I. These results indicate that HIE protein supplementation may provide the body a greater ability to recover from exhaustive 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, pneumoniae, 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.

Insulin-like growth factor-I (IGF-I) is a key hormone released from liver and helps with muscle repair following exercise. Circulating IGF-I is bound to carrier proteins Insulin-like growth factor binding protein 1 (IGFBP-1) and -3 (IGFBP-3) to regulate its bioavailability.

Research has shown that exercise stimulates both circulating IGF-1 and IGFBP-3 which supports IGFs anabolic activity. IGFBP-1 acts to inhibit anabolic effects of IGF-1 and is elevated in pathologic and/or catabolic states.

Protein supplementation has been shown to stimulate muscle growth; however, the interaction between HIE protein, IGF and IGFBP-1 and -3 is unknown.

Purpose

The purpose of this project was to determine if supplementation with BioChoice® immune26® for 10 days differentially stimulated IGF-I and its bioavailability regulating binding proteins (IGFBP-1 and IGFBP-3).

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 immunosorbent 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.

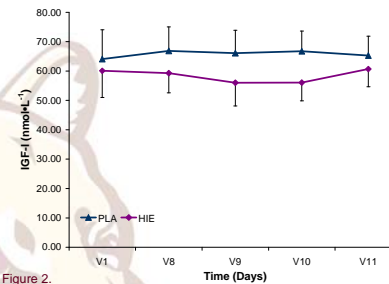


Figure 2.

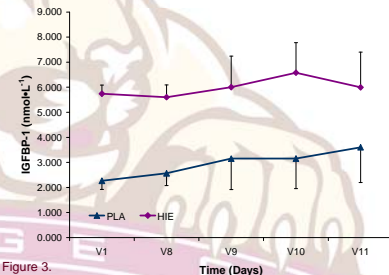


Figure 3.

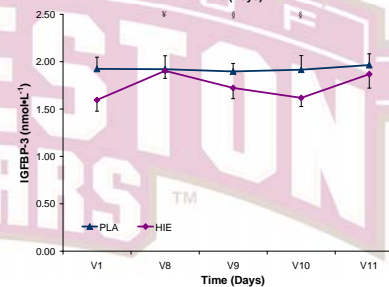


Figure Legend. Serum concentrations for Insulin-like Growth Factor-I (Figure 1), Insulin-like Growth Factor Binding Protein 1 (Figure 2) and Insulin-like Growth Factor Binding Protein 3 (Figure 3) during 10 days of Hyperimmune Egg protein or Placebo supplementation (mean ± SE). #, denotes HIE significantly 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.

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 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.

HIE supplementation did not alter IGFBP-1 responses. This is probably because the exercise performance bout did not induce a stressor great enough to cause a significant catabolic state.

The subjects supplementing with hyperimmune egg protein appear to have experienced a greater recovery capacity as indicated by comparing successive exercise performance results.

The data from this study supports exercise performance results including significant decreases in submaximal heart rate (-6 bpm) and significant increases in anaerobic power (9%), maximal strength (3 kg) and muscular endurance (2 reps) in HIE vs. PLA.

Conclusions

The data suggest that oral supplementation of hyperimmune egg for 10 d resulted in significant alterations in IGFBP-3 and non-significant but intriguing alterations in IGF-I.

This data indicates that additional research is necessary to fully elucidate the mechanism of action between HIE and IGF as related to muscle repair.

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