CONSUMPTION OF A TESTOSTERONE-BOOSTING SUPPLEMENT IS SAFE AND LOWERS ESTROGEN AND CORTISOL LEVELS

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ABSTRACT

Increasing testosterone and lowering estrogen can lead to performance benefits and possible health benefits in some men. Testosterone-boosting supplements (TB) may exert these effects; however, it is still unclear whether many TB are safe or effective when consumed chronically. **PURPOSE:** To determine the efficacy and safety of a TB ingested for 8 weeks. **METHODS:** Eighteen trained men (age: 25.8 +/- 4.3 years; height: 176.7 +/- 4.97 cm; weight: 80.35 +/- 11.99 kg) completed a double-blind, placebo-controlled study. First, blood was sampled for safety panels, estrogen, and cortisol. For 8 weeks, the TB group (n = 10) consumed a TB twice daily, and the placebo (PLA) group (n = 8) consumed a visually identical placebo in the same manner. After the 8 weeks, subjects returned to the testing facility to provide another blood sample. **RESULTS:** Regarding safety, no statistically significant changes were measured in hematology other than chloride (TB: PRE, 102 +/- 2.12 mmol/L to POST: 103 +/- 1.83 mmol/L; PLA: PRE, 103 +/- 1.13 mmol/L to POST: 102 +/- 1.89 mmol/L; p = 0.025) and the change in chloride was not clinically significant (clinical range: 97-108 mmol/L). Liver enzymes aspartate aminotransferase (TB: PRE, 24.1 +/- 9.05 IU/L to POST: 24.6 +/- 7.49 IU/L; PLA: PRE, 26.0 +/- 13.9 IU/L to POST: 28.5 +/- 14.7 IU/L) and alanine aminotransferase (TB: PRE, 28.9 +/- 7.19 IU/L to POST: 26.7 +/- 10.2 IU/L; PLA: PRE, 22.8 +/- 11.8 IU/L to POST: 23.8 +/- 12.4 IU/L) demonstrated no statistical differences. Estrogen (TB: PRE, 124 +/- 35.9 pg/ml; POST: 97.9 +/- 25.3 pg/ml; p = 0.0166) and cortisol (PRE: 20.5 +/- 3.96 ug/dl; POST: 16.6 +/- 3.93 ug/ml; p = 0.0160) decreased significantly in TB, while no changes were observed in PLA. **CONCLUSION:** A TB supplement is safe and effective at decreasing estrogen and cortisol levels in the blood.

INTRODUCTION

Testosterone's ability to increase strength and fat-free mass is well documented. Exogenous testosterone administration has been utilized effectively by both hypogonadal [1] men and by eugonadal [2] men. Since young, healthy athletes have been able to vastly increase size and strength with testosterone, its use has been banned in most sports. However, sales of testosterone-boosting supplements continues to increase, since exogenous consumption of certain botanicals and naturally-occurring endogenous substances has demonstrated increases in testosterone.

For example, fenugreek is an herb that has been used for medicinal and culinary applications for centuries. It is also believed to be an aromatase inhibitor which can lower estrogen levels. Fenugreek supplementation did increase testosterone levels with resistance training over placebo with training, but no changes in muscle mass or strength were observed [3]. Since resistance training can cause an increase in testosterone [4], it is important to investigate a testosterone-boosting supplement in conjunction with resistance exercise, since most athletes would be using it in this way.

D-aspartic acid is a naturally occurring amino acid that was able to increase testosterone in eugonadal men after only 12 days of consumption [5]. However, when D-aspartic acid consumption was combined with resistance training, no improvements were seen [6].

Compounds that demonstrate hormonal improvements are combined into multi-ingredient testosterone-boosting supplements, but many of these supplements remain untested for safety or efficacy. Therefore, the purpose of the present study was to determine the safety and efficacy of 10 weeks of consumption of a multi-ingredient, testosterone-boosting supplement in healthy, resistance-trained men.

METHODS

Participants

Eighteen trained men (age: 25.8 +/- 4.3 years; height: 176.7 +/- 4.97 cm; weight: 80.35 +/- 11.99 kg) completed this study. To be eligible, each participant must have performed resistance training regularly (3+days/week) for 30+ minutes per day for at least 1 year. Additionally, subjects needed to be able to bench press their body weight and to squat 1.5 times their body weight. Exclusion criteria included: major medical conditions or disorders especially those that may affect weight training, kidney or liver function, smoking, and chronic medication use that may affect kidney or liver function. All subjects provided written, informed consent prior to testing and all testing procedures were approved by an Institutional Review Board.

Experimental Design

Participants reported to the blood testing facility (Laboratory Corporation of America, Denver, CO) in the morning after fasting for at least 8 hours and after refraining from exercise for at least 24 hours. First, consent forms were signed and medical and exercise history forms were completed. After height and weight were measured, blood pressure and heart rate were measured via automated blood pressure cuff. Next, blood samples were taken and analyzed for testosterone, estrogen, cortisol and safety biomarkers (complete blood count, complete metabolic profile, lipids). Participants were given TB or placebo to take daily with breakfast for 10 weeks. Supervised exercise was mandatory for three days per week at the laboratory, and extraneous exercise was limited to 30 minutes per week. A diet of 50% carbohydrates, 25% protein, and 25% fat was prescribed. After 10 weeks, subjects returned and repeated all tests.

Serving Size 2 Capsules Servings Per Container 45		
Amount Per Serving		**% DV**
Vitamin D	400.00 IU	100%
Zinc (as Zinc Citrate)	30.00 mg	200%
Iron Test Blend	1350.00 mg	**
Arginine Nitrate D-Aspartic Acid Fenugreek (Trigonella Feonum Greacum) Seed Extract (50% Saponins) Indole-3-Carbinol Boron		**
** Daily Value (DV) not established		

Other Ingredients: Gelatin, Magnesium Stearate, Microcrystalline Cellulose, Silicon Dioxide, Citric Acid

Blood Draws

Blood was taken via venipuncture by a trained phlebotomist at the blood testing facility. Samples were taken before and after the 10 week supplementation period at the same time in the morning to avoid diurnal variations. Variables analyzed included: testosterone, estrogen, cortisol, white blood cell count (WBC), red blood cell count (RBC), hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red blood cell distribution width (RDW), platelets (percent and absolute), neutrophils (percent and absolute), lymphocytes (percent and absolute), monocytes (percent and absolute), eosinophils (percent and absolute), basophils (percent and absolute), serum glucose, blood urea nitrogen (BUN), creatinine, eGFR, BUN:creatinine, sodium, potassium, chloride, carbon dioxide, calcium, protein, albumin, globulin, albumin:globulin ratio (A/G ratio), bilirubin, alkaline phosphatase, aspartate aminotransferase (AST), alanine aminotransferase (ALT)., total cholesterol, triglycerides, high density lipoprotein (HDL), and low density lipoprotein (LDL).

RESULTS

Table 1. Complete blood count variables pre and post supplementation.

Variable	Treatment	PRE	POST	Delta	Reference Interval
WBC (x10E3/uL)	PLA	5.5±1.1	5.6±1.3	0.1±1.4	3.4 - 10.8
	TB	6.2±1.5	5.8±1.2	-0.4±1.0	
p-value		0.38			
RBC (x10E6/uL)	PLA	5.2±0.19	5.3±0.21	0.06±0.23	4.14 - 5.80
	TB	5.5±0.21	5.4±0.32	-0.04±0.18	
p-value		0.32			
Hemoglobin (g/dL)	PLA	16.1±0.49	16.2±0.83	0.04±0.66	12.6 - 17.7
	TB	16.6±0.92	16.4±1.1	-0.14±0.61	
p-value		0.56			
Hematocrit (%)	PLA	47.3±1.1	47.7±2.0	0.34±2.2	37.5 - 51.0
	TB	49.0±2.0	48.6±2.7	-0.33±1.4	
p-value		0.44			
MCV (fL)	PLA	90.4±2.6	89.9±2.9	-0.50±1.1	79 - 97
	TB	89.4±1.8	89.7±2.6	0.3±2.6	
p-value		0.43			
MCH (pg)	PLA	30.8±1.2	30.5±1.2	-0.30±0.49	26.6 - 33.0
	TB	30.3±0.72	30.3±0.74	-0.05±0.73	
p-value		0.42			
MCHC (g/dL)	PLA	34.0±0.74	33.9±0.68	-0.18±0.51	31.5 - 35.7
	TB	33.9±0.86	33.8±0.75	-0.06±0.98	
p-value		0.77			
RDW (%)	PLA	13.7±0.59	13.4±0.56	-0.30±0.66	12.3 - 15.4
	TB	13.8±1.1	13.5±0.46	-0.31±0.87	
p-value		0.98			
Platelets (x10E3/uL)	PLA	240.0±45.8	232.0±28.6	-8.0±19.8	155 - 379
	TB	263.5±54.6	251.2±54.5	-12.3±19.62	
p-value		0.65			
Neutrophils (%)	PLA	54.1±12.8	54.3±6.2	0.13±11.9	40 - 74
	TB	53.6±8.2	52.6±7.2	-1.0±6.1	
p-value		0.80			
Lymphs (%)	PLA	35.5±11.9	35.3±6.1	-0.25±10.0	14 - 46
	TB	32.8±7.4	34.5±6.9	1.7±6.7	
p-value		0.63			
Monocytes (%)	PLA	8.3±2.1	8.0±2.0	-0.25±1.4	4 - 12
	TB	9.7±1.9	8.9±1.3	0.80±1.6	
p-value		0.46			
Eos (%)	PLA	1.9±1.6	2.1±1.0	0.25±1.0	0 - 5
	TB	3.1±1.3	3.4±1.5	0.30±1.1	
p-value		0.92			
Basos (%)	PLA	0.25±0.46	0.38±0.52	0.13±0.64	0 - 3
	TB	0.50±0.71	0.60±0.70	0.10±0.57	
p-value		0.93			
Neutrophils (Absolute) (x10E3/uL)	PLA	3.1±1.3	3.1±0.90	0.02±1.53	1.4 - 7.0
	TB	3.3±0.88	3.0±0.78	-0.26±0.74	
p-value		0.61			
Lymphs (Absolute) (x10E3/uL)	PLA	1.89±0.61	2.0±0.52	0.08±0.24	0.7 - 3.1
	TB	2.05±0.72	2.0±0.53	-0.06±0.53	
p-value		0.51			
Monocytes (Absolute) (x10E3/uL)	PLA	0.45±0.12	0.45±0.12	0.00±0.11	0.1 - 0.9
	TB	0.58±0.16	0.52±0.14	-0.06±0.13	
p-value		0.32			
Eos (Absolute) (x10E3/uL)	PLA	0.11±0.08	0.13±0.05	0.01±0.06	0.0 - 0.4
	TB	0.19±0.10	0.19±0.12	0.00±0.07	
p-value		0.69			
Baso (Absolute) (x10E3/uL)	PLA	0.00±0.00	0.00±0.00	0.00±0.00	0.0 - 0.2
	TB	0.01±0.03	0.01±0.03	0.00±0.00	
p-value		no variance			

Table 2. Complete metabolic profile variables pre and post supplementation.

Variable	Treatment	PRE	POST	Delta	Reference Interval
Serum Glucose (mg/dL)	PLA	90.3±6.3	88.1±7.3	-2.1±2.2	65 - 99
	TB	87.8±6.2	88.5±7.1	0.70±11.9	
p-value		0.52			
BUN (mg/dL)	PLA	15.0±2.9	17.8±3.5	2.8±5.0	6 - 20
	TB	16.8±7.1	18.9±4.6	2.1±4.6	
p-value		0.78			
Serum Creatinine (mg/dL)	PLA	1.1±0.13	1.0±0.16	-0.14±0.06	0.76 - 1.27
	TB	1.1±0.16	0.96±0.13	-0.14±0.09	
p-value		0.82			
eGFR (mL/min/1.73)	PLA	88.1±13.1	101.8±16.2	13.6±7.6	>59
	TB	93.8±20.8	108.5±15.2	14.7±11.6	
p-value		0.82			
BUN/Creatinine Ratio	PLA	13.3±2.9	18.4±5.7	5.1±5.7	8 - 19
	TB	15.1±5.2	19.8±4.8	4.7±3.3	
p-value		0.76			
Serum Sodium (mmol/L)	PLA	139.1±1.4	138.0±1.01	-1.1±1.5	134 - 144
	TB	138.2±1.5	138.9±2.1	0.7±2.5	
p-value		0.09			
Serum Potassium (mmol/L)	PLA	4.4±0.41	4.3±0.25	-0.11±0.26	3.5 - 5.2
	TB	4.3±0.31	4.3±0.18	-0.06±0.25	
p-value		0.67			
Serum Chloride (mmol/L)	PLA	102.9±1.1	101.9±1.9	-1.0±2.3	97 - 108
	TB	101.6±2.1	103.3±1.8	1.7±2.3	
p-value		0.02*			
Carbon Dioxide (mmol/L)	PLA	21.6±1.9	21.5±1.6	-0.13±1.5	19 - 28
	TB	20.3±2.6	21.6±1.3	1.3±2.7	
p-value		0.20			
Serum Calcium (mg/dL)	PLA	9.6±0.38	9.2±0.43	-0.43±0.28	8.7 - 10.2
	TB	9.7±0.37	9.3±0.39	-0.45±0.25	
p-value		0.84			
Serum Protein (g/dL)	PLA	7.2±0.25	7.2±0.45	-0.04±0.36	6.0 - 8.5
	TB	7.3±0.52	7.1±0.51	-0.15±0.30	
p-value		0.48			
Serum Albumin (g/dL)	PLA	4.5±0.19	4.6±0.38	0.06±0.28	3.5 - 5.5
	TB	4.5±0.31	4.6±0.30	0.10±0.22	
p-value		0.75			
Globulin (g/dL)	PLA	2.7±0.32	2.6±0.28	-0.10±0.24	1.5 - 4.5
	TB	2.7±0.38	2.5±0.26	-0.25±0.24	
p-value		0.21			
Albumin:Globulin Ratio	PLA	1.7±0.24	1.8±0.27	0.10±0.17	1.1 - 2.5
	TB	1.7±0.25	1.9±0.14	0.22±0.15	
p-value		0.14			
Bilirubin (mg/dl)	PLA	0.95±0.68	0.76±0.48	-0.20±0.19	0.0 - 1.2
	TB	0.67±0.32	0.47±0.19	-0.19±0.35	
p-value		0.92			
Alkaline Phosphatase (IU/L)	PLA	68.8±18.8	75.4±16.6	6.6±5.7	39 - 117
	TB	82.6±20.2	94.5±17.5	11.9±10.1	
p-value		0.21			
AST (IU/L)	PLA	26.0±13.9	28.5±14.7	2.5±8.2	0 - 40
	TB	24.1±9.0	24.6±7.5	0.50±5.1	
p-value		0.53			
ALT (IU/L)	PLA	22.8±11.9	23.8±12.4	1.0±5.1	0 - 44
	TB	28.9±7.2	26.7±10.2	-2.2±10.1	
p-value		0.43			

Table 3. Vital signs and lipid variables pre and post supplementation.

Variable	Treatment	PRE	POST	Delta	Reference Interval
Systolic BP (mm Hg)	PLA	127.5±10.7	126.6±8.3	-0.9±8.0	90 - 120
	TB	121.1±9.6	121.4±15.2	0.3±10.6	
p-value		0.80			
Diastolic BP (mm Hg)	PLA	73.6±8.4	76.6±9.5	3.0±11.3	60 - 80
	TB	69.3±9.5	73.3±12.0	4.0±5.6	
p-value		0.81			
Heart Rate (BPM)	PLA	66.5±8.0	69.0±17.0	2.5±15.1	< 100
	TB	65.0±5.9	65.4±12.7	0.4±11.4	
p-value		0.74			
Total Cholesterol (mg/dL)	PLA	155.9±22.1	161.3±15.6	5.4±15.4	100 - 189
	TB	151.9±22.0	154.7±28.6	2.8±14.5	
p-value		0.72			
Triglycerides (mg/dL)	PLA	75.4±30.0	75.6±29.1	0.3±24.2	0 - 114
	TB	69.8±14.1	81.2±20.3	11.4±24.4	
p-value		0.35			
HDL (mg/dL)	PLA	55.0±10.8	54.5±9.9	-0.5±3.2	> 39
	TB	54.7±12.1	50.8±10.7	-3.9±5.7	
p-value		0.15			
LDL (mg/dL)	PLA	85.8±14.4	91.5±14.1	5.8±13.6	0 - 119
	TB	83.2±22.7	87.6±29.4	4.4±11.4	
p-value		0.82			
VLDL (mg/dL)	PLA	15.1±6.0	15.3±5.7	0.13±4.4	5 - 40
	TB	14.0±2.7	16.3±3.9	2.3±4.4	
p-value		0.31			

Table 4. Hormone variables pre and post supplementation.

Variable	Group	Pre	Post	p
Total Testosterone (ng/dL)	PLA	681.1±174.8	612.4±153.8	0.55
	TB	618.3±220.5	609.4±153.1	
Free Testosterone (pg/mL)	PLA	12.0±5.2	9.0±2.3	0.46
	TB	12.5±6.5	10.5±3.1	
Estrogens (pg/mL)	PLA	114.8±39.5	111.3±30.3	0.017*
	TB	124.0±35.9	97.9±25.3	
Cortisol (µg/dL)	PLA	16.4±4.4	15.2±4.4	0.016*
	TB	20.5±4.0	16.6±3.9	

Figure Legend:

PLA = placebo (n=8); TB = Testosterone-boosting supplement (n=10). Data are reported as means ± SD. *Different from PLA ($p < 0.05$)

CONCLUSIONS

No blood markers changed to reach clinically significant levels after 10 weeks of consumption of a testosterone-boosting supplement. Also, estrogen and cortisol levels decreased significantly compared to placebo. Due to the hormonal changes induced by the supplement, chronic consumption may result in a hormonal milieu favorable to improved body composition and performance in trained individuals.

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