Enhanced Weight Loss From a Dietary Supplement Containing Standardized Phaseolus vulgaris Extract in Overweight Men and Women

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ABSTRACT

One billion human adults worldwide are overweight and, thus, more prone to develop cardiovascular diseases, diabetes, and a variety of other chronic contidions. . Dietary supplements that inhibit gastrointestinal amylase are referred to as "starch blockers," and have been associated with weight loss. Starch blockers may promote weight loss by interfering with breakdown of complex carbohydrates (CHO), limiting their immediate gastrointestinal absorption. Such a process could lessen caloric intake, augment distal CHO fermentation, and/or enhance insulin sensitivity to account for weight loss. The present study examines a dietary supplement given three times per day containing 1,000 mg of Phaseolus vulgaris extract derived from the white kidney bean. This extract has previously been shown to inhibit the activity of the digestive enzyme alpha amylase and inhibit starch reabsorption so as to be associated with weight loss. In China, a randomized, double-blinded, placebo-controlled study was conducted on 101 volunteers with a BMI between 25-40. The volunteers were divided into two groups that received either placebo or the active substance. Two capsules containing Phaseolus vulgaris extract (1,000 mg) or placebo were taken 15 minutes before each meal for 60 consecutive days. Body weights, waist and hip measurements and blood for chemical analysis were obtained. After 60 days, 51 subjects receiving Phaseolus vulgaris extract compared to a placebo group of 50 subjects had clinical and statistically significantly greater average reduction of body weight (-1.9Kg vs. -0.4Kg, kelli, stet pervious correction. Not sure we have the all of these fonts, so if not,

just use traditional parentheses ($p<0.001$)] and waist circumference [-1.9cm vs. -0.4cm, ($p<0.001$)], but no difference in the changes of average hip circumference [-0.3cm vs. -0.3cm, ($p=0.84$)]. The results indicate that Phaseolus vulgaris extract taken under the conditions of this study produces clinically and statistically significant decrements in body weight and waist circumference.

INTRODUCTION

It is generally recognized that overweight and obesity have reached epidemic proportions. The proof lies in the fact that there are over one billion overweight/obese adults throughout the world according to many sources including the World Health Organization (WHO) [1-4].please make all references superscript Strategies to lose body fat typically involve a combination of dietary changes limiting caloric intake, physical activity, behavioral therapy, pharmacotherapy, and, in extreme cases, surgery[5]. Since many prefer a natural approach using dietary means to reverse fat accumulation, the availability and popularity of new dietary regimens, and natural dietary supplements haverisen dramatically in recent years[6,7].

Seeking a safe, easy-to-follow, and effective remedy, many patients have turned to diets proportionately low in refined carbohydrates (CHO) [8-10]. This is based upon continual emergence of data supporting a positive correlation between high refined CHO intake and obesity [11]. Diets possessing stringent depletion of dietary CHO have been tried and shown some success [11]. However, problems arise from usage. Many individuals find such diets unpalatable, while others fear the substitution of too much fat for the missing CHO will increase cardiovascular risk factors. If CHO must remain in the diet for the sake of palatability and the need to lessen fat intake, one alternative is to reduce the gastrointestinal absorption of CHO. Starch blockers are believed to promote weight loss by interfering with and slowing the breakdown of complex CHO, thereby reducing the digestive availability of CHO-derived calories, augmenting distal CHO fermentation, and/or favorably influencing the glucose-insulin system [12-14].

The present paper reports findings from a randomized, double-blinded, placebo-controlled investigation in which body weights of generally healthy, overweight human volunteers in China were examined before and after 30 and 60 days of oral treatment with placebo or a starch blocker produced from white beans. While the rationale seems simple, what appears to be a sound hypothesis remains an elusive one to prove. Conclusive, difficult-to-refute results concerning the inhibitory and/or hypoglycemic effects of a bean extract starch blocker are limited and sometimes difficult to interpret [12,13,15-22].

METHODS

Subject Selection

The present study is a randomized, double-blinded, and placebo-controlled investigation carried out with IRB approval from the College of Biosystems Engineering and Food Science, Zhejiang University, China. A total of 101 subjects (50 in the Placebo group and 51 in the Active group) were recruited in Hangzhou, China, according to the following inclusion criteria. The healthy subjects, between 20 and 50 years of age, possessed a BMI between 25-40. Subjects were not undergoing any other treatment and had the ability and willingness to understand informed consent and to comply with study procedures. Exclusion criteria included the presence of the following health conditions: diabetes, pregnancy or lactation, active invasive malignant carcinoma, hypertension and/or cardiovascular diseases, hepatic perturbations, renal damage, and severe allergies.

Active Product

The active substance to be tested was delivered in two capsules containing approximately 1,000mg of Phase 2 Starch Neutralizer, a dried aqueous extract of the common bean Phaseolus vulgaris. Phase 2 had been standardized to a minimum of 3000 AAlU (alpha-amylase inhibiting units), validated by a modified USP method (SOP 110, Rev.).

Table 1: *Body Weight and Measurement*

	Placebo	Active	p
Scale Weight (Kg)			
Baseline	81.3 ± 1.7	79.2 ± 1.6	0.38
Delta (Month 1- Baseline)	-0.2 ± 0.12	-1.1 ± 0.10	<0.001
Delta (Month 2-Baseline)	-0.4 ± 0.13	-1.9 ± 0.15	<0.001
BMI (Kg/m2)			
Baseline	28.6 ± 0.4	28.6 ± 0.4	1.00
Delta (Month 1- Baseline)	-0.06± 0.04	-0.39± 0.04	<0.001
Delta (Month 2-Baseline)	-0.15 ± 0.06	-0.70 ± 0.05	<0.001
Waist Measurement (cm)			
Baseline	96.9 ± 1.4	95.9 ± 1.5	0.63
Delta (Month 1- Baseline)	-0.4 ± 0.24	-1.2 ± 0.21	0.01
Delta (Month 2-Baseline)	-0.4 ± 0.26	-1.9 ± 0.32	<0.001
Hip Measurement (cm)			
Baseline	106.8 ± 1.2	106.9 ± 1.3	0.95
Delta (Month 1- Baseline)	-0.2 ± 0.15	-0.3 ± 0.23	0.68
Delta (Month 2-Baseline)	-0.3 ± 0.17	-0.3 ± 0.24	0.84

Average ±SEM is shown

The control substance was two capsules containing microcrystalline cellulose (MCC) containing a similar volume and with the same appearance of the active capsule.

Measurements

Body weight, waist and hip circumferences, and blood chemistry values were measured at the beginning, at 30 days, and at the end of the 60-day treatment phase. BMI was calculated taking weight and height into consideration.

Body Weight

Body weights, performed on lightly dressed individuals, were measured using a single, common scale.

Waist and Hip Circumferences

The respective circumference of the waist and hips was measured using a standard non-stretchable flexible measuring tape. Temporary marks were used to identify the area of reference from one reading to the next.

Adverse Side Effects

The study staff monitored subjects throughout the investigation for the occurrence of any adverse side effects.

Statistical Analysis

At completion, data from 51 subjects receiving the active supplement and 50 subjects receiving the placebo were available for statistical analysis. For each subject, the differences between pre-treatment (baseline) and post-treatment (30 and 60-day) values for each parameter (body weight, waist, and hip measurements.) were calculated. The differences were always obtained by subtracting the 30 or 60-day values from the baseline values. A negative difference indicates a reduction in the parameter after 30 or 60 days. Conversely, a positive difference indicates an increase in that parameter. This approach allowed test variability to remain low and the statistical analysis to be more powerful. The differences between pretreatment and 30 and 60-day values were analyzed using Student's t-test. Differences between the Placebo and Active group at each time point

***Table 2**: Gender Data for Weight Loss*

	Active	Placebo
Males	-1.98±0.22 (24)	-0.40±0.17 (31)
Females	-1.88±0.21 (27)	-0.40±0.21 (19)

Ave±SEM depicted
Number in parentheses indicate number of subjects in category

were assessed by Student's t test.

RESULTS

The Active and Placebo groups were not statically significantly different in starting weight [79.2 Kg±1.6 (SEM) vs. 81.3 Kg±1.7 (SEM)], height [166.1 cm±1.0 (SEM) vs. 168.1cm±1.1 (SEM)], BMI [28.6 Kg/m2 ±0.4 (SEM) vs. 28.6 Kg/m2±0.4 (SEM)], and age [38.1 years ±1.7 (SEM) vs. 39.1 years±1.8 (SEM)]. Considering gender, the distribution between Active and Placebo was 27F/24M vs. 19F/31M.

Subjects in the Active group lost significantly more body weight and waist measurement at both month 1 and 2 than the Placebo group (Table 1). Corresponding with scale weight, the BMI decreased significantly more after the first and second month in the Active group when compared to the Placebo group. Hip measurement did not change significantly over the two months of study.

No significant adverse events were reported. Forty-seven of 51 subjects in the Active group lost weight (92%) after 2 months, compared to 31 in the Placebo group (62%). The average weight loss in the Active group was 1.9 kg compare to a 0.4 kg loss in the Placebo group ($p<0.001$). There were a lesser percentage of females in the Placebo group (38%) than in the Active group (53%). However, when the weight changes were assessed according to gender, it was found that weight changes were comparable between females and males (Table 2).

The waist size decreased significantly more in the Active group (-1.9cm vs. -0.4cm, $p <0.001$), while there were no significant differences in hip size changes between the Active and Placebo groups.

Table 3 gives the blood chemistry values from baseline to one and two months. In general, the chemistries did not change markedly over two months, and there were no statistically significant differences between the Active and the Placebo groups with only two exceptions. Creatinine values at one month were higher in the Active compared to the Placebo group, and the GPT levels averaged lower in the Active than Placebo group. However, these differences were not statistically significant in the two-month values.

DISCUSSION

Continual emergence of data supporting a positive correlation between excess refined CHO intake and obesity has made many investigators seek more practical means to duplicate results found with the stringent depletion of CHO in the diet [11]. One alternative is use of natural dietary supplements that can considerably lessen starch and sugar absorption,– thus, mimicking low CHO diets. Ingredients causing such a phenomenon are often referred to as "starch or CHO blockers." We have previously shown in rat and pig models the ability of so-called CHO blockers to prevent early absorption of rice starch and sucrose [23,24]. Perhaps the best known of the starch blockers is an extract from bean [12,13,15-22].

The mechanism behind the weight loss associated with the taking of a bean extract relies on alpha-amylase-inhibiting activity [25-29]. Phaseolus vulgaris extract has been shown in vitro to inhibit the activity of alpha-amylase and may help promote weight loss by interfering with the digestion of complex CHO to simple, absorbable sugars, potentially reducing carbohydrate-derived calories [12,13]. Before crossing the intestinal

Table 3: *Blood Chemisties at Different Time Points*

Blood Test	Group	Baseline	One Month	Two Months
Glucose (mmol/l)	Pl	5.0±0.10	4.8±0.10	4.7±0.10
	A	4.9±0.08	4.7±0.08	4.8±0.11
	P value	0.53	0.85	0.36
BUN (mmol/l)	Pl	4.5±0.18	4.6±0.18	5.4±0.21
	A	4.6±0.24	5.2±0.24	4.9±0.18
	P value	0.62	0.60	0.60
Creatinine (umol/l)	Pl	70.3±2.5	74.7±3.3	82.2±2.2
	A	75.5±2.5	86.4±2.7	85.5±2.7
	P value	0.15	0.01	0.34
Uric Acid (mmol/l)	Pl	218±10.9	248±9.8	226±10.1
	A	239±10.5	236±8.8	225±9.0
	P value	0.17	0.36	0.94
T Chol (mmol/l)	Pl	4.9±0.09	4.6±0.09	4.7±0.09
	A	4.9±0.08	4.6±0.08	4.7±0.08
	P value	0.88	0.84	0.53
LDL (mmol/l)	Pl	3.4±0.09	3.4±0.07	3.4±0.
	A	3.4±0.10	3.3±0.07	3.4±0.08
	P value	0.76	0.44	0.99
HDL (mmol/l)	Pl	1.4±0.04	1.4±0.04	1.4±0.04
	A	1.5±0.06	1.5±0.04	1.5±0.04
	P value	0.49	0.49	0.13
Trigly (mmol/l)	Pl	1.7±0.11	1.5±0.09	1.5±0.09
	A	1.7±0.18	1.5±0.13	1.5±0.10
	P value	0.95	0.29	0.34
Apo A (mmol/l)	Pl	1.4±0.03	1.4±0.03	1.4±0.03
	A	1.4±0.03	1.4±0.03	1.4±0.03
	P value	0.57	0.41	0.78
Apo B (mmol/l)	Pl	1.2±0.03	1.2±0.03	1.2±0
	A	1.2±0.03	1.2±0.03	1.2±0.03
	P value	0.75	0.71	0.19
GPT (U/l)	Pl	42.5±2.5	40.7±1.5	35.8±1.8
	Pl	41.1±1.9	35.3±1.4	32.4±1.3
	P value	0.66	0.01	0.12
AAT (U/l)	Pl	41.4±1.8	37.4±1.5	32.4±1.4
	A	42.9±1.6	37.8±1.5	31.9±1.4
	P value	0.52	0.86	0.79
GIT (U/l)	Pl	37.5±2.5	35.2±3.3	30.6±2.2
	A	38.8±2.5	39.0±2.7	32.8±2.7
	P value	0.61	0.08	0.19

Values are in SI units. Average + SEM is shown. P value is for difference between placebo and active at indicated time point.

BUN=blood urea nitrogen, T Chol= total cholesterol, Trigly=triglycerides, Apo A – apoliprotein A, Apo B= apolipoprotein B, GPT=glutamate pyruvate transaminase, AAT=aspartate aminotransferase, GIT= glutamyltranspeptidase

wall, all complex CHO (ie,, starches) must be hydrolyzed to their monosaccharide units, in most cases glucose [30]. There are several enzymes involved in this process -- alpha-amylase present in saliva and pancreatic juice, which converts complex CHO into oligosaccharides, and various other enzymes (maltase, lactase, etc.) present in the brush border of the small intestine that convert these oligosaccharides to monosaccharides that can then be absorbed.

Unfortunately, data relating starch blockers to weight loss are scarce, and those that exist do not always present positive correlations. Earlier studies in the 1980's produced poor results now attributed to insufficient alpha amylase activity in the preparations used at that time [12,13,15-18]. Obviously, the bean extract possessing a greater anti-amylase activity used in starch blocking is very important. In 2007, a dietary formula containing 445 mg of a bean extract taken daily by overweight human subjects concurrently with a carbohydrate-rich, 2,000- to 2,200-calorie diet was more effective at reducing body weight and body fat mass than placebo [22]. This positive study was carried out with well-studied bean extract named Phase 2. Chokshi noted that Phase 2 is prepared using thermoprocessing conditions to substantially inactivate hemagglutinating activity and trypsin inhibitory activity while preserving substantial alpha-amylase inhibition activity [31,32]. Meiss fed Phase 2 bean extract for 30 days and found a 4% decrease in body weight, accompanied by a 10-45% reduction in body fat [33]. Using the same bean extract, Udani et al. [21] reported reduced body weights and serum triglycerides in 14 obese adults receiving 1,500 mg of Phaseolus vulgaris extract (Phase 2TM) twice daily. However, other dose levels were less effective in their study [21].

The present study adds further credibility to the capability of Phase 2 to cause weight loss. After 2 months of receiving 1 gram of Phase 2 three times a day, the Active group lost -1.9 kg vs. -0.4kg in the placebo group after 2 months. BMI deceases significantly more in the Active group. While baseline values were fairly consistent between the Active and Placebo groups, there were fewer females in the Placebo group. Examining the weight changes separately in each group as depicted in table 2 showed virtually the same changes in each gender as the overall results.

In examining so-called "weight loss studies," current reports have repeatedly emphasized that the weight loss is only beneficial if it involves principally fat loss, not muscle loss [34]. Although no direct measurements of fat mass were made in the present study, the fact that waist size decreased significantly more in the Active group compared to the Placebo group (-1.9cm vs. -0.4cm), whereas, there were no significant differences in hip size suggests that fat loss played a major role in the weight changes.

In conclusion, use of CHO blockers may prove useful in allowing more CHO to be present in the diet and yet obtain results similar to those in diets now severely restricted in CHO [21,33,35,36].

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Drs. Wu, Xu, and Shen designed the study that was carried it out in China. Drs. Preuss and Perricone analyzed the data and wrote the manuscript.

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