



# ANALYSIS OF THE SAFETY OF THE CURVES™ FITNESS AND WEIGHT LOSS PROGRAM HIGH PROTEIN DIETS



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## Abstract

**PURPOSE:** Ketogenic diets are believed to promote weight loss by suppressing appetite, promoting lipolysis, sparing muscle mass, and maintaining energy expenditure. However, these diets have been criticized because some fear they may lead to excessive elevations in ketone bodies, increase kidney and liver stress, promote calcium and bone loss, and/or increase blood lipids. This study examined the effects of following the Curves moderate and high protein diets on ketone production, markers of renal and liver function, and blood lipids.

**METHODS:** 154 sedentary women (38.8±8 yr; 94.3±19 kg; 43.8±3.5 % body fat) participated in a 14-wk exercise and diet program. Subjects were assigned to an exercise and no diet group (E+ND); an exercise and high mixed calorie diet group (HCD); or, a low calorie high carbohydrate (HCHO), high protein (HP), or very high protein (VHP) diet. The diets involved consuming 1,200 kcal/d for 2-wks followed by ingesting 1,600 kcal/d for 8 wks. Subjects then ingested 2,600 kcal/d and 1,200 kcal diet at 3/2, 3/2, 5/2, & 10/0 day intervals, respectively, in an attempt to maintain weight loss. Diets were standardized with 30% dietary fat with carbohydrate intake ranging from 40-55% on the HCD and HCHO diets and protein intake ranging from 50-63% (~2.0 – 2.4 g/kg/d) on the HP and VHP diets. Subjects participated in a supervised Curves 30-min resistance training circuit program that was interspersed with calisthenic exercises and performed 3-d per week. At 0, 2, 10, 10.4 and 14 weeks, subjects donated fasting blood samples, had DEXA whole body bone density determined, and completed a food satisfaction inventory. Data were analyzed by repeated measures ANOVA and Pearson Product correlations.

**RESULTS:** Serum  $\beta$ -hydroxybutyrate levels significantly increased from baseline values ( $p<0.002$ ) in the HP and VHP diets by 56±88% and 54±98%, respectively, after two weeks of dieting at 1,200 kcal/d but returned to near baseline levels thereafter with no differences observed among groups at week 10, 10.4 or 14. No significant interactions were observed among groups in creatinine, BUN, uric acid, total protein, AST, ALT, GGT, LDH, GGT, total cholesterol, HDL, LDL, calcium, alkaline phosphatase, or bone mineral content. Changes in  $\beta$ -hydroxybutyrate at 2-weeks significantly correlated with changes in weight ( $r=-0.24$ ,  $p=0.002$ ), leptin ( $r=-0.18$ ,  $p=0.05$ ), glucose ( $r=-0.17$ ,  $p=0.03$ ), CK ( $r=-0.15$ ,  $p=0.05$ ), appetite ( $r=-0.18$ ,  $p=0.02$ ), and hunger ( $r=-0.16$ ,  $p=0.04$ ). **CONCLUSION:** The moderate and high protein Curves diets appear to be well tolerated and do not adversely affect health status.

(Sponsored by Curves International, Waco, TX)

## Rationale

The Curves fitness and weight loss program has become a very popular means of promoting health and fitness among women. The program involves a 30-minute circuit training

program and a weight management program involving periods of moderate caloric restriction (1,200 to 1,600 calories per day) followed by short periods of higher caloric intake (2,600 calories per day). The program is designed to promote a gradual reduction in body fat while increasing strength and fitness. Although the program has been based on sound rationale, the effects of following this program have not been studied. The purpose of this study is to examine the safety of the adhering to the Curves high protein diets in sedentary overweight females.

## Experimental Design

### Subjects

- 154 sedentary women (38.8±8 yr; 94.3±19 kg; 43.8±3.5 % body fat) participated in a 14-wk exercise and diet program.
- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with the human subject's guidelines of Baylor University.
- Testing sessions were performed at 0, 2, 10, 10.4 & 14 weeks to examine the effects of the Curves diet and exercise program.

### Diet Protocol

- Based on baseline testing, subjects were randomly assigned to one of the following groups:
  - an exercise and no diet group (ND+E);
  - an exercise and high calorie mixed diet (2,600 kcals/d for 2 wks at 55% C, 15% P, 30% F; 8 wks at 40% C, 30% P, 30% F; 4 wks at 55% C, 15% P, 30% F) group (HCD+E);
  - a low calorie high carbohydrate group (LC-HCHO+E);
  - a low calorie high protein group (LC-HP+E); or,
  - a low calorie very high protein (LC-VHP+E) diet group.
- The diets involved consuming 1,200 kcal/d for 2-wks and 1,600 kcal/d for 8 wks. Subjects then ingested 2,600 kcal/d and 1,200 kcal diet at 3/2, 3/2, 5/2, & 10/0 day intervals in an attempt to maintain weight loss and REE.
- Diets were standardized with 30% dietary fat with carbohydrate intake ranging from 40-55% on the HCD+E and LC-HCHO+E diets and protein intake ranging from 50-63% on the LC-HP+E and LC-VHP+E diets.

### Training

- Subjects participated in a supervised 30-min resistance training circuit program that was interspersed with calisthenic exercises and performed 3-d per week at the Baylor University Student Life Center.

## Methods & Procedures

- Fasting blood samples were obtained at 0, 2, 10, 10.4 & 14 weeks.
- Serum  $\beta$ -hydroxybutyrate levels were measured using a GM7 Micro-Stat Analyser (Analox Instruments; London, UK).
- Serum and whole blood samples were also analyzed by Quest Diagnostics for the all other variables examined in this study.

## Statistical Analysis

- Data were analyzed by repeated measures ANOVA and Pearson Product correlation analysis using SAS for Windows version 8.2 software (Cary, NC) and are presented as means  $\pm$  SD from baseline for each diet group.

## Results

- The HP and VHP diets resulted in a significant increase in serum  $\beta$ -hydroxybutyrate levels 56±88% and 54±98%, respectively, following two weeks of dieting.
- Despite the significant elevations, the serum  $\beta$ -hydroxybutyrate levels returned to near baseline values and showed no significant difference among groups at weeks 10, 10.4, and/or 14.
- The levels of serum  $\beta$ -hydroxybutyrate were not significantly interacted with the observed variables creatinine, BUN, uric acid, total protein, AST, ALT, GGT, LDH, GGT, total cholesterol, HDL, LDL, calcium, alkaline phosphatase, or bone mineral content among groups.

## Conclusions

- The data from this study suggests that the moderate (HP) and high protein (VHP) used by Curves International, Inc. appears to be well tolerated and do not adversely affect health status of this subject population.

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