ACUTE EFFECTS OF INGESTING A HIGH CARBOHYDRATE AND HIGH PROTEIN HYPOCALORIC DIET ON BODY MASS, BODY COMPOSITION, AND RESTING ENERGY EXPENDITURE IN OBESE FEMALES

Exercise and Sport Nutrition Laboratory, Department of HHPR, Baylor University, Waco, TX 76798-7313.

Abstract

The purpose of this study was: 1.) to determine the acute changes in energy expenditure, body composition, and body water during one week of hypocaloric dieting; and 2.) to determine whether ingesting hypocaloric diets with higher proportions of carbohydrate or protein affect acute weight loss parameters. METHODS: 97 sedentary, obese women (41.4±11 yrs, 164.1±7 cm, 98.2±18.4 kg, 45.2±4.6% body fat) were randomized to consume either a normal diet (control, n=14) or a higher carbohydrate (% CHO: PRO: FAT: n=43) or higher protein (% CHO: PRO: FAT: n=40) hypocaloric diet (1,000 kcal/day) for a 7-day period. Subjects were given prescribed diets developed by a registered dietician in order to provide the desired macronutrient and caloric intake. Participants reported for testing sessions in a fasted state at the same time of day on days 0, 2, 3, 4, and 7 of dieting to determine changes in body mass, body composition using DEXA, body water using multi-frequency BIA, and REE assessed using indirect calorimetry. Data were analyzed by repeated measures ANOVA and reported as delta values (post – pre values) for the hypocaloric (HYPO) diet groups and control (CON) group, respectively. RESULTS: When compared to CON, subjects maintaining the hypocaloric diet experienced significant reductions in body mass, body water, fat mass, fat-free mass, body fat, and lean mass. Respiratory exchange ratio decreased in both groups to reflect a more preferential oxidation of fat when compared to baseline data. These findings indicate that acute dieting decreases REE and promotes loss of body mass, body water, fat mass, and lean mass. However, the macronutrient content of the hypocaloric diet does not affect acute energy expenditure. Percent body fat did not significantly change over time and were not different among types of diet suggesting similar percent reductions in fat mass and lean mass. Respiratory exchange ratio decreased in both groups to reflect a more preferential oxidation of fat when compared to baseline data. These findings indicate that acute dieting decreases REE. Body composition was determined using DEXA (Hologic 1700• Discovery W). Energy expenditure and substrate oxidation was determined using indirect calorimetry.

Rationale

Previous research has indicated that short-term dieting reduces resting energy expenditure (REE) and promotes weight loss primarily from loss of fat mass. However, the influence of dietary carbohydrate and protein on acute weight loss parameters and metabolism is unclear. The purpose of this study was to examine the effect of a hypocaloric diet with either a high carbohydrate diet or high protein diet on acute changes in body mass, body water, fat mass, and fat-free mass. The study hypothesis is that acute dieting decreases REE and promotes loss of body mass, body water, fat mass, and lean mass. However, the macronutrient content of the hypocaloric diet does not affect acute energy expenditure. Percent body fat did not significantly change over time and were not different among types of diet suggesting similar percent reductions in fat mass and lean mass.

Subjects

- 97 sedentary, obese women completed all testing.
- Subjects were descriptively described as 41.4±11 yrs, 164.1±7 cm, 98.2±18.4 kg, 45.2±4.6% body fat.
- Subjects signed informed consent statements in compliance with the Human Subjects Guidelines of Baylor University and the American College of Sports Medicine.
- All subjects were free of disease, were not currently taking any prescription medications that would interfere with their study participation.

Diet Protocol

- Subjects were randomized to consume either a normal diet (control, n=14) or a higher carbohydrate (% CHO: PRO: FAT: n=43) or higher protein (% CHO: PRO: FAT: n=40) hypocaloric diet (1,000 kcal/day) for a 7-day period.
- Subjects were given prescribed diets developed by a registered dietician in order to provide the desired macronutrient and caloric intake.
- Compliance was monitored by daily interviews with all research participants and calculation of all energy and macronutrients consumed.

Baseline Testing

- Participants reported for testing sessions at the same time of day on days 0, 2, 3, 4, and 7 of dieting.
- All testing sessions were completed in a fasted state at the exact time each morning of testing.

Methods & Procedures

- Body mass was determined using a self-calibrating digital scale (±0.05 kg).
- Body water was assessed using a Xitron multi-frequency bioelectrical impedance analyzer.
- Body composition was determined using DEXA (Hologic 1700• Discovery W).
- Energy expenditure and substrate oxidation was determined using indirect calorimetry.

Experimental Design

- A 3 x 6 (Group x Testing Session) repeated measures ANOVA was used to analyze all data.
- LSD post-hoc procedures were used for any significant interaction (p<0.05) to determine differences.
- SPSS for Windows version 11.5 (SPSS Inc., Chicago, IL) statistical package with an alpha-level of 0.05 was used for all statistical analysis.
- Data are presented as means ± SD and presented as delta values (post – pre values) from baseline for both hypocaloric (HYPO) diet groups and the non-dieting control group (CON).

Statistical Analysis

Results

In comparison to non-dieting controls, subjects who followed the hypocaloric diet experienced significant reductions (p<0.05), irrespective of dietary group, in the following variables:
- Body mass (HYPO: -2.0±1.7 kg vs. CON: -0.25±0.5 kg)
- Fat mass (HYPO: -0.44±1.3 kg vs. CON: 0.22±0.8 kg)
- Fat-free mass (HYPO: -1.02±2.2 kg vs. CON: 0.23±1.5 kg), relative REE (HYPO: -0.87±1.3 kcal•kg -1•d -1 vs. CON: -0.04±1.4 kcal•kg -1•d -1), and total body water (HYPO: -1.42±1.8 L vs. CON: 0.11±1.7 L).

Conclusions

- One week of following a 1,000 kcal•d -1 diet with either a higher proportion of dietary CHO or PRO results in significant but similar reductions in body mass, fat mass, and fat-free mass. However, macronutrient content of the hypocaloric diet does not influence weight loss parameters.

Supported by Curves International, Waco, TX
EFFECTS OF INCREASED LEVELS OF ENERGY INTAKE AFTER HYPOCALORIC DIETING ON BODY MASS, BODY COMPOSITION, AND RESTING ENERGY EXPENDITURE IN OBESE FEMALES


Exercise and Sport Nutrition Laboratory, Department of HHPH, Baylor University, Waco, TX 76798-7313.

Abstract

Previous research has indicated that short-term dieting reduces resting energy expenditure (REE) and promotes weight loss primarily from fat. However, it is unclear whether the macronutrient profile influences acute weight loss and/or energy expenditure. Preferential changes in energy expenditure or body composition relative to different macronutrient ratios might help to stimulate weight loss and/or promote weight maintenance.

Rationale

A 3 x 6 (Group x Testing Session) repeated measures ANOVA was used to analyze all data.

Statistical Analysis

LSD post-hoc procedures were used for any significant interaction (p<0.05) to determine differences.

SPSS for Windows version 11.5 (SPSS Inc, Chicago, IL) statistical package with an alpha-level of 0.05 was used for all statistical analysis.

Conclusions

Hypocaloric dieting for 6-days resulted in a significant decrease in weight loss parameters when compared to a control group.

Increasing caloric intake in a stepwise fashion resulted in maintenance or continuation in weight loss parameters.

There was some evidence of a rebound in relative REE values when ingesting the 2,600 kcal•d⁻¹ diet while REE values remained lower than baseline in remaining diet groups.

These data help to identify the acute responses of body mass, body composition and energy expenditure after brief periods of hypocaloric dieting as well as progressive increases in caloric intake.

Supported by Curves International, Waco, TX

Results

As stated in the companion abstract, the 7-day hypocaloric diet intervention promoted weight loss but there were no differences between the types of diet.

After 6 days of following a hypocaloric diet, subjects experienced significant reductions (p<0.05) in comparison to the control group.

Increasing caloric intake for the next 1 days resulted in an overall maintenance or continuation of weight loss for body mass, fat mass and FFM.

Relative REE values tended to rebound in subjects consuming the 2,600 kcal•d⁻¹ diet. Results can be found in the table below.

Conclusions

Hypocaloric dieting for 6-days resulted in a significant decrease in weight loss parameters when compared to a control group.

Increasing caloric intake in a stepwise fashion resulted in maintenance or continuation in weight loss parameters.

There was some evidence of a rebound in relative REE values when ingesting the 2,600 kcal•d⁻¹ diet while REE values remained lower than baseline in remaining diet groups.

These data help to identify the acute responses of body mass, body composition and energy expenditure after brief periods of hypocaloric dieting as well as progressive increases in caloric intake.

Supported by Curves International, Waco, TX

Presented at the 2012 Academy of Nutrition and Dietetics Annual Meeting, Boston, MA.