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## Alternate day fasting (ADF) with a high-fat diet produces similar weight loss and cardio-protection as ADF with a low-fat diet

Monica C. Klempel, Cynthia M. Kroeger, Krista A. Varady\*

Department of Kinesiology and Nutrition, University of Illinois at Chicago, 1919 West Taylor Street, Room 506F, Chicago, IL, 60612

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### ABSTRACT

Alternate day fasting (ADF) with a low-fat (LF) diet is effective for weight loss and cardio-protection. However, the applicability of these findings is questionable as the majority of Americans consume a high-fat (HF) diet.

**Objective.** The goal of this study was to determine if these beneficial changes in body weight and coronary heart disease (CHD) risk can be reproduced if an HF background diet is used in place of an LF diet during ADF.

**Methods.** Thirty-two obese subjects were randomized to an ADF-HF (45% fat) or ADF-LF diet (25% fat), which consisted of two phases: 1) a 2-week baseline weight maintenance period, and 2) an 8-week ADF weight loss period. All food was provided during the study.

**Results.** Body weight was reduced ( $P < 0.0001$ ) by ADF-HF ( $4.8 \pm 1.1\%$ ) and by ADF-LF ( $4.2 \pm 0.8\%$ ). Fat mass decreased ( $P < 0.0001$ ) by ADF-HF ( $5.4 \pm 1.5\%$ ) and ADF-LF ( $4.2 \pm 0.6\%$ ). Fat free mass remained unchanged. Waist circumference decreased ( $P < 0.001$ ) by ADF-HF ( $7.2 \pm 1.5\%$ ) and ADF-LF ( $7.3 \pm 0.9\%$ ). LDL cholesterol and triacylglycerol concentrations were reduced ( $P < 0.001$ ) by both interventions (ADF-HF:  $18.3 \pm 4.6\%$ ,  $13.7 \pm 4.8\%$ ; and ADF-LF:  $24.8 \pm 2.6\%$ ,  $14.3 \pm 4.4\%$ ). HDL cholesterol, blood pressure, and heart rate remained unchanged. There were no between-group differences for any parameter.

**Conclusion.** These findings suggest that an ADF-HF diet is equally as effective as an ADF-LF diet in helping obese subjects lose weight and improve CHD risk factors.

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## 1. Introduction

Obesity in adulthood doubles the risk of coronary heart disease (CHD) mortality [1,2]. Reducing energy intake by means of dietary restriction has been shown to lower the risk of CHD in obese adults [3,4]. Evidence suggests that alternate day fasting (ADF) is an effective diet strategy to help obese individuals lose weight and lower CHD risk [5,6]. ADF regimens include a “feed day” where food is consumed ad libitum over 24 h, alternated with a “fast day” where intake is

limited to 25% of the individual’s energy needs over 24 h. To date, only two clinical trials have been performed to evaluate the ability of ADF to facilitate weight loss and decrease CHD risk [5,6]. Each of these trials implemented a low-fat (LF) background diet (i.e. 25% of energy from dietary fat) to test the study objectives [5,6]. In both trials, body weight was reduced by 6%–8% after 8 weeks of an ADF-LF diet in obese adults [5,6]. Beneficial effects on CHD risk indicators were also noted. For instance, LDL cholesterol concentrations decreased by 10%–25%, while triacylglycerol concentrations were lowered by

Abbreviations: ADF, Alternate day fasting; CHD, coronary heart disease; HF, high-fat; LF, low-fat; METS, metabolic equivalents; NHANES, National Health and Nutrition Examination Survey.

\* Corresponding author. Tel.: +1 312 996 7897; fax: +1 312 413 0319.

E-mail address: [varady@uic.edu](mailto:varady@uic.edu) (K.A. Varady).

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30%–40% from baseline [5,6]. In the trial by Varady et al., decreases in systolic blood pressure and heart rate were also demonstrated [5].

Although these data for ADF-LF diets are promising, the applicability of these findings is questionable as the majority of Americans consume a high-fat (HF) diet, and not an LF diet. More specifically, the most recent data from the National Health and Nutrition Examination Survey (NHANES) suggest that the average middle age American consumes 35%–45% of their daily calories as dietary fat [7]. This report also indicates that 13% of energy is consumed as saturated fat [7]. This level of fat consumption (45% kcal as fat) also corresponds to the highest level of fat intake reported in the Women's Health Initiative trial [8]. In view of these findings, an important question that has yet to be tested is whether these beneficial changes in body weight and CHD risk can be reproduced if an HF (45% fat) background diet is used in place of an LF (25% fat) background diet during periods of ADF. Accordingly, the objective of the present study was to compare the effects of an ADF-HF diet to those of an ADF-LF diet on body weight, body composition, and CHD risk factors in obese adults. We chose 45% as the level of fat intake to see if the beneficial effects of ADF could still be reproduced during periods of extremely high fat consumption.

## 2. Methods

### 2.1. Subjects

Subjects were recruited from the Chicago area by means of advertisements placed on and around the University of Illinois, Chicago campus. A total of 44 individuals expressed interest in the study, but only 35 were deemed eligible to participate after the preliminary questionnaire and body mass index (BMI) assessment (Fig. 1). Key inclusion criteria were as follows: female, age 25–65 y, BMI between 30 and 39.9 kg/m<sup>2</sup>,

weight stable for 3 months prior to the beginning of the study (i.e. <5 kg weight loss or gain), non-diabetic, no history of cardiovascular disease, sedentary or lightly active for 3 months prior to the beginning of the study (i.e. <3 h/week of light-intensity exercise at 2.5–4.0 metabolic equivalents (METs)), non-smoker, and not taking weight loss, lipid-lowering, or glucose-lowering medications. Perimenopausal women were excluded from the study, and postmenopausal women (defined as absence of menses for 2 y) were required to maintain their current hormone replacement therapy regimen for the duration of the study. The experimental protocol was approved by the Office for the Protection of Research Subjects at the University of Illinois, Chicago. All volunteers gave written informed consent to participate in the trial.

### 2.2. Experimental design

Eligible subjects were randomized by way of a stratified random sample. The sample frame was divided into strata based on BMI and age. Subjects from each stratum were then randomly assigned to either the ADF-HF group or the ADF-LF group. The 10-week trial consisted of two dietary phases: 1) a 2-week baseline weight maintenance period, and 2) an 8-week weight loss ADF period. All food was provided throughout the 10-week trial to all subjects.

#### 2.2.1. Baseline weight maintenance diet (Week 1–2)

Before commencing the 8-week ADF intervention, each subject participated in a 2-week baseline weight maintenance period where they consumed either the HF or LF diet (providing 100% of their energy needs). Energy requirements were calculated using the Mifflin–St. Jeor equation [9]. Macronutrient compositions of the ADF-HF and ADF-LF diets are reported in Table 1. Diets were prepared in the metabolic kitchen of the Human Nutrition Research Unit (HNRU) at the University of Illinois, Chicago. Study diets were formulated for each participant using Nutritionist Pro Software (Axxya

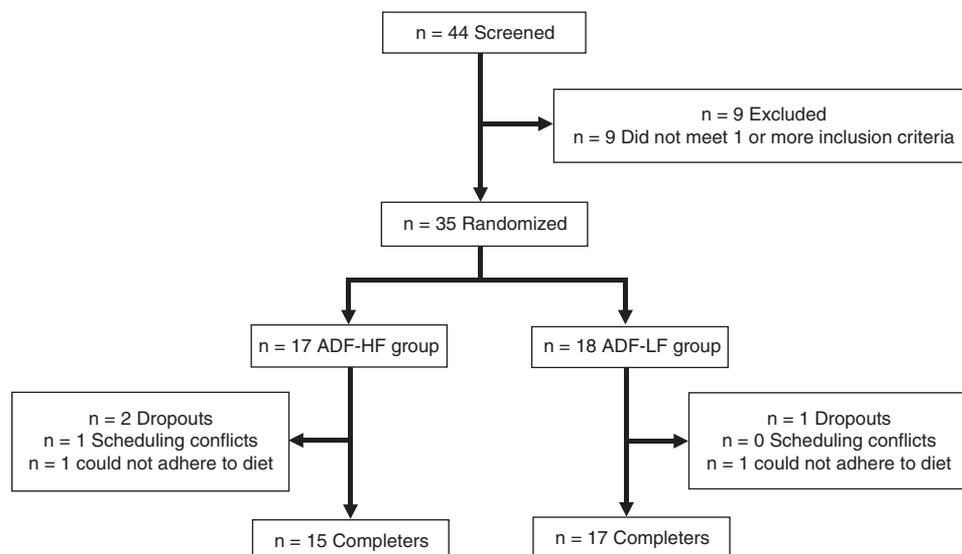


Fig. 1 – Study flow chart.

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