

ORIGINAL ARTICLE

Diets with High or Low Protein Content and Glycemic Index for Weight-Loss Maintenance

Thomas Meinert Larsen, Ph.D., Stine-Mathilde Dalskov, M.Sc.,
Marleen van Baak, Ph.D., Susan A. Jebb, Ph.D., Angeliki Papadaki, Ph.D.,
Andreas F.H. Pfeiffer, M.D., J. Alfredo Martinez, Ph.D.,
Teodora Handjieva-Darlenska, M.D., Ph.D., Marie Kunešová, M.D., Ph.D.,
Mats Pihlsgård, Ph.D., Steen Stender, M.D., Ph.D., Claus Holst, Ph.D.,
Wim H.M. Saris, M.D., Ph.D., and Arne Astrup, M.D., Dr.Med.Sc.,
for the Diet, Obesity, and Genes (Diogenes) Project

ABSTRACT

BACKGROUND

Studies of weight-control diets that are high in protein or low in glycemic index have reached varied conclusions, probably owing to the fact that the studies had insufficient power.

METHODS

We enrolled overweight adults from eight European countries who had lost at least 8% of their initial body weight with a 3.3-MJ (800-kcal) low-calorie diet. Participants were randomly assigned, in a two-by-two factorial design, to one of five ad libitum diets to prevent weight regain over a 26-week period: a low-protein and low-glycemic-index diet, a low-protein and high-glycemic-index diet, a high-protein and low-glycemic-index diet, a high-protein and high-glycemic-index diet, or a control diet.

RESULTS

A total of 1209 adults were screened (mean age, 41 years; body-mass index [the weight in kilograms divided by the square of the height in meters], 34), of whom 938 entered the low-calorie-diet phase of the study. A total of 773 participants who completed that phase were randomly assigned to one of the five maintenance diets; 548 completed the intervention (71%). Fewer participants in the high-protein and the low-glycemic-index groups than in the low-protein–high-glycemic-index group dropped out of the study (26.4% and 25.6%, respectively, vs. 37.4%; $P=0.02$ and $P=0.01$ for the respective comparisons). The mean initial weight loss with the low-calorie diet was 11.0 kg. In the analysis of participants who completed the study, only the low-protein–high-glycemic-index diet was associated with subsequent significant weight regain (1.67 kg; 95% confidence interval [CI], 0.48 to 2.87). In an intention-to-treat analysis, the weight regain was 0.93 kg less (95% CI, 0.31 to 1.55) in the groups assigned to a high-protein diet than in those assigned to a low-protein diet ($P=0.003$) and 0.95 kg less (95% CI, 0.33 to 1.57) in the groups assigned to a low-glycemic-index diet than in those assigned to a high-glycemic-index diet ($P=0.003$). The analysis involving participants who completed the intervention produced similar results. The groups did not differ significantly with respect to diet-related adverse events.

CONCLUSIONS

In this large European study, a modest increase in protein content and a modest reduction in the glycemic index led to an improvement in study completion and maintenance of weight loss. (Funded by the European Commission; ClinicalTrials.gov number, NCT00390637.)

From the Department of Human Nutrition, Faculty of Life Sciences (T.M.L., S.-M.D., A.A.), and the Department of Clinical Biochemistry, Gentofte Hospital (S.S.), University of Copenhagen; and the Institute of Preventive Medicine, Copenhagen University Hospital (M.P., C.H.) — all in Copenhagen; the NUTRIM (Nutrition and Toxicology Research Institute Maastricht) School for Nutrition, Toxicology and Metabolism, Department of Human Biology, Maastricht University Medical Centre, Maastricht, the Netherlands (M.B., W.H.M.S.); the Medical Research Council Human Nutrition Research, Elsie Widdowson Laboratory, Cambridge, United Kingdom (S.A.J.); the Department of Social Medicine, Preventive Medicine, and Nutrition Clinic, University of Crete, Heraklion, Crete, Greece (A.P.); the Department of Clinical Nutrition, German Institute of Human Nutrition Potsdam-Rehbrücke, Nuthetal, Germany (A.F.H.P.); the Department of Endocrinology, Diabetes, and Nutrition, Charité Universitätsmedizin Berlin, Berlin (A.F.H.P.); the Department of Physiology and Nutrition, University of Navarra, Pamplona, Spain (J.A.M.); the Department of Pharmacology and Toxicology, Medical Faculty, National Transport Hospital, Sofia, Bulgaria (T.H.-D.); and the Obesity Management Center, Institute of Endocrinology, Prague, Czech Republic (M.K.). Address reprint requests to Dr. Larsen at the Department of Human Nutrition, Faculty of Life Sciences, University of Copenhagen, Rolighedsvej 30, 1958 Frederiksberg, Copenhagen, Denmark, or at tml@life.ku.dk.

N Engl J Med 2010;363:2102-13.

Copyright © 2010 Massachusetts Medical Society.