

# Low-Fat Diets for Diabetes Prevention

The article authored by Swinburn, Metcalf, and Ley and published in this issue of *Diabetes Care* (1) adds a new perspective to the growing body of evidence that lifestyle interventions can result in improved glucose tolerance among individuals at high risk for developing type 2 diabetes (2). The study provides evidence that long-term compliance with a reduced-fat ad libitum diet may result in sustained improvements in glycemic status after 5 years. Although the final results were somewhat mixed, the findings are of importance because of the relative simplicity of the intervention message, at least in some populations. A recent meta-analysis of low-fat ad libitum diets in relation to weight control also showed that the relatively simple message to restrict fat can, without explicit instruction to reduce calories, lead to weight loss (3). The results of Swinburn et al. (1) also highlight extremely important issues to behavioral intervention studies, in particular, the sustainability of behavior change and the related health benefits over time.

Prevention of type 2 diabetes is a critical public health priority, as evidenced by the substantial increase in the prevalence of diabetes from 8.9 to 12.3% of the U.S. adult population over an 11-year period (4). From the most recent data available, the remarkably rapid increase in the prevalence of diabetes continued unabated well through the late 1990s (5). Body fatness is perhaps the most notable modifiable risk factor for the development of type 2 diabetes (6). Manson and Spelsberg (2) estimated the risk of type 2 diabetes attributable to obesity to be up to 75%. A striking increase in the prevalence of obesity, as well as diabetes, was reported between the second and third National Health and Nutrition Examination Surveys. As of the early 1990s, over 50% of the U.S. adult population was overweight (7). As the prevalence of obesity increases, it is expected that the overall percent of diabetes in the population attributable to obesity will increase.

Numerous interventions focusing on weight loss through hypocaloric low-fat diet, increased physical activity, and a variety of behavior change strategies have

emerged (8). Unfortunately, preventing obesity, or effectively reducing body weight, has proved difficult to accomplish and particularly challenging to maintain in the long-term.

Despite these difficulties, several recent studies have demonstrated the potential for moderate, sustained weight loss to substantially reduce the risk for incidence of type 2 diabetes (9–12). In the Malmo Feasibility Study (10), both weight reduction and increased fitness were associated with the reduced incidence of diabetes observed among the lifestyle intervention group compared with the control group (RR = 0.37, 95% CI 0.20–0.68). Despite only minor changes within the Da Qing Study intervention arms of diet, exercise, or diet plus exercise, the 6-year incidence of diabetes ranged from 41.1–46% across the three intervention groups compared with 67.7% in the control group (9). In the Swedish Obese Subjects (SOS) Study, obese individuals with sustained weight loss after 2 years post bariatric surgery had a substantially lower risk of developing type 2 diabetes (OR = 0.02, 95% CI 0.00–0.16) or hyperinsulinemia (OR = 0.10, 95% CI 0.04–0.25) than control subjects (12). Results from a 2-year clinical trial showed reduced risk for progression from impaired glucose tolerance (IGT) to diabetes among individuals randomized to use orlistat compared with those receiving behavioral therapy for weight loss. These results appear to be attributable to the greater weight loss experienced among those who took orlistat (13).

The Finnish Diabetes Prevention Study includes 523 overweight individuals with IGT randomized to either control or intensive lifestyle intervention, including reduction of saturated fat and calories, increased intake of dietary fiber, and increased physical activity. From an interim report (14), those in the intensive lifestyle achieved greater weight loss and improvements in glucose and insulin concentrations than control subjects. In the U.S., the Diabetes Prevention Program (DPP) is a randomized multicenter clinical trial sponsored by the National Insti-

tutes of Health (15) to test the safety and efficacy of either pharmacological or intensive lifestyle intervention for weight management and physical activity among over 3,000 individuals of diverse ethnic backgrounds, all of whom had IGT at study entry. Although final results from both the Finnish DPS and the U.S. DPP will be extremely helpful in defining the role of lifestyle intervention and weight management in primary prevention of type 2 diabetes, important questions will remain regarding the feasibility of broad-scale implementation of lifestyle interventions, particularly in highly diverse populations.

Observational studies have also provided evidence for the merit of weight loss toward diabetes prevention. Wannamethee et al. (16) reported significantly increased risk for diabetes incidence across a range of weight loss to weight gain observed among 7,100 men ( $P < 0.001$ ) over a 12-year follow-up. Findings were similar among both obese and non-obese individuals and among those with normal or high nonfasting glucose levels. Interestingly, these results were based on weight loss that occurred in the population, rather than within a clinical trial. This could be considered an advantage because individuals who are successful in weight loss efforts on their own are typically not eligible to participate in weight loss intervention trials due to recent intentional weight loss. Therefore, it is possible that these clinical trials paint a far gloomier picture of the potential for weight loss interventions to improve health in the population, due to the participants being representative mainly of individuals who have been previously unsuccessful at weight loss attempts. In another well-conducted observational study, namely the Framingham Study, sustained weight loss over two consecutive 8-year periods led to a 37% lower risk of diabetes; however, those who regained the lost weight failed to experience any reduction in diabetes incidence (17).

Overall, both the clinical trial data (particularly that of Swinburn et al.) and the observational data demonstrate the importance of sustaining weight loss and

the related behaviors in order to achieve lasting benefit in terms of glucose tolerance. Wing et al. (18) recently reviewed behavioral science research to date, focusing on lifestyle changes related to obesity, eating behavior, and physical activity. This excellent review notes that long-term behavioral change is indeed one of the most challenging areas in the prevention field today and that future research should focus on environmental as well as individual determinants of weight-related behaviors, including both eating and physical activity. As with any intervention, such research will need to consider the cost effectiveness of approaches under study. With the knowledge gained, hopefully, it will be possible to design intervention strategies to be delivered on both the individual and community levels that will lead to sustained weight loss and reduced risk for type 2 diabetes.

**ELIZABETH J. MAYER-DAVIS, PHD**

From the Department of Epidemiology and Biostatistics, Norman J. Arnold School of Public Health, University of South Carolina, Columbia, South Carolina.

Address correspondence to Elizabeth J. Mayer-Davis, Department of Epidemiology and Biostatistics, Norman J. Arnold School of Public Health, University of South Carolina, Columbia, SC 29208. E-mail: ejmayerd@sph.sc.edu.



References

1. Swinburn B, Metcalf P, Lezotte DC: Long-term (5-year) effects of a reduced fat diet in individuals with glucose intolerance. *Diabetes Care* 24:619–624, 2001
2. Manson J, Spelsberg A: Primary prevention of non-insulin dependent diabetes mellitus. *Am J Prev Med* 10:172–184, 1994
3. Astrup A, Grunwald G, Melanson E, Saris WH, Hill J: The role of low-fat diets in body weight control: a meta-analysis of ad libitum dietary intervention studies. *Int J Obesity* 24:1545–1552, 2000
4. Harris MI, Flegal KM, Cowie CC, Eberhardt MS, Goldstein DE, Little RR, Wiedmeyer H, Byrd-Holt DD: Prevalence of diabetes: impaired fasting glucose and impaired glucose tolerance in U.S. adults. *Diabetes Care* 21:519–524, 1998
5. Mokdad A, Ford E, Bowman B, Nelson D, Engelau M, Vinicor F, Marks J: Diabetes trends in the U.S. *Diabetes Care* 23:1278–1283, 2000
6. Edelstein SL, Knowler WC, Bain RP, Andres R, Barrett-Connor E, Dowse G, Haffner S, Pettitt DJ, Sorkin JD, Muller DC, Collins VR, Hamman R: Predictors of progression from impaired glucose tolerance to NIDDM: an analysis of six prospective studies. *Diabetes* 46:701–710, 1997
7. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL: Increasing prevalence of overweight among U.S. adults. *JAMA* 272: 205–211, 1994
8. National Heart Lung and Blood Institute Expert Panel: Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. *Obes Res* 6:102S–125S, 1998
9. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, Hu ZX, Lin J, Xiao JZ, Cao HB, Liu PA, Jiang XG, Jiang YY, Wang JP, Zheng H, Zhang H, Bennett PH, Howard BV: Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. *Diabetes Care* 20: 537–544, 1997
10. Eriksson K-F, Lindgarde F: Prevention of type 2 (non-insulin-dependent) diabetes mellitus by diet and physical exercise: the 6-Year Malmo Feasibility Study. *Diabetologia* 34:891–898, 1991
11. Viswanathan M, Snehalatha C, Viswanathan V, Vidyavathi P, Indu J, Ramachandran A: Reduction in body weight helps to delay the onset of diabetes even in non-obese with strong family history of disease. *Diabetes Res Clin Pract* 35:107–112, 1997
12. Sjostrom C, Lissner L, Weedel H, Sjostrom L: Reduction of incidence of diabetes, hypertension and lipid disturbances after intentional weight loss induced by bariatric surgery: the SOS Intervention Study. *Obes Res* 5:477–484, 1999
13. Heymsfield SB, Segal KR, Hauptman J, Lucas CP, Boldrin M, Rissanen A, Wilding J, Sjostrom L: Effects of weight loss with orlistat on glucose tolerance and the progression to type 2 diabetes in obese adults. *Arch Intern Med* 160:1321–1326, 2000
14. Uusitupa M, Louheranta A, Lindstrom J, Valle T, Sundvall J, Eriksson J, Tuomilehto J: The Finnish Diabetes Prevention Study. *Br J Med* 83:S137–S142, 2000
15. Diabetes Prevention Program Research Group: Diabetes Prevention Program: Design and methods for a clinical trial in the prevention of type 2 diabetes. *Diabetes Care* 22:623–634, 1999
16. Wannamethee S, Shaper A: Weight change and duration of overweight and obesity in the incidence of type 2 diabetes. *Diabetes Care* 23:18–22, 1999
17. Moore L, Vioni A, Wilson P, D'Agostino R, Finkle W, Ellison R: Can sustained weight loss in overweight individuals reduce the risk of diabetes mellitus? *Epidemiol* 3:269–273, 2000
18. Wing RR, Goldstein M, Acton K, Birch L, Jakicic JM, Sallis JF, Smith-West D, Jeffrey R, Surwit R: Lifestyle changes related to obesity, eating behavior, and physical activity. *Diabetes Care* 24:117–123, 2001

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