

Effects of Diets Rich in Unsaturated Fatty Acids on Glucose, Insulin and Lipid Metabolism

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High-fat diet induces insulin resistance in experimental animals, and there is evidence that dietary fat may modify glucose tolerance in healthy subjects and in patients with impaired glucose tolerance or overt diabetes. In connection of two studies on healthy young volunteers examining the effects of the diets high in polyunsaturated (Pufa, n=9) and high in monounsaturated fats (Mufa, n=10) on serum lipids and lipoproteins, an intravenous glucose tolerance test (300 mg/kg) were also carried out to evaluate the influence of these fat-modified diets on glucose tolerance. Both studies were randomised, cross-over studies and a diet rich in saturated fat served as Control diet. Each diet lasted for 3 weeks, and there was a 2-week wash-out period between the experimental diets. The diets contained 40 percent of energy (E%) fat, 45 E% carbohydrates and 15 E% proteins. The proportion of fatty acids was 20:15:5 (saturated:monoenes:polyunsaturated, E %) in Control diet, the respective figures for Pufa and Mufa diets were 10:15:15 and 10:20:10. The diets were identical with respect to dietary fibre and other nutrients. The main sources of visible fat were butter during Control diet, sunflower oil during Pufa diet and low-erucic acid rape seed oil during Mufa diet. Baseline diet was a habitual low-fat diet of the study subjects.

Control diet did not affect glucose tolerance (glucose area under the curve, AUC) in either study, but glucose tolerance significantly improved during Pufa diet as compared to baseline diet ($p=0.037$). Also during Mufa diet the AUC value tended to improve ($p=0.06$ vs. baseline diet), and AUC value during Mufa diet was significantly lower ($p=0.007$) than AUC value during Control diet which was rich in saturated fat. The insulin responses to glucose dose did not change significantly during these experimental diets.

As compared to baseline diet, LDL-cholesterol declined by 20.2 % during Pufa diet and 26.6 % during Mufa diet. HDL-cholesterol did not change significantly. Apolipoprotein B level reduced during Pufa and Mufa diets, and a small increase was found in apolipoprotein A1 level during Control diets.

The present results show that diets rich in unsaturated fats may induce an improved glucose tolerance as compared to low-fat diet or diet rich in total fat and saturated fatty acids.

Furthermore, both Pufa and Mufa diets result in substantial reduction in LDL-cholesterol level as compared to a diet high in total fat and saturated fatty acids or even to low-fat diet which is relatively rich in saturated fatty acids. The present results also suggest that monounsaturated like polyunsaturated fatty acids may have an inherent LDL-cholesterol lowering effect.