## Dietary *trans* fatty acids and lipoprotein cholesterol

Dear Sir:

Judd et al (1) recently reported a well-controlled dietary study in which they investigated the effects on plasma lipoproteins of two doses of monounsaturated *trans* fatty acids. Compared with oleic acid, *trans* fatty acids raised low-density-lipoprotein (LDL) cholesterol, although somewhat less than did saturates. Replacement of 6% of energy as oleic acid by *trans* fatty acids resulted in a small decrease in high-density-lipoprotein (HDL), cholesterol, whereas 3% of energy as *trans* fatty acids did not cause a significant change in HDL. Judd et al suggested that HDL-cholesterol responses to *trans* monoenes may be concentration dependent (1).

Since 1990, several trials on the effects of *trans* fatty acids from hydrogenated vegetable oils on lipoprotein cholesterol in humans have been published (1–5). **Figure 1** shows the effects of monounsaturated *trans* fatty acids relative to their *cis* isomer oleic acid across five trials. We adjusted for differences in other fatty acids between the *trans* enriched diets and the reference diets using regression coefficients from a recent meta-analysis (6). Figure 1 suggests that the effect of *trans* fatty acids on HDL increases with the amount consumed. Although more experiments would be needed to define the shape of the dose-response curve, a linear relation appears satisfactory, and there is no evidence for a threshold below which *trans* fatty acids do not affect HDL-cholesterol concentrations. When the data from references 1–5 are combined in a linear model, every additional percent of dietary energy as *trans* fatty acids results in a decrease in HDL cholesterol of 0.013 mmol/L, or 0.50 mg/dL ($R^2 = 0.88$, $P = 0.0019$), and an increase in LDL cholesterol of 0.040 mmol/L, or 1.55 mg/dL ($R^2 = 0.86$, $P = 0.0028$). This effect on LDL is similar to that of saturates (6).

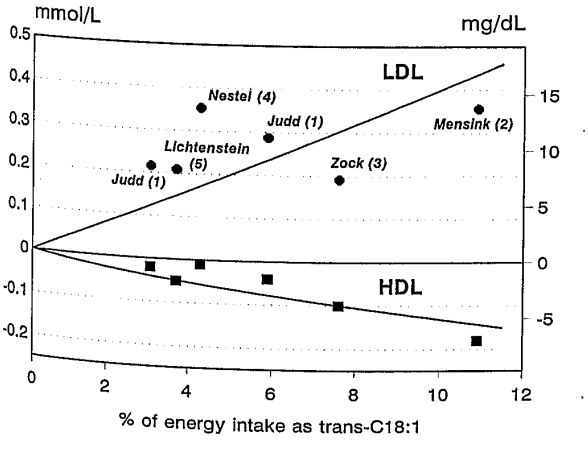


FIGURE 1. Effects of monounsaturated *trans* fatty acids (*trans*-C18:1) on lipoprotein cholesterol concentrations relative to oleic acid (*cis*-C18:1). Data are derived from six dietary comparisons between *trans* monounsaturates and *cis* unsaturated fatty acids (1–5); differences between diets in fatty acids other than *trans* and *cis* monounsaturates were adjusted for by using regression coefficients from a meta-analysis of 27 controlled trials (6). The regression lines were forced through the origin because a zero change in intake will produce a zero change in lipoprotein concentrations.

Thus, monounsaturated *trans* fatty acids with a chain length of 18 carbon atoms lower HDL cholesterol and raise LDL cholesterol, as compared with their *cis* isomer oleic acid, and the effect is proportional to the amount consumed without evidence for a threshold. High amounts of *trans* fatty acids thus appear undesirable in diets aimed to lower the risk of coronary heart disease. For nutrition information purposes, a simple although not wholly accurate approach is to include *trans* with saturated fatty acids. At the same time it should be kept in mind that the consumption of *trans* fatty acids is low compared with that of saturates, and that the reduction of saturated fatty acid and cholesterol intakes should remain a primary goal in the dietary prevention of coronary heart disease. Therefore, fats high in *trans* fatty acids should not be replaced by fats such as butter, lard, or tropical oils, which are high in saturates and/or cholesterol but by oils and spreads containing no *trans* fatty acids and low amounts of saturates. Margarines with *trans* fatty acid contents <1% and a low saturated fat content are widely available in Canada and Europe. Introduction of such spreads in the United States could help resolve worries about margarines high in *trans* fatty acids.

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