

## Effects of N-3 fatty acids of marine or plant origin on serum triglycerides and LDL-cholesterol: Influences of initial BMI and LDL-cholesterol values

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**Purpose:** Regular consumption of n-3 fatty acids, whether from marine or plant sources results in cardiovascular health benefits, including improved serum lipids. However, fish oil supplementation resulted in a paradoxical increase in low density lipoprotein (LDL)-cholesterol in some clinical trials. We investigated how the initial values of LDL-cholesterol and body mass index (BMI) of a subject may influence the effects of two sources of n-3 fatty acids, salmon or walnuts, on serum LDL-cholesterol and triglyceride levels.

**Methods:** In a randomized crossover metabolic trial, 25 normo- or hypercholesterolemic subjects (14 males, 11 females) were fed three isocaloric diets for four weeks each in random order. The diets conformed to the current dietary guidelines for cardiovascular disease prevention and differed primarily in source and type of polyunsaturated fat: walnut (42 g/2400 kcal diet, 6 days/week), fish (113 g of salmon/2400 kcal, 2 days/week), and control diet (no fish or walnuts).

**Results:** The walnut diet significantly decreased serum total and LDL-cholesterol compared to the fish and control diets. The fish diet increased serum HDL-cholesterol and decreased triglycerides compared to the control and walnut diets. Compared with the control diet, we observed an LDL-cholesterol-increasing effect of fish that was magnified in subjects with higher baseline LDL-cholesterol (mean change  $\pm$  SE:  $3.2 \pm 1.9$  mg/dL for a baseline LDL-cholesterol of 110 mg/dL versus  $8.1 \pm 2.0$  mg/dL for a baseline LDL of 170 mg/dL; P value for diet-baseline interaction 0.04). In contrast, we observed an LDL-C-lowering effect of the walnut diet ( $-11.0 \pm 2.0$ ) that was not influenced by subjects' baseline LDL-cholesterol level. We observed a triglyceride-lowering effect of fish that attenuated with increasing BMI, reversed, and became a triglyceride-increasing effect among obese (BMI  $>30$ kg/m<sup>2</sup>) subjects ( $-23.2 \pm 5.5$  mg/dL at BMI of 22,  $-0.6 \pm 6.4$ mg/dL at BMI of 27.5,  $25.4 \pm 17.1$  mg/dL at BMI of 33; P value for diet-BMI interaction 0.02). No effect of the walnut diet was observed on triglycerides.

**Conclusions:** Fish and walnut sources of n-3 fatty acids have distinct effects on serum lipids. High baseline values of LDL-cholesterol magnify the increasing effect of fish on LDL-cholesterol, but does not influence the LDL lowering effects of walnuts. A high BMI attenuates the triglyceride lowering effect of fish.