

Dietary Saturated Fat Impairs HDL Benefits

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SIDNEY, Australia, Aug. 7 -- A single meal high in saturated fat reduced the anti-inflammatory activity of high density lipoproteins (HDLs) and impaired arterial endothelial function, according to researchers here.

By contrast, a single meal high in polyunsaturated fat improved the anti-inflammatory activity of HDL cholesterol compared with fasting baseline levels, according to report in the Aug. 15 issue of the *Journal of the American College of Cardiology*.

This study further defines the role of fatty acids in promoting atheroma formation, said David Celermajer, MBBS, Ph.D., at the Royal Prince Alfred Hospital in Sydney, and colleagues in Adelaide and Stockholm.

To study the influence of dietary fatty acids, the investigators enrolled 14 healthy adults (mean age 29.5 years) who after an overnight fast consumed an isocaloric meal (a slice of carrot cake and a milk shake) containing either a polyunsaturated or a saturated fat on two occasions.

The polyunsaturated meal contained safflower oil (75%), while the saturated-fat meal contained coconut oil (89.6%). The meals contained the equivalent of 1 g of fat for every kg (2.2 pounds) of body weight.

Both meals were followed by an increase in plasma levels of triglyceride and insulin at three hours and nonesterified fatty acids at six hours, the researchers reported.

The HDL collected six hours after the saturated-fat meal was less effective than HDL from fasting plasma in terms of the ability to inhibit expression of intercellular adhesion molecule-1 (ICAM-1) and vascular cell adhesion molecule-1 (VCAM-1) ($P < 0.004$).

By contrast, HDL collected six hours after the polyunsaturated meal had an inhibitory activity on intracellular adhesion molecules that was greater than that of HDL at fasting levels ($P = 0.01$), the researchers reported.

Furthermore, post-hyperemic microvascular blood flow from the forearm increased significantly three hours after the polyunsaturated meal by $45 \pm 14\%$ but only by $21 \pm 11\%$ after the saturated meal.

In a complementary finding, the study showed that altering the fatty acid composition of a meal had a potential influence on vascular function in large vessels. The researchers reported that three hours after the meal, saturated fat produced significant post-prandial impairment of vascular reactivity, whereas no

such impairment was observed after eating the polyunsaturated meal ($0.9 \pm 1\%$).

Flow-mediated dilation (FMD) decreased three hours after the saturated meal by $2.2 \pm 0.9\%$ ($P < 0.05$ compared with baseline) but not significantly three hours after the polyunsaturated meal, the researchers said. Six hours after both meals, FMD did not differ significantly compared with fasting baseline levels.

However, the authors pointed out that "it is possible that 'regression to the mean' may have contributed to some of the flow-mediated dilation reduction observed after consumption of the saturated fat (although all analyses were blinded to meal assignment and timing)."

It is unclear whether altering dietary fat composition influences other functions of HDL, the researchers wrote. The current results were obtained from a modest cohort of normal subjects, and extrapolation to subjects with atherosclerosis or other risk factors should be made with caution, they said.

These findings highlight novel mechanisms by which different dietary fatty acids may influence key atherogenic processes, Dr. Celermajor and colleague said. The composition of dietary fat has a substantial influence on the anti-inflammatory activity of HDL and may contribute to the finding that the systemic level of soluble adhesion molecules varies with the consumption of different fatty acids, he said.

"The present study raises the possibility that the differential effects of dietary fats on the anti-inflammatory potential of HDL and endothelial function may contribute to the apparent benefits of polyunsaturated over saturated diets observed in the epidemiological literature," he concluded.

A study co-author, Stephen Nicholls, Ph.D., now at the Cleveland Clinic, received a Young Investigator Award from Pfizer to support this research.

Action Points

Explain to patients concerned about cholesterol levels or with cardiac risks that this study found that foods high in saturated fat can lower the beneficial effects of HDLs compared with foods with a high concentration of polyunsaturated fats.

Remind concerned patients that saturated fats are found in butter, red meat, and whole milk, as well as in coconut and other tropical oils often used in prepared foods.

Inform interested patients that polyunsaturated fats, usually liquid at room temperature, include safflower, corn, olive, and sunflower oils.

Primary source: Journal of the American College of Cardiology

Source reference:

Nicholls SJ, et al "Consumption of Saturated Fat Impairs the Anti-Inflammatory Properties of High-Density Lipoproteins and Endothelial Function," *JACC* 2006; 48 (4): 715-720.