Effect of fat type on cholesteryl ester transfer and cholesterol precursor levels during postprandial lipemia

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Cholesteryl esters formed in the plasma high density lipoprotein (HDL) fraction by the action of the lecithin : cholesterol acyltransferase (LCAT) enzyme are transferred to lipoproteins of lower density in a process catalysed by cholesteryl ester transfer protein (CETP) in plasma. Remnant lipoproteins derived from the hydrolysis of triglyceride rich lipoproteins are avid acceptors of these cholesteryl esters (1). Plasma newly synthesised cholesteryl ester transfer (NCET) activity provides an indication of activity in this pathway.

This study compared the effect of liquid meals of different fatty acid composition on the postprandial response of plasma newly synthesized cholesteryl ester transfer (NCET) activity and lathosterol concentration, an index of hepatic cholesterol synthesis rates, in 18 healthy men and women. The meals were isocaloric and contained approximately 30 g fat/m^2 body area, with the mean quantity of fat provided being 55 g. They were rich in polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA) or saturated fatty acids (SAFA) supplied equally by dairy fat and coconut fat. Plasma cholesterol, HDL and triglycerides were measured by standard enzymic assays, and NCET activity was measured by a radio-isotopic assay (2). A measure of habitual fat intake was obtained from a validated food frequency questionnaire.

Plasma NCET activity increased in parallel with triglyceride concentration during the initial 200 minutes and remained elevated while TG returned almost to baseline levels at 300 minutes after the oral fat loads. After meals rich in PUFA or MUFA plasma NCET activity tended to parallel plasma free cholesterol concentration during the ensuing 300 minutes. Significantly smaller postprandial increases in plasma NCET activity, plasma triglyceride and free cholesterol concentrations were observed after the meal rich in SAFA-coconut fat compared with other meals.

The increase in plasma NCET was correlated significantly ($P<0.006$) with the corresponding increases in free cholesterol and TG at 200 minutes after an oral load of PUFA or MUFA. Plasma NCET activity after meals rich in SAFA or MUFA, was significantly higher in subjects in the highest tertile of reported habitual dietary SAFA intake compared with other levels of intake, indicating that this may modulate the response. Plasma lathosterol concentration decreased significantly ($P=0.003$) following a meal rich in SAFA in women, indicating that hepatic cholesterol synthesis may be reduced.

Coconut fat is widely used in some cuisines. Absorption of dietary lauric acid, the main fatty acid in coconut fat, independent of chylomicrons may underlie the differential effect of SAFA-coconut fat rich meals on plasma lipoproteins and NCET activity. Documentation of such differences in post prandial responses contribute to our understanding of lipid metabolism and, might be clinically important as postprandial lipaemia appears to be a factor in coronary heart disease risk.

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