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ORIGINAL RESEARCH COMMUNICATION

Increased plasma concentrations of lipoprotein(a) during a low-fat, high-carbohydrate diet are associated with increased plasma concentrations of apolipoprotein C-III bound to apolipoprotein B–containing lipoproteins[1,2,3]

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Background: Low-fat, high-carbohydrate (LFHC) diets have been shown to increase plasma concentrations of lipoprotein(a) [Lp(a)] and of triacylglycerol- rich lipoproteins (TRLs).

Objective: We tested whether increases in plasma Lp(a) induced by an LFHC diet are related to changes in TRLs.

Design: Healthy men (study 1; *n* = 140) consumed for 4 wk each a high-fat, low-carbohydrate diet (HFLC; 40% fat, 45% carbohydrate) and an LFHC diet (20% fat, 65% carbohydrate). Plasma lipids; lipoproteins; apolipoprotein (apo) B, A-I, and C-III; and Lp(a) were measured at the end of each diet. In a second group of men following a similar dietary protocol (study 2; *n* = 33), we isolated apo(a)-containing particles by immunoaffinity chromatography and determined the concentrations of apo C-III in ultracentrifugally isolated subfractions of apo B–containing lipoproteins.

Results: In study 1, plasma concentrations of Lp(a) ($P < 0.001$), triacylglycerol ($P < 0.001$), apo B ($P < 0.005$), apo C-III ($P < 0.005$), and apo C-III in apo B–containing lipoproteins (non-HDL apo C-III) ($P < 0.001$) were significantly higher with the LFHC diet than with the HFLC diet. Stepwise multiple linear regression analysis showed that the association of changes in Lp(a) with changes in non-HDL apo C-III was independent of changes in body mass index, apo B, LDL cholesterol, and HDL cholesterol. Plasma lipid and lipoprotein changes were similar in study 2, and we found that both total apo C-III and the apo C-III content of apo(a)-containing particles were increased in a TRL fraction consisting predominantly of large VLDL particles [TRL-apo(a)].

Conclusions: The increase in plasma Lp(a) with an LFHC diet is significantly associated with an increase in non-HDL apo C-III. Enrichment of TRL-apo(a) with apo C-III may contribute to this dietary effect on Lp(a) concentrations.

Key Words: Dietary fat • dietary carbohydrate • apolipoprotein C-III • apolipoprotein B • lipoprotein(a) • Lp(a)