

ORIGINAL RESEARCH COMMUNICATION

Postprandial effect of n-3 polyunsaturated fatty acids on apolipoprotein B-containing lipoproteins and vascular reactivity in type 2 diabetes^{1,2,3}

Kirsten F Hilpert, Sheila G West, Penny M Kris-Etherton, Kari D Hecker, Nancy M Simpson and Petar Alaupovic

¹ From the Departments of Nutritional Sciences (KFH, PMK-E, and KDH) and Biobehavioral Health (SGW) and The Huck Institutes of the Life Sciences (KFH), Pennsylvania State University, University Park, PA; Frito-Lay, Inc, Plano, TX (KDH); and the Lipid and Lipoprotein Laboratory, Oklahoma Medical Research Foundation, Oklahoma City, OK (NMS and PA)

Background: Plasma lipoproteins may be classified by their apolipoprotein composition. The lipoprotein subclass containing apolipoproteins B and C (LpB:C) is considered the most atherogenic.

Objective: We evaluated the acute effects of individual fatty acids on apolipoprotein B (apo B)-containing lipoproteins in adults with type 2 diabetes ($n = 15$).

Design: We administered 3 meals in a randomized, double-blind, crossover design. Treatments contained skim milk and 50 g fat from high-oleic acid safflower and canola oils (monounsaturated fatty acid; MUFA), MUFA + 3.5 g α -linolenic acid (ALA; MUFA + ALA) from high-ALA canola oil, or MUFA + 4.0 g both eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA; MUFA + EPA/DHA) from sardine oil. Apo B, LpB, LpB:C, LpB:E + LpB:C:E, and LpA-II:B:C:D:E were measured at baseline and 2 and 4 h after the meal. Flow-mediated dilation was measured at baseline and 4 h after the meal.

Results: The treatments significantly increased apo B and LpB postprandially ($P < 0.03$ for both), but the magnitude of the changes did not differ significantly between the treatments. The postprandial change in LpB:C was 23% lower after MUFA + EPA/DHA than after MUFA (treatment x time interaction, $P < 0.0001$). MUFA + ALA attenuated the increase in LpA-II:B:C:D:E in those with high triacylglycerols (≥ 1.69 mmol/L) but was the only treatment to significantly increase this particle in those with low triacylglycerols (treatment x group interaction, $P < 0.0001$). Examination of change scores did not reveal the source of the interaction of treatment and time ($P < 0.007$) for LpB:E + LpB:C:E. Furthermore, the subjects with the largest increases in LpB:C exhibited the largest impairment in endothelial function.

Conclusions: The results suggest that unsaturated fatty acids differentially affect concentrations of apo B-containing lipoprotein subclasses. A rise in LpB:C adversely affects endothelial function. Meals containing MUFA + EPA/DHA attenuated the postprandial rise in LpB:C and the impairment of endothelial function.

Key Words: Lipoproteins • apolipoprotein B • type 2 diabetes • hypertriglyceridemia • n-3 fatty acids • monounsaturated fatty acids • lipoproteins LpB:C • postprandial apolipoproteins

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