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Effect of a low fat and low cholesterol diet on the metabolism of apolipoprotein AI and AII in high density lipoprotein subpopulations

정영신*, Lichtenstein AJ, Ordovas JM, and Schaefer EJ, Lipid Metabolism Laboratory, USDA HNRC at Tufts University, Boston, USA

Introduction The kinetics of apolipoprotein (apo) A-I and A-II within high density lipoprotein (HDL) particles containing apoA-I and apoA-II (LpAIAII) and HDL with apoA-I only (LpAI) were assessed in four healthy male and four postmenopausal female subjects on two different diets in the fed state using a primed-constant infusion of deuterated leucine.

Material & Methods All subjects consumed a baseline diet (an average U.S. diet, 49% of calories as carbohydrate, 15% protein, 36% fat; 14% saturated, 15% mono unsaturated, 7% polyunsaturated, 147 mg cholesterol/1000kcal) for 6 weeks and a diet reduced in fat and cholesterol meeting the National Cholesterol Education Panel (NCEP) Step 2 criteria (58% carbohydrae, 15% protein, 27% fat; 5% saturated, 12% monounsaturated, 10% polyunsaturated, 62 mg cholesterol/1000 kcal) for the following 24 weeks. HDL subspecies were isolated from plasma using immunoaffinity chromatography at the end of each phase.

Results Consumption of the NCEP Step 2 diet for twenty-four weeks lowered non-fasting plasma cholesterol and triglyceride by 15% ($P < 0.01$) and 28% ($P < 0.05$) respectively, compared with baseline. The NCEP Step 2 diet also resulted in lower non-fasting apoA-I within LpAI (14%, $P < 0.005$) and LpAIAII (16%, $P < 0.005$), and apoA-II (7%, $P < 0.005$). On the baseline diet the mean fractional secretion rate (FSR) was 0.210 ± 0.097 pools/day [residence time (RT), 4.76] for apoA-I within LpAI, 0.172 ± 0.058 (RT, 5.81) for apoA-I within LpAIAII, and 0.105 ± 0.055 (RT, 9.52) for apoA-II. On the NCEP Step 2 diet there was a 27% increase of FSR with a 13% increase of absolute secretion rate (ASR) for apoA-I within LpAI and a 20% increase of FSR for apoA-I within LpAIAII without changing in ASR. These data indicate that apoA-I within LpAI is catabolized at a faster rate than apoA-I within LpAIAII ($P = 0.11$ on the baseline diet and $P = 0.041$ on the NCEP Step 2 diet), while apoA-II within LpAIAII is catabolized at the slowest rate. The increased FSR of apoA-I in both HDL particles as a result in decreasing the total and saturated fat in the diet is the major cause of the reduced apoA-I levels in the plasma in the NCEP Step 2 diet versis an average U.S. diet.

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