

Long-Term Effects of Fat-Modified Diets on Serum Lipids- Impact of Apolipoprotein E Phenotypes

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The effects of four different fat-modified diets on serum lipids were examined in 160 free living subjects with mild to moderate hypercholesterolemia during six months. The habitual fat intake of the subjects before the study was 34/14:12:6 (indicating percent of energy from total fat /saturated: monounsaturated: polyunsaturated fatty acids).

After two weeks run-in period on habitual diet subjects were randomized into one of the four experimental diets. The composition of the actual experimental diets were: 1. Control diet 35/14:10:4 2. AHA type diet 32/10:8:8 3. Monoene- enriched diet 34/11/11:5 4. Low-fat diet 30/12:8:3. Fatty-acid modifications were accomplished in the Control group mainly with butter, in the AHA type group with sunflower oil and in the Monoene- enriched group with low-erucic acid rapeseed (LEAR) oil and in the Low-fat group with a mixture of butter and a small amount of LEAR oil. In addition, low-fat food items were substituted for high-fat food items typically consumed in Finland, except in the Control group. The mean(\pm SD) cholesterol intake was in Control group 299 ± 83 , in the AHA type group 232 ± 81 , in the Monoene- enriched group 230 ± 50 and in the Low-fat group 231 ± 72 mg/day.

LDL cholesterol (LDL-C) decreased significantly ($p < 0.01$) with the AHA type diet $-6.3; -10.7, -2.0\%$ (mean; 95 % CI) and with the Monoene- enriched diet $-6.2; -9.7, -2.6\%$ from baseline to six months. The net decrease in LDL-C compared to the Control group was about 8% both in the AHA type and Monoene- enriched groups at the end of the study. In the Control group there was a mean increment of $8.7; +3.0, +14.4\%$ ($p \leq 0.001$) in HDL cholesterol. The changes in HDL in other groups were nonsignificant. Total triglycerides ($p < 0.05$) in the AHA type group and LDL-triglycerides in both AHA type and Monoene- enriched diet groups decreased significantly ($p \leq 0.001$). Lipid values remained unchanged with the Low-fat diet with unaltered fatty acid composition.

During the AHA type diet the decrease in LDL-C was similar in subjects with apo E phenotype 4/4 or 4/3 ($n=20$)($-6.9; -14.6, +0.8\%$) as in those with apo E 3/3 phenotype ($n=20$)($-6.9; -11.6, -2.1\%$). But during the Monoene- enriched diet only subjects with apo E 3/3 had a significant decrease in LDL-C ($n=27$)($-8.6; -12.0, -5.1\%$). The respective change for apo E 4/4 or 4/3 group ($n=10$) was $+1.3; -9.7, +12.3\%$). Difference between the phenotypes 3/3 and 4/4 or 4/3 was significant ($p=0.016$). Different adherence to the diets did not explain the difference in hypocholesterolemic response between the phenotypes.

In conclusion, both the AHA type and Monoene- enriched diets similarly lowered LDL cholesterol level, but the lipid profile improved with AHA type diet throughout the six months period irrespective of apo E phenotype. Our results suggest that the response to high monoene diet may be dependent on apo E phenotype.