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Effects of dietary saturated and n-6 polyunsaturated fatty acids on the incorporation of long-chain n-3 polyunsaturated fatty acids into blood lipids

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Abstract

Background/objectives: Omega-3 polyunsaturated fatty acids (n-3PUFA) are better absorbed when they are combined with high-fat meals. However, the role of different dietary fats in modulating the incorporation of n-3PUFA in blood lipids in humans has not been previously explored. Omega-6 polyunsaturated fatty acids (n-6PUFA) are known to compete with n-3PUFA in the metabolic pathways and for the incorporation into phospholipids, whereas saturated fats (SFA) may enhance n-3PUFA incorporation into tissues.

Subjects/methods: In a randomized parallel-design trial, we aimed to investigate the long-term effects of n-3PUFA supplementation in subjects consuming a diet enriched with either SFA or n-6PUFA on fatty acid incorporation into plasma and erythrocytes and on blood lipid profiles (total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) and triglycerides).

Results: Dietary supplementation with n-3PUFA co-administered with SFA for 6 weeks resulted in a significant rise in total cholesterol (0.46±0.60 mmol/L; P=0.020) and LDL-C (0.48±0.48 mmol/L; P=0.011) in comparison with combination with n-6PUFA. The diet enriched with SFA also induced a greater increase in eicosapentaenoic acid (2.07±0.79 vs 1.15±0.53; P=0.004), a smaller decrease in docosapentaenoic acid (-0.12±0.23 vs -0.30±0.20; P=0.034) and a similar increase in docosahexaenoic acid (3.85±1.14 vs 3.10±1.07; P=0.128) percentage in plasma compared with the diet enriched with n-6PUFA. A similar effect was seen in erythrocytes. N-3PUFA supplementation resulted in similar changes in HDL-C and triglyceride levels.

Conclusions: The results suggest that dietary substitution of SFA with n-6PUFA, despite maintaining low levels of circulating cholesterol, hinders n-3PUFA incorporation into plasma and tissue lipids.

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