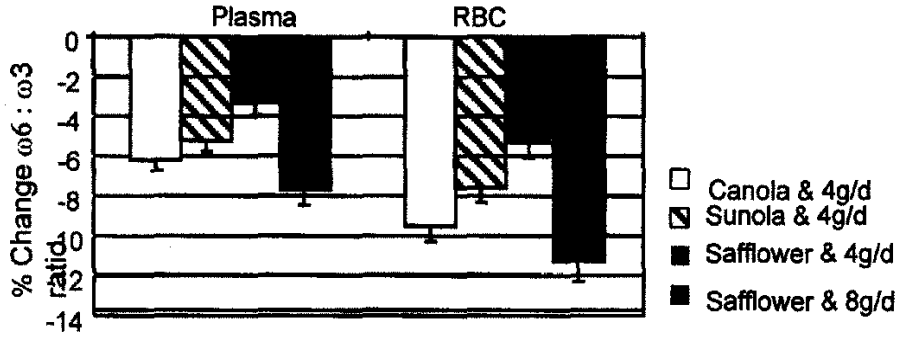
Are benefits of ω-3 supplementation enhanced by reducing ω-6 fatty acid intake?

L Ridges, E Grigonis-Deane, B Meyer, L Astheimer, P McLennan, P Howe

Smart Foods Centre & Dept of Biomedical Science, University of Wollongong, NSW 2522

Omega 3 (ω3) and omega 6 (ω6) fatty acids in tissues compete as substrates for specific eicosanoid pathways with opposing physiological functions. The proportion of ω6:ω3 fatty acids present in active cellular stores is determined by dietary intake levels. In western societies ω6 fatty acids predominate in the diet[1]. The aim of this study was to see whether 1) dietary fish oil (FO) supplementation can increase the proportion of ω3 fatty acids in plasma and erythrocyte membranes in a dose-dependent manner and 2) reducing dietary ω6 fatty acid intake can enhance the ω3 uptake.

Seventy four men and women (fasting triglycerides >1.5 mmol/L) were randomly assigned to one of four interventions for 6 weeks: 4g/d of DHA-rich fish oil (supplying 1.25g of ω3 fatty acids) with 20g/d of either a) Canola b) Sunola or c) safflower oil or d) 8g/d of FO with safflower oil. Safflower oil is a rich source of linoleic acid (ω6), while Canola and Sunola are predominantly monounsaturated with small amounts of ω3 and ω6 fatty acids respectively.



Percent changes in the ratio of ω6:ω3 fatty acids in plasma and erythrocytes (Note: erythrocyte values x 10).

A significant increase in the proportion of ω3 fatty acids (EPA + DPA + DHA relative to total fatty acids) in plasma and erythrocytes was observed with all 4 interventions. Supplementation with 8g/d FO resulted in a significantly greater increase than 4g/d FO. There was a trend toward greater increases in ω3 fatty acid uptake when the 4g/d dose of FO was combined with Canola and Sunola in place of safflower. Moreover, when considering changes in the ω6:ω3 ratio these effects were significantly different in both plasma and erythrocytes (see figure).

All interventions, except the 4g/d FO with safflower, significantly reduced fasting plasma triglycerides. This effect of ω3 fatty acids was not dose-related but there was a significant correlation between baseline triglycerides and the extent of reduction ($r = -0.63$, $p < 0.05$).

In conclusion, both increasing dietary ω3 intake and reducing dietary ω6 intake reduced the ω6:ω3 ratio in plasma and erythrocytes. However the beneficial effect of ω3 supplementation on plasma triglycerides was not related to changes in this ratio.

1 Ollis TE, Meyer BJ, Howe PRC. Australian food sources and intakes of omega-6 and omega-3 polyunsaturated fatty acids. Ann Nutr Metab 1999;43:346-355.

Supported by Meadow Lea Foods, Grains Research & Development Corporation and Clover Corporation.