COMPARISON OF LOW SATURATED FAT DIETS WITH DIFFERENT α-LINOLENIC:LINOLEIC ACID RATIOS ON BLOOD LIPIDS

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It is recommended that Australians reduce dietary fat to 30% of energy intake (en) with polyunsaturated fat to contribute about 6% en (NHMRC 1992). The intake of the ω6 fatty acid, linoleic acid (LA), has been encouraged because of its LDL cholesterol-lowering properties. The aim of the current study was to determine if substitution of LA, with the ω3 fatty acid, α-linolenic acid (ALA), would adversely affect blood lipid profiles. Increasing the dietary ratio of ALA:LA to increase tissue accumulation of very long chain ω3 fatty acids, may have beneficial effects on the tendency to thrombosis (Allman et al. 1995).

Eighteen healthy men, aged 18 to 35 years, consumed a typical Australian diet for two weeks. At this time they were randomly allocated to one of two low fat diets:- saturated fat (10% en), monounsaturated (13% en) and polyunsaturated (7% en). Both were identical in macro- and micronutrient content with the only difference being the ALA:LA such that calculated ALA:LA was 1.4:1 (ALA-rich diet) or 1:34 (ALA-poor diet). Diets were consumed for six weeks. Blood was sampled at the beginning, mid-point and end-point of the test diets to measure total and HDL cholesterol and triglycerides. Erythrocyte membrane fatty acids were analysed and used to monitor dietary compliance.

The table shows the effects of the diets on blood lipids and erythrocyte fatty acids. No differences were detected between the two diets with respect to plasma cholesterol but the triglycerides increased on the ALA-poor diet compared to the ALA-rich ($P<0.05$). The changes in the fatty acids were indicative of compliance. The very long chain polyunsaturated ω3 fatty acids, eicosapentaenoic acid (C20:5) and docosapentaenoic acid (C22:5) increased on the ALA-rich diet ($P<0.05$).

		Baseline[1] 0 weeks	Mid-point[1] 3 weeks	End-point[1] 6 weeks
Total cholesterol	ALA-rich	3.7 ± 0.5	3.7 ± 0.2	3.6 ± 0.2
(mmol/L)	ALA-poor	3.5 ± 0.3	3.7 ± 0.2	3.4 ± 0.2
LDL cholesterol	ALA-rich	2.3 ± 0.2	2.3 ± 0.2	2.2 ± 0.2
(mmol/L)	ALA-poor	2.1 ± 0.2	2.1 ± 0.2	1.8 ± 0.2
HDL cholesterol	ALA-rich	1.1 ± 0.1	1.0 ± 0.1	1.1 ± 0.1
(mmol/L)	ALA-poor	1.2 ± 0.5	1.2 ± 0.1	1.1 ± 0.1
Triglycerides	ALA-rich	0.8 ± 0.1	0.9 ± 0.1	0.8 ± 0.1
mmol/L	ALA-poor	0.6 ± 0.1	0.8 ± 0.1	0.9 ± 0.1

[1]means ± sem

In conclusion, substitution of LA with ALA had no adverse effects on plasma lipid concentrations. However, the study was conducted in a group of healthy normolipidaemic young men and the results cannot necessarily be extrapolated to older people with dyslipidaemia.

ALLMAN, M.A, PENA, M.M., and PANG, D. (1995). Eur. J. Clin. Nutr. 49: 169.
NHMRC: REPORT OF WORKING PARTY. (1992). 'The role of polyunsaturated fatty acids in the Australian diet.' (Australian Government Publishing Service: Canberra).

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