Plant omega 3 fatty acids and fibrinolysis

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Consumption of large amounts of fish or supplements of fish oils rich in omega 3 fatty acids (n-3 FA), eicosapentaenoic (EPA) and docosahexaenoic acid, decrease the tendency to platelet aggregation and lower fibrinogen thereby reducing the risk of thrombosis (1). However, there is a second process involved in haemostasis (ie fibrinolysis or clot dissolution). Fish and fish oil may have deleterious effects on fibrinolysis by increasing the concentration and/or activity of plasminogen activator inhibitor (PAI-1) thus inhibiting clot lysis (2). The aim of this study was to examine the effects of the plant n-3 FA, α-linolenic acid (ALA) on fibrinolysis.

Thirty healthy, non-smoking men, aged 18 to 35 yr, consumed a typical Australian diet for 2 wk (37% energy (en) from fat, 16% en saturated, 5.8% en n-6 polyunsaturated). At this time they were randomly allocated to consume one of two low fat diets for 6 wk:- one the traditional low saturated, high n-6 polyunsaturated (linoleic acid, LA) fat diet and the other rich in ALA (ALA-rich) with a calculated ALA:LA 1.4:1 designed to maximise conversion to EPA and its incorporation. Both were identical in macro- and micronutrient content All food was supplied and subjects maintained their weight. Blood was sampled at the beginning, mid-point and end-point of the test diets to measure changes in coagulation and fibrinolytic activities. Tissue plasminogen activator (tPA) and PAI-1 antigen and activity were assayed using commercial kits (Biopool, Umea, Sweden). Activated protein C resistance (APCR), a measure of the activity of the anticoagulant pathway involving protein C, was also assayed. The platelet fatty acids (FA) were analysed by gas chromatography to verify intake and conversion of ALA.

		Baseline[1]	Mid-point[1]	End-point[1]
PAI-1 antigen (ng/mL)	ALA-rich	13.6 ± 3.0	13.0 ± 3.3	14.0 ± 3.0
	ALA-poor	12.7 ± 2.4	10.1 ± 2.6	12.7 ± 3.2
PAI activity (IU/mL)	ALA-rich	4.5 ± 1.1	3.8 ± 0.7	5.0 ± 1.1
	ALA-poor	4.4 ± 0.9	4.1 ± 0.9	4.3 ± 0.7
tPA antigen (ng/mL)	ALA-rich	4.4 ± 0.5	4.2 ± 0.5	4.2 ± 0.5
	ALA-poor	3.8 ± 0.5	3.7 ± 0.6	4.6 ± 0.7
tPA activity (IU/mL)	ALA-rich	0.7 ± 0.1	0.7 ± 0.1	0.7 ± 0.1
	ALA-poor	0.6 ± 0.1	0.7 ± 0.1	0.7 ± 0.1
APCR	ALA-rich	3.4 ± 0.1	3.7 ± 0.1 *	3.8 ± 0.1 *
	ALA-poor	3.5 ± 0.1	3.7 ± 0.1	3.4 ± 0.1
Platelet EPA (% total FA)	ALA-rich	0.2 ± 0.05	0.5 ± 0.08 *	0.6 ± 0.1 *
	ALA-poor	0.2 ± 0.05	0.2 ± 0.05	0.1 ± 0.03

[1]means ± sem * indicates that the baseline is significantly different P<0.01

APCR increased in the group on the ALA-rich diet, suggestive of reduced procoagulant activity in this pathway. No change in tPA or PAI antigen or activities was detected. It is likely that the effects of moderate ALA intake are very subtle and more subjects would be necessary to detect changes in PAI-1.

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2. Emeis JJ, van Houwelingen AC, van den Hoogen CM, Hornstra G. A moderate fish intake increases plasminogen activator inhibitor type-1 in human volunteers. Blood. 1989;74: 233-7.