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## Decreased monocyte chemoattractant protein 1 and relationship with 15-deoxy $\Delta^{12,14}$ -prostaglandin J<sub>2</sub> in gamma-linolenic acid supplemented healthy subjects

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In this pilot study, we investigated the effects on monocyte chemoattractant protein 1 (MCP-1; CCL2) secretion, MCP-1 gene expression and 15-deoxy  $\Delta^{12,14}$ -prostaglandin J<sub>2</sub> (15d-PGJ<sub>2</sub>) production in peripheral blood mononuclear cells (PBMCs) of gamma-linolenic acid (GLA, 18:3 n-6) rich-borage oil supplemented healthy volunteers. GLA is rapidly converted to dihomo-gamma-linolenic acid (DGLA, 20:3 n-6) and in some cells desaturated further to arachidonic acid (AA, 20:4 n-6). In this study, we present data as seven healthy volunteers acting as their own controls who ingested 14 g borage oil per day consecutively for 13 weeks. It was found that the MCP-1 production from phytohaemagglutinin (PHA)-stimulated PBMCs was significantly reduced during the time course of the supplementation (Table). In addition, the level of PBMC MCP-1 gene expression was reduced significantly during the supplementation period (Table). A significant positive correlation was found between the expression of MCP-1 gene and MCP-1 production in stimulated cell cultures. There was a significant increase in stimulated 15d-PGJ<sub>2</sub> production at weeks 7 and 13 (Table) and a significant negative correlation between 15d-PGJ<sub>2</sub> production and MCP-1 production (Figure). In a parallel study using 14 g of corn oil [which contains linoleic acid (LA, 18:2 n-6) but no GLA] preliminary findings suggest no changes in MCP-1 (week 0, 1462 ± 163 pg/ml v. week 13, 1045 ± 73 pg/ml). The study suggests therefore that GLA-rich borage oil supplementation in humans results in the inhibition of PBMC MCP-1 expression at the gene and protein levels and that 15d-PGJ<sub>2</sub>, a metabolite of AA known to inhibit MCP-1, appears to be the mechanism by which GLA-rich borage oil inhibits MCP-1. The effects of GLA-rich borage oil on PBMC MCP-1 expression and production may be beneficial in certain chronic inflammatory diseases where MCP-1 has been strongly implicated.

	Borage oil supplementation							
	0		4 weeks		7 weeks		13 weeks	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
MCP-1 (pg/ml)	875.4	130.2	355.9***	97.6	105.0***	11.2	66.2***	11.6
MCP-1:18S rRNA	23.83	1.81	10.53***	2.41	7.59***	1.01	1.84***	0.33
15d-PGJ <sub>2</sub> (pg/ml)	363.22	26.61	1375.59	715.02	1691.91*	687.45	1732.45**	489.56

Comparison between groups supplemented borage oil for weeks 4, 7 and 13, respectively and week 0 (without borage oil supplementation). \* $P < 0.05$ , \*\* $P < 0.01$  and \*\*\* $P < 0.001$ .

