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(*n*-3) PUFA rich diets modulate the PGI_2 inhibitory potency of low density lipoprotein (LDL) taken from venous blood of volunteers

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Epidemiological, clinical and experimental studies demonstrated a close correlation between an increased level of LDL (low density lipoprotein) and/or a lowered HDL (high density lipoprotein) and the enhanced incidence of ischemic heart disease. Moreover, prostaglandin I_2 (PGI_2) and thromboxane A_2 (TxA_2) seem to participate in the pathogenesis of arteriosclerosis. In former studies we could demonstrate that LDL of male donors inhibits the synthesis of PGI_2 and increased the production of TxA_2 in different systems. LDL of female donors exert no influence on the PGI_2 formation, hence it increases the TxA_2 formation. The impact of (*n*-3) PUFA in healthy volunteers and patients seems of utmost importance for the development of arteriosclerosis, but their mechanism of action is only partly known. Therefore, we have investigated the influence of an intake of linseed oil (30 ml daily for 4 weeks) or cod liver oil (6.75 g daily for 2 weeks) by healthy, diabetic, and hyperlipidaemic volunteers on the PGI_2 inhibitory potency of their LDL.

Linseed oil diet, rich in α-linolenic acid (LNA), enhanced the levels of LNA and eicosapentaenoic acid (EPA) in the plasma phospholipids (PL) of healthy or hyperlipidaemic type IV (LP IV) volunteers, whereas the same diet in diabetics or hyperlipidaemic type IIa (HLP IIa) volunteers only increased the level of LNA [1–3].

When comparing the PGI_2 inhibitory potency of LDL, taken from volunteers after the diet, to the influence of LDL from the same donors before the diet, it appeared diminished in healthy and HLP IV volunteers and unchanged in diabetic and HLP IIa volunteers [1, 2, 4].

Cod liver oil administration caused changes in the level of EPA in the PL of healthy volunteers similar to those observed after linseed oil diet administration. This dosage of cod liver oil also increased the level of EPA in PL of diabetics to a similar extent [5]. The PGI_2 inhibitory potency of LDL, taken after the diet, versus that before the diet, was diminished in healthy and diabetic volunteers [5].

From these results it is suggested that a decreased PGI_2 inhibitory potency of LDL after (*n*-3) PUFA rich diets is associated with an enhanced level of EPA in PL but not with changes in the level of LNA in the PL (see Table 1). This diminished PGI_2 inhibitory potency of LDL may be one reason for the differential modification in the formation of PGI_2 and TxA_2 after EPA rich diet, which is not explicable by an inhibition of the cyclooxygenase only.

Our studies demonstrate that in healthy and HLP IV volunteers linseed oil increases the level of EPA in plasma PL. In diabetics and HLP IIa volunteers, on the other hand, such an increase was not demonstrated. This may be a result of metabolic abnormality in the elongation and desaturation system for fatty acids (defect in Δ6-desaturase?). This assumption is supported by the elevation of the level of EPA in PL after an EPA rich diet in healthy as well as diabetic volunteers. Therefore, findings from investigations on a diet rich in LNA could be markedly different in

Table 1
Influence of dietary supplementation with (*n*-3) PUFA rich oils on the levels of (*n*-3) PUFA in plasma phospholipids and on the PGI_2 inhibitory potency of LDL.

	Levels of (*n*-3) PUFA		PGI_2 inhibitory potency of LDL
	18:3	20:5	
Linseed oil			
healthy humans	↑	↑	↓
diabetics (IDDM)	↑	–	–
hyperlipidaemics (Type II a)	↑	–	–
hyperlipidaemics (Type IV)	↑	↑	↓
Cod liver oil			
healthy humans	–	↑	↓
diabetics (IDDM)	–	↑	↓

healthy humans in comparison to diabetics, whereas after an EPA rich diet they may be similar.

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