Omega-3 long-chain PUFA and triglyceride lowering: minimum effective intakes

W. S. Harris

Lipid and Diabetes Research Center, Saint Luke’s Hospital, Kansas City, MO, U.S.A.

Early studies on the cardioprotective effects of high doses (up to 20 g of eicosapentaenoic and docosahexaenoic acids, EPA and DHA, per day) of omega-3 fatty acids (FAs) suggested that these FAs primarily lowered triglyceride levels. These supraphysiological intake studies soon gave way to trials using lower and lower intakes of omega-3 FAs such that it is now clear that up to 45% lowering of serum triglyceride levels can be achieved with 3–4 g of EPA+DHA. This is an intake that can hardly be achieved by dietary means; direct supplementation is required. This is a public health challenge since implementing wide-scale supplementation programmes would be difficult.

Relatively few investigators have examined the effects of low (<2 g) EPA+DHA on serum lipid profiles, presumably because until recently there was little expectation that any benefit would be detectable. With the publication of the DART study and more recently the GISSI–Prevenzione Study, it is becoming clear that small intakes of omega-3 FAs can significantly impact CHD risk.

A review of the studies on the effects of small doses (<2 g·day⁻¹) of omega-3 FAs on serum triglyceride levels suggests that serum triglyceride levels decreased in every study (compared with control or placebo treatment). The decreases were often not statistically significant, but this is to be expected with small doses given for short time-periods. Four of the five studies that examined postprandial lipids (PPL) reported significant reductions in this parameter even when fasting levels were not altered. This suggests that chronic intake of small amounts of omega-3 FAs may reduce overall (day-long) triglyceride-rich lipoprotein levels which could have long-term implications for the reduction of CHD risk.

Whilst the cardioprotective effects of omega-3 FAs are becoming well documented, the question of whether such beneficial effects of omega-3 FAs are at least partially mediated by changes in serum levels of triglyceride-rich lipoproteins or their remnants remains open. Further studies to examine the effects of this low level of intake are clearly needed to determine the relative contribution of hypolipidaemic mechanisms versus those involving diminished platelet function, altered adhesion molecule expression, improvements in endothelial function and antiarrhythmic or hypotensive effects.

Key Words: Omega-3 fatty acids, eicosapentaenoic acid, docosahexaenoic acid, serum triglycerides.

Introduction

One of the earliest proposed mechanisms for the cardioprotective effects of omega-3 fatty acids (FAs) observed in Greenland Eskimos was lipid lowering[1]. Although early studies suggested that these FAs (eicosapentaenoic and docosahexaenoic acids, EPA and DHA) lowered serum cholesterol levels, later work revealed that the primary lipid fraction impacted was triglycerides. This has now been confirmed many times over[2-3].

Our early work with omega-3 FAs involved studies with salmon oil, and we examined the hypolipidaemic effects of more than 20 g of EPA+DHA per day[4]. These supraphysiological intake studies soon gave way to trials using lower and lower intakes of omega-3 FAs such that it is now clear that up to 45% lowering of serum triglyceride levels can be achieved with 3–4 g of EPA+DHA[5]. This intake can be achieved with four capsules of Omacor® (Pronova Biocare, Oslo) ESAPENT® or SEACOR®. Although this dose is now known to be effective in lowering triglyceride levels, its impact on clinical coronary heart disease end-points is not well documented. In addition, this is an intake that can hardly be achieved by dietary means; direct supplementation is required. This is a public health challenge since implementing wide-scale supplementation programmes would be difficult. If lower, nutritionally achievable intakes of omega-3 FAs could be shown to...
have clinical benefit, incorporating them into traditional foods might feasibly impact CHD incidence population-wide. With the publication of the DART study and more recently the GISSI–Prevenzione Study, it is becoming clear that quite small intakes of omega-3 FAs (700–1000 mg/day) can significantly impact CHD risk. These patients consuming 700–850 mg of EPA+DHA per day for 2–3½ years. Thus, the cardioprotective effects of small doses given for short time-periods. It is interesting that four of the five studies that examined postprandial lipids (PPL) reported significant reductions in this parameter even when fasting levels were not altered. This suggests that chronic intake of small amounts of omega-3 FAs may reduce overall (day-long) triglyceride-rich lipoprotein levels, which could have long-term implications for the reduction of CHD risk.

In conclusion, the question of whether the beneficial, cardioprotective effects of omega-3 FAs is at least partially mediated by changes in serum levels of triglyceride-rich lipoproteins or their remnants remains open. Further studies examining the effects of this low level of intake are clearly needed to determine the relative contribution of hypolipidaemic mechanisms versus those involving diminished platelet function, altered adhesion molecule expression, improvements in endothelial function and antiarrhythmic or hypotensive effects.

**References**


Minimum effective intakes of omega-3 PUFAs


