

FISH OILS AND CARDIOVASCULAR HEALTH

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It is increasingly being recognised that fish oils have substantial benefits which could promote cardiovascular health. This is based on several epidemiological studies, which show that populations consuming a high fish diet have low cardiovascular mortality rates. Secondary prevention, controlled trials, including the Gissi Prevenzione Study and the Diet and Re-infarction Trial, also provide strong evidence that increased fish and fish oil intake is cardioprotective.

The active agents in fish oils are the two long chain n-3 polyunsaturated fatty acids (n-3 PUFA), eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). The chemical structure of each is shown in Figure 1. Both n-3 PUFA are characterised by the double bond between the third and fourth carbons, from the methyl (CH₃) end of the fatty acid carbon chain. These fatty acids are unique in that they can only be provided to the body through adequate dietary sources of oily fish, including salmon, mackerel, tuna and sardines.

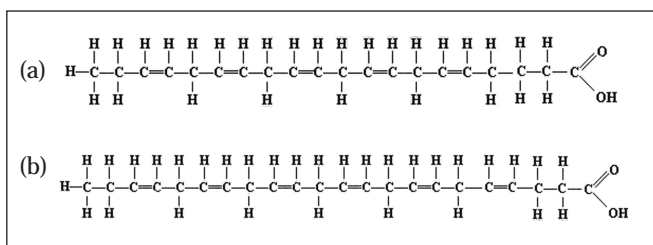


Figure 1. Chemical structure of (a) EPA and (b) DHA.

Cardiovascular benefits of fish oils

A number of dietary intervention studies have shown that n-3 PUFA supplementation improves a number of biological processes related to cardiovascular disease (CVD). Atherosclerosis is a complex pathological process characterised by lipid deposition, a local inflammatory response and a potentially prothrombotic state. Specific cardioprotective effects that have been associated with fish oil supplementation are as follows:

Lipid metabolism

Fish oils reduce plasma triglyceride concentrations, an effect that is often associated with increased HDL cholesterol concentrations. It has been shown that

relatively low levels of supplementation (1g per day) can reduce plasma triglyceride concentrations by 20%.



Platelet aggregation and thrombosis

Fish oils reduce the amount of thromboxane A₂ produced by the platelet. Thromboxane A₂ is a potent prothrombotic eicosanoid and, therefore, reduced levels have an anti-thrombotic effect. Fish oil supplementation also promotes the vascular endothelial cells to produce prostacyclin I₂, a potent eicosanoid that promotes vasodilation and inhibits platelet aggregation.

Inflammation

Recent research shows that inflammation is a key process involved in atherosclerosis. n-3 PUFA are potent anti-inflammatory nutrients. In the case of CVD, n-3 PUFA can reduce cytokine and adhesion molecule expression, which are key mediators of the local pro-inflammatory condition associated with atherosclerosis.

Arrhythmia

Several animal studies suggest that n-3 PUFA have potent anti-arrhythmic effects. Whilst this positive effect has yet to be demonstrated in man, it provides another mechanism that explains the well-accepted cardioprotective effect of n-3 PUFA.

Recommended intakes of n-3 PUFA and current intakes
 Several scientific organisations have made recommendations for n-3 PUFA, including the Committee on Medical Aspects of Food Policy (COMA, 1991 & 1994), the British Nutrition Foundation (BNF, 1992), the Scientific Committee for Food (SCF, 1993) and the FAO/WHO (FAO/WHO, 1998). However, there is a high degree of variation both in terms of the type and the amount of n-3 PUFA (up to seven-fold). The specific recommendations for n-3 PUFA intake are detailed in Figure 2.¹

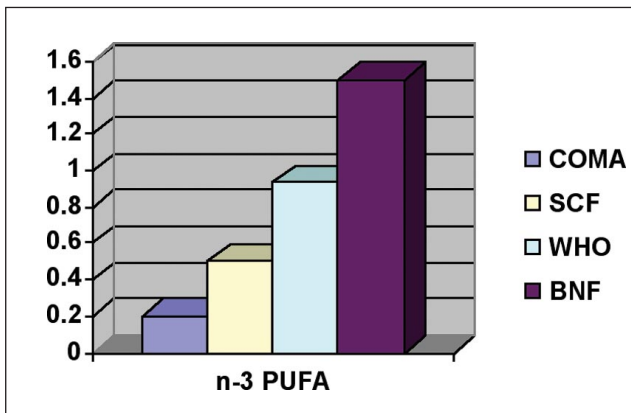


Figure 2. Dietary n-3 PUFA recommendations (% energy).

The large range of values between the scientific authorities reflects the different scientific axioms which underlie the different recommendations. Traditionally, nutritional recommendations were based on the amount of a nutrient required to prevent deficiency. COMA and the SCF base their n-3 PUFA recommendations on this approach, i.e. to prevent essential fatty acid deficiency; therefore, their n-3 PUFA recommendations are very low. In contrast, the WHO and the BNF base their recommendations on the concept of optimal nutrition. This may be defined in terms of the level of a nutrient required to avoid deficiency, plus the amount required to have a positive effect on disease biomarkers and prevent disease. Accordingly, the BNF and the WHO recognise that there are additional beneficial effects associated with greater levels of n-3 PUFA intake; therefore, these recommendations are quantitatively greater to prevent deficiency and promote health.

Current dietary intake versus optimal levels of n-3 PUFA consumption

It is difficult to quantify the actual intake of n-3 PUFA across Europe because dietary surveys usually do not measure n-3 PUFA intake. Therefore, n-3 PUFA intake was estimated based on the actual intake of fish data throughout Europe.¹ Figure 3 shows the estimated range of n-3 PUFA intake (0.07-0.64% energy) in Europe. It is important to note that this estimate assumed that all fish eaten was oily fish, a gross overestimation of actual n-3 PUFA intake because most people eat white fish. Even so, in most European countries, n-3 PUFA intake falls far short of the recommendations.

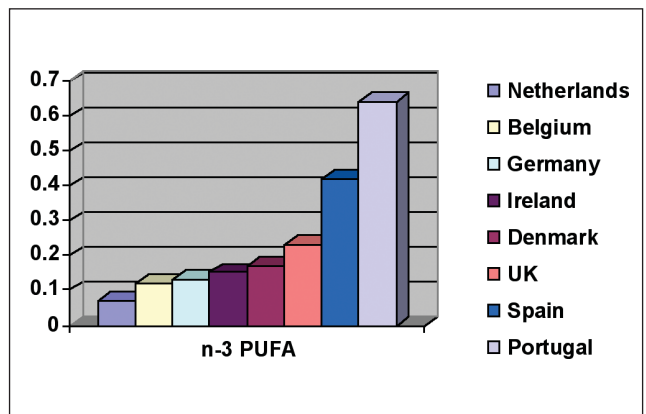


Figure 3. Current dietary intake n-3 PUFA (% energy) in Europe.

In particular, current intakes in northern Europe fall far short of the level of n-3 PUFA required to achieve optimal n-3 PUFA status and promote cardiovascular health.

Total fat intake and promoting n-3 PUFA consumption
 Current healthy eating advice focuses on reducing fat intake. It is important to note that dietary fat composition is a very important component of effective dietary intervention strategies. Total fat intake should be reduced at the expense of saturated fat. Monounsaturated fatty acids (MUFA) and polyunsaturated fats, in particular n-3 PUFA, have positive health effects; therefore, they should be maintained in the diet.

Dietary n-3 PUFA levels required to achieve optimal nutrition and promote cardiovascular health are equivalent to two to three servings of oily fish per week or the equivalent amount (1g per day of fish oil) provided as a capsule for those who do not like fish.

Reference

1. Roche HM. Unsaturated fatty acids. *Proceedings of the Nutrition Society* 1999; 58: 397.

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