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# OMEGA-3s FOR OLDER ADULTS

**The proportion of older people in developed countries across the world is rising. With 23 percent of the UK population set to be 65 years and over by 2035, this has implications for health and NHS costs (1). This article will consider the role of long-chain omega-3 polyunsaturated fatty acids (LC n3PUFA) in helping to support well-being in older adults. The latest evidence, dietary guidelines and health claims will be reviewed.**

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The family of LC n3PUFA are comprised of eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA), which are all derived from the parent fatty acid, alpha-linolenic acid (ALA) (2). While the ratios of these vary depending on the food source, DPA is typically less prevalent than EPA and DHA (3).

Metabolically, ALA can be converted to EPA in humans, but conversion to DHA is inefficient (4). This is why it is important to obtain LC n-3 PUFA direct from dietary sources (2). Currently, mean intakes of EPA + DHA in Europe range from 127 to 1,278mg per day, when foods and supplements are taken together (3). In the UK, this figure is only 410mg per day in people aged 65 years and over, with lower amounts in younger people (5).

UK dietary guidelines for LC n3PUFA were set in 2004 when the Scientific Advisory Committee on Nutrition/Committee on Toxicity (SACN/COT) recommended the consumption of two 140g portions of fish weekly, one of which should be oily (6). This equated to 450mg LC n3PUFA daily and was aimed at the general, healthy population. More recently, the European Food Safety Authority (EFSA) advised that long-term intakes of up to 5.0g per day EPA + DHA from supplements and up to 1.8g per day of EPA alone from supplements were safe for adults (3).

Seafood is the richest natural source of LC n3PUFA, although other sources include human milk, marine algae, marine mammals and krill (3). Unfortunately, mean UK intakes of oily fish are well below SACN guidelines, with older adults aged ≥65 years eating just 85g per week instead of 140g (7). For these reasons, food supplements and enriched foods are important sources of LC n3PUFA (8).

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## HEART HEALTH

Cardiovascular (CV) disease is one of the leading causes of death worldwide (9). LC n3PUFA consumption is viewed as protective, an effect most likely due to reductions in triacylglycerol (TAG) concentrations, improved plaque stability and anti-thrombotic or anti-arrhythmic effects (10). This is supported by good evidence, with one meta-analysis of 47 randomised controlled trials (RCTs) finding that fish oils (average intake of 3.25g EPA and/or DHA per day) significantly reduced TAG levels in patients with high lipid levels (11). Similarly, a RCT on 40 healthy 51- to 72-year olds found that 3.0g per day fish oil significantly reduced TAG levels and systolic blood pressure (12). In contrast, a five-year cohort study using lower doses of LC n3PUFA (1.0g per day) found that these were not associated with improvements in CV mortality or morbidity (13). A systematic review of 48 RCTs and 41 cohort studies also found that LC n3PUFA did not have any clear effects on total mortality, or combined CV events, although the data included subjects without CV risk factors which may have diluted findings (14). Finally, a US cohort of 2,692 adults (mean age 74 years) found that individual and total LC n3PUFA levels were significantly and inversely associated with mortality, especially CHD death (15).

Several meta-analyses have considered the effects of LC n3PUFA on other markers of CV health. Kotwal et al (16) pooled data from 20 RCTs, finding that LC n3PUFA protected against vascular disease while other benefits were less clear. Fillion et al (17) found that LC n3PUFA modestly reduced mortality and risk of arterial blockages after surgery amongst high-risk CV patients, while Cao et al (18) reported

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Table 1: Approved EU health claims for fatty acids and heart health

| Nutrients/ ingredients | Excerpt of claim | Conditions of use |
|---|---|---|
| ALA | Contributes to the maintenance of normal blood cholesterol levels | Food must be at a 'source' of ALA (i.e. at least 0.3g/100g). Consumers must be informed that the beneficial effect is obtained with a daily intake of 2.0g of ALA |
| MUFA and PUFA | Replacing saturated fats with unsaturated fats contributes to the maintenance of normal blood cholesterol levels | Food must be 'high in' unsaturated fat (i.e. at least 70% of total fatty acids in the food or drink derived from unsaturated fat plus >20% energy from unsaturated fat). |
| EPA and DHA | EPA/DHA contribute to the normal function of the heart. | Food must be at a 'source' of EPA/DHA (i.e. at least 0.4g/100g in total). Consumers must be informed that the beneficial effect is obtained with a daily intake of 250mg of EPA and DHA. |
| DHA and EPA | DHA contributes to the maintenance of normal blood triglyceride levels<br>DHA/EPA contribute to the maintenance of normal blood triglyceride levels | Food must provide a daily intake of 2.0g of DHA in combination with EPA. Consumers must be informed that the beneficial effect is obtained with a daily intake of 2.0g of DHA. When the claim is used on food supplements and/or fortified foods, consumers must be told not to exceed a supplemental daily intake of 5.0g of EPA and DHA combined. The claim shall not be used for foods targeting children. |
| DHA and EPA | DHA/EPA contribute to the maintenance of normal blood pressure | As above, but food must provide a daily intake of 3.0g of DHA in combination with EPA. Consumers must be informed that the beneficial effect is obtained with a daily intake of 3.0g of DHA. |

Key: ALA, alpha-linolenic acid; DHA, docosahexaenoic acid; EPA, eicosapentaenoic acid; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids.
Source: European Parliament and Council (22)

that LC n3PUFA for a least four weeks before and after cardioversion (when heart rate is corrected) led to significantly lower rates of recurring atrial fibrillation.

While these findings seem mixed, a number of factors may have influenced the data, e.g. 1) different levels of n-3 red blood cell levels at baseline, 2) variations in the source, type, combination and dose of n-3 fatty acids, 3) differences in patients groups i.e. primary vs secondary prevention trials and 4) the inclusion of different quality studies within meta-analyses. Considering this, LC n3PUFA, at higher levels of intake and from fish oils, appear to be effective for improving markers of heart health. More studies are needed to compare the potential benefits of EPA and DHA. For example, it has been proposed that while EPA and DHA are both effective at reducing TAG and markers of inflammation, only DHA seems to reduce heart rate, blood pressure and low-density lipoprotein particles (19).

In terms of clinical guidelines, EFSA advise that intakes of 0.25 to 0.5g/day of EPA + DHA may exert cardio-protective effects (3) while the International Society for the Study of Fatty Acids and Lipids (ISSFAL) (20) recommends that at least 0.5g/day EPA + DHA should be consumed to support CV health. The American Heart Association advises 1.0g per day of EPA + DHA per day for patients diagnosed with coronary heart diseases and a supplement of 2.0-4.0g/day of EPA + DHA for patients with raised triglycerides (21). As shown in Table 1, two heart health claims were approved by the European Commission (22), although these are strict conditions of use.

## COGNITIVE FUNCTION

Maintaining optimal cognitive health is central to healthy ageing. As with heart health, different n-3 fatty acids may have distinct but complementary roles in the brain (23). A systematic review (24), which included 14 studies, mainly epidemiological, found that diets with a higher n-6:n-3 ratio were associated with an increased risk of cognitive decline and dementia. The beneficial role of n-3 fats may be because DHA is a major component of brain phospholipids and helps to regulate the uptake of brain glucose, ion transport, signal transmission, neurotransmitter release (and uptake) and the sequestration of free radicals, preventing oxidative stress (23, 25). In addition, ALA is thought to support the production of ketone bodies and EPA the oxidation of fatty acids, both of which are central to providing a supply of brain glucose (23).

Some studies have been conducted on healthy adults, while others have focused on the role of LC n3PUFA in managing cognitive conditions. For example, the OPAL study of healthy elderly found that higher fish intakes at baseline were associated with better cognitive function (26). Equally, a five-week RCS of 40 healthy middle-aged and elderly subjects revealed that supplementation with fish oil (3 g LC n3PUFA per day) significantly improved working memory (12). In contrast, a review of three RCTs concluded that LC n3PUFA had no effect on cognitive function in healthy adults aged ≥60 years, although this may be because few participants demonstrated cognitive decline (27).

Studies on the management of cognitive conditions show some benefits. A well-designed case control study found that higher plasma and dietary DHA levels/intakes reduced the odds of elderly people developing dementia and AD (28). Findings showed that plasma DHA levels in the highest tertile were associated with a 65 percent reduced risk of dementia and a 60 percent reduced risk of AD. A six-month RCT of 50 adults aged >65 years with mild cognitive impairment showed that supplementation (1.55g DHA + 0.40g EPA daily) significantly improved verbal fluency and depression scores (29). Another RCT gave patients with Alzheimer disease (AD) 1.7g DHA + 0.6g EPA per day versus a placebo. While the findings showed no significant effect on cognitive decline over six months, improvements in the AD assessment scale were seen in a sub-group with very mild AD (30). Finally, a trial of a prescription-only drink, containing 300mg EPA + 1,200mg DHA (amongst other nutrients), reported that daily consumption over

24 weeks significantly improved memory performance in patients with mild AD who were not taking psychotropic medications (31). For the management of depression, meta-analyses suggest that supplements containing more than 50 percent EPA and pure ethyl-EPA appear to be more effective than DHA at reducing depressive symptoms (32). Similarly, an analysis of 15 RCTs concluded that supplements containing ≥60 percent EPA, in doses ranging from 200 to 2,200mg, were effective alongside DHA in reducing primary depression (33).

Overall, there seem to be cognitive benefits for n-3 fatty acids but study results are varied, possibly due to recruitment of healthy participants, poor retention, failure to screen for low baseline LC n3PUFA status, different doses and ratios of EPA/DHA and inappropriate study size or duration (25). Thus, while fish consumption and higher dose fish-oil supplements seem to improve cognitive health (especially EPA for depression management), further well-designed trials in the elderly are needed.

## CONCLUSION

There is good evidence that LC n3PUFA help to support heart health and protect against secondary coronary events. They may also be useful for certain cognitive conditions such as in treatment of depression (32, 33). Further research is needed to establish whether LC n3PUFA (or specific fatty acids) should be recommended for the prevention of cognitive decline.

Unfortunately, LC n3PUFA and their main natural source, oily fish, are under-consumed by most people (7). Dietitians can play an important role in encouraging older patients to meet SACN/COT fish consumption guidelines of two portions a week (6) and raising

awareness of the levels needed for heart health, i.e. 0.5g/day (20). However, even this may not be enough to ensure that 'at risk' groups achieve the optimal intakes for CHD prevention of 1.0-4.0g/day EPA + DHA (21) and supplementation may be warranted.

In conclusion, LC n-3PUFA appear to have a promising role in supporting the health of older people, particularly in relation to cholesterol management and heart function. For cognitive function, there is growing evidence that EPA may be useful for management of depression while both EPA and DHA could benefit elderly in the early stages of dementia, AD and cognitive decline. More evidence from RCTs is needed to ascertain the most appropriate doses, and proportions, of the individual fatty acids. Dietitians can help older people to meet PUFA recommendations by encouraging oily fish consumption and by providing impartial advice about fish oil supplements.

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**Questions relating to:** *Omega-3s for older adults.*
Type your answers below and then **print for your records.** Alternatively print and complete answers by hand.

| | |
|---|---|
| Q.1 | What does the long-chain omega-3 polyunsaturated fatty acid (LC n3PUFA) family comprise of? |
| A | |
| Q.2 | Why should LC n3PUFA be obtained from dietary sources? |
| A | |
| Q.3 | What are the natural dietary sources of omega-3 and why are supplements an important source? |
| A | |
| Q.4 | Describe how LC n3PUFA is considered protective against cardiovascular disease. Support your answer with an example of research evidence. |
| A | |
| Q.5 | What are the clinical guidelines for omega-3 intake to support heart health? |
| A | |
| Q.6 | Describe the two heart health claims that were approved by the European Commission. |
| A | |
| Q.7 | Why is LC n3PUFA thought to play a beneficial role in cognitive function? |
| A | |
| Q.8 | Summarise the findings of the studies published in the article relating to omega-3 intake in the management of cognitive conditions. |
| | |
| Q.9 | What role can dietitians take in supporting the health of older people with regards to LC n3PUFA? |
| | |

Please type additional notes here . . .