Omega−3 fatty acid

Omega−3 fatty acids, also called Omega-3 oils, ω−3 fatty acids, or n−3 fatty acids, are polyunsaturated fatty acids (PUFAs) characterized by the presence of a double bond, three atoms away from the terminal methyl group in their chemical structure.

Omega-3 fatty acids are a group of polyunsaturated fatty acids (PUFAs) that are essential for human health. The term “omega-3” refers to the location of the first double bond in the fatty acid molecule, counting from the methyl end (the omega end) of the carbon chain. There are three main omega-3 fatty acids that are considered nutritionally important:

Alpha-linolenic acid (ALA): ALA is a plant-based omega-3 fatty acid found in sources such as flaxseeds, chia seeds, walnuts, and hemp seeds. It is an essential fatty acid, meaning the body cannot produce it and must obtain it from the diet. ALA can be converted into the longer-chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), although this conversion is relatively inefficient in humans. Eicosapentaenoic acid (EPA): EPA is found primarily in fatty fish such as salmon, mackerel, sardines, and anchovies. It is also available in fish oil supplements. EPA has anti-inflammatory properties and is thought to play a role in reducing inflammation, supporting cardiovascular health, and potentially benefiting mood and mental health. Docosahexaenoic acid (DHA): DHA is abundant in oily fish like salmon, trout, and tuna, as well as in algae-based supplements. It is a major structural component of cell membranes in the brain and retina and is crucial for brain development and function, particularly during infancy and early childhood. DHA has been associated with cognitive function, memory, and overall brain health. Omega-3 fatty acids have been studied extensively for their potential health benefits, including:

Heart Health: Omega-3 fatty acids, especially EPA and DHA, are associated with reduced risk of heart disease. They can lower triglyceride levels, reduce blood pressure, decrease inflammation, and improve arterial function. Brain Health: DHA, in particular, is important for brain development and function. It may play a role in preventing cognitive decline and reducing the risk of neurodegenerative diseases like Alzheimer's disease. Mood and Mental Health: Some studies suggest that omega-3 fatty acids, especially EPA, may help improve mood and alleviate symptoms of depression and anxiety. Eye Health: DHA is a major component of the retina, and adequate intake of omega-3 fatty acids may help protect against age-related macular degeneration and maintain overall eye health. Omega-3 fatty acids are considered essential nutrients, and incorporating sources of omega-3s into your diet or taking supplements can be beneficial for overall health, particularly heart and brain health. However, it's important to consume them as part of a balanced diet, alongside other essential nutrients, and to consult with a healthcare professional before starting any supplementation regimen.

They are widely distributed in nature, being important constituents of animal lipid metabolism, and they play an important role in the human diet and in human physiology.

The three types of omega−3 fatty acids involved in human physiology are α-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). ALA can be found in plants, while DHA

and EPA are found in algae and fish. Marine algae and phytoplankton are primary sources of omega−3 fatty acids.

DHA and EPA accumulate in fish that eat these algae.

Common sources of plant oils containing ALA include walnuts, edible seeds, and flaxseeds, while sources of EPA and DHA include fish and fish oils, as well as algae oil.

Conventional lipid-lowering agents, including statins, ezetimibe, fibrates, bile acid sequestrants, nicotinic acid, bempedoic acid and Omega-3 fatty acid, are essential to the management of dyslipidemia. However, these agents have been shown to increase the level of plasma proprotein convertase subtilisin/kexin 9 (PCSK9), a serine protease associated with increased - cardiovascular risk.

A review of Luo et al. aimed to investigate the impact of commonly available conventional lipid-lowering agents on circulating PCSK9 levels and lipid profiles.

This protocol was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines. A systematic literature search will be conducted in the following databases: MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Web of Science, SCOPUS and ScienceDirect. Additional information will be retrieved from clinical trial registries or from reference list searches. Published and peer-reviewed randomised controlled trials with adults receiving statin, ezetimibe, fibrate, bile acid sequestrant, nicotinic acid, bempedoic acid or Omega-3 monotherapy or in combination for at least 2 weeks, with availability of plasma PCSK9 at the beginning and end of treatment or the net changes in values, will be included. Study selection, data extraction and assessment of the risk of bias will be independently conducted by two investigators. Continuous data will be presented as a standardised mean difference with 95% confidence interval (CI) and dichotomous data as risk ratios with 95% CI. Subgroup analysis and sensitivity analysis will be performed when sufficient studies are included. Publication bias will be assessed with a funnel plot and Egger's test. [1].

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Luo J, Huang T, Xu R, Wang X, Yang Y, Li L, Zhang X, Zhang Y, Yang R, Wang J, Yang H, Ma Y, Yang B, Wang T, Jiao L. Impact of conventional lipid-lowering therapy on circulating levels of PCSK9: protocol for a systematic review and meta-analysis of randomised controlled trials. BMJ Open. 2022 Sep 8;12(9):e061884. doi: 10.1136/bmjopen-2022-061884. PMID: 36691198.