

Role of Fish Oil for Human Health

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Abstract

In recent times, seafood is gaining more focus on account of its richness in omega-3 fatty acids. Numerous investigations carried out reveal the health benefits of omega-3 fatty acids as a nutritional supplement against various life threatening diseases like cardiovascular disease, cancers, skin diseases and many inflammatory diseases etc. They also play a significant role for the proper growth and development of the foetus. National and International health authorities have set up recommendations of daily fish oil intake due to the immense health potential it carries and it is necessary to create an awareness in the society on its importance, as the modern world has become a hub of various lifestyle diseases.

INTRODUCTION

Life has become fast and convenient on account of the latest development in technology but at the same time it has welcomed various health hazards also. Life style diseases are mainly associated with poor eating habits like the consumption of junk and processed foods rich in saturated fat, dietary deficiencies over consumption of certain foods etc. Other reasons causing health risks include lack of physical activity, work stress, disturbed biological cycle and other factors which affect human beings of all generations. In this context it is of paramount importance to choose appropriate food which provides healthy balanced nutrition.

Fish is considered as a cheap source of many essential nutrients especially fat and protein and hence is of value in human diet. It is highly recommended in the human diet due to its richness in two many fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These two fatty acids are polyunsaturated fatty acids and are classified as omega-3 fatty acids. The main sources of these omega-3 PUFA rich oils are the meat of fatty fish such as sardine, herring, mackerel, menhaden, salmon, the liver of cod and the blubber or marine mammals such as seals and whales.

Table 1. Marine sources rich in omega-3 fatty acids (g/100g meat)¹.

Marine Sources	Omega-3 fatty acids (EPA and DHA) (g/100g fish meat)
Sardine/Herring	1.5-2.4
Salmon	1.3-2.2
Spanish Mackerel, Atlantic and pacific	1.3-2.0
Halibut	0.7-1.3

Tuna	0.3-1.3
Sword fish	1.14
Green Shell/Lipped mussels	1.12
Tile fish	1.06
Shark	0.98

Fish lipid/oils consists of triglycerides, phospholipids, fatty acids, wax esters, sterols, other minor compounds like glyceryl ester, glycolipids, hydrocarbons like squalene, sulpholipids etc. Phospholipids and sterols are structural components in cell membrane while other lipids act as energy stores and are important for maintaining buoyancy. The fatty acid compositions of fish lipids are more complex with mainly monounsaturated fatty acids (MUFA) along with polyunsaturated fatty acids (PUFA) and some saturated fatty acids in different proportions. PUFAs are mainly contributed by omega-6 and omega-3 fatty acids with former being high in fresh water fishes and the latter being the major contributions in marine fishes. The omega-3 fatty acids which are important in human nutrition are α -linolenic acid (918.3 ALA), Eicosa pentaenoic acid (20.5 EPA) and Docosahexaenoic acid (22.6 DHA). The term omega-3 has been derived as the first double bond appear at the third carbon-carbon chain from methyl end.

The oil of some species of sharks especially deep sea sharks have high squalene content of about 90% and it has many pharmaceutical as well as cosmetic applications. Central institute of Fisheries technologies (ICAR-CIFT) has developed methods of extraction, isolation and purification of squalene and obtained a yield of about 80% pure squalene from *Centrophorus* sp. ICAR-CIFT has also developed the technology for extraction of Poly Unsaturated Fatty Acids (PUFA) from fish oil, thus making a very important contribution towards nutritional security².

Omega-3 fatty acids are used as dietary supplements in the liquid or capsule form. Different forms like omega-3 concentrated oils, shark liver oil and cod liver oil are readily available in the market under different brands. The liver oils are often consumed not only due to their richness in omega-3 components but also associated vitamins like A and D. The significance of these oils has created a wide market demand and hence they are used for fortifying bakery products, dairy products such as milk, yoghurt and juice, infant formulas etc.

FISH OIL FOR HEALTH

Omega-3 fatty acids are dietary fibres having an array of health benefits. They are essential for various metabolic processes, from structural component to the cell membrane, essential for foetal development and is found abundant in brain and retina. Recent investigations conducted on omega-3 Fatty acids has gained more recognition to seafood on account of the health benefit they provide and this is regarded to be one of the most promising development in human nutrition. EPA and DHA are precursors for several metabolites which are potential mediators beneficial for the prevention and treatment of numerous diseases. Studies revealed the role of chain omega-3 PUFAs in

the treatment of cardiovascular diseases, hypertension, diabetes, arthritis, depression, migraines, skin diseases like psoriasis, eczema and other inflammatory and autoimmune disorders as well as cancer³.

Omega-3 fatty acids and cardiovascular disease

Cardiovascular disease (CVD) refers to the health disorder associated with heart and related circulatory system. It is a prominent disease in the modern world and is mainly associated with the intake of fat rich in saturated and trans components. Chronic inflammation is thought to be the cause of many chronic diseases, including CVDs. CVDs are associated with the narrowing of large arteries with atheromatous plaques, or the total occlusion of coronary arteries (thrombosis) caused by atheromatous blockages leading to myocardial tissue necrosis. Both conditions reduce the heart's ability to pump blood and can result in either chronic or sudden heart failure. It is becoming apparent that regular consumption of fatty fish or fish oil lowers the rate of incidence and death from cardiovascular disease.

Omega-3 fatty acids and cancer

Cancer is one of the most threatening lifestyle disease having wide spread occurrence irrespective of the generation. Several studies have reported possible anticancer effect of omega-3 fatty acids particularly in breast, colon and prostate cancer. Omega-3 fatty acids were found to reduce the tumor growth as well as slowed histopathological progression.

Omega-3 fatty acids and inflammatory disease

EPA and DHA have anti-inflammatory effect and a role in oxidative stress and to improve cellular function through changes in gene expression. Inflammatory Bowel Disease (IBD) is a general term for chronic inflammatory disease of the GI tract which includes ulcerative colitis and Crohn disease. Crohn's disease can affect the small intestine and large intestine, mouth, oesophagus, stomach and the anus whereas ulcerative colitis primarily affects the colon and the rectum. Studies using animal models provide strong evidence for the protective effects of omega-3 fatty acids against induced IBD. Similarly individuals having lower intake or omega-6/omega-3 ratios were 21% less likely to suffer from Crohn disease.

Omega-3 fatty acids in mental health and neural function

Human nervous system has the highest lipid content compared to all other tissues excluding adipose tissue. 50-60% of the total dry weight of adult human is lipid and one third being omega-3 PUFAs; mostly DHA. Incorporation of DHA into graving neurons in a prerequisite for synaptogenesis. The Canadian Government has reported the DHA have a biological role in supporting the normal development of brain, eyes and nerves. Omega-3 PUFAs are known to have membrane-enhancing capabilities in brain cells which are explained to be due to the major role played by them in fortification of the myelin sheaths and are also found beneficial in repairing brain damage by promoting neuronal growth.

Epidemiological and clinical studies suggest inverse relation between omega-3 PUFA consumption and depression. Change of traditional seafoods to processed foods increases decline in mental health characterized by increased depression. A population survey carried out in the adults of Finland revealed that depression is more

prevalent among infrequent fish consumers. Since depression is linked to proinflammatory cytokines, beneficial effect of omega-3 PUFAs may be through modulation of proinflammatory eicosanoid and cytokine production.

Omega-3 fatty acids for foetal development

Supplementing with EPA and DHA in the diet during pregnancy is associated with multiple benefits for the foetal development. Deficiency of DHA during prenatal development increases likelihood of diminished visual activity, cerebellar dysfunction, cognitive impairment and neurological disorders. As per US Department of Health and Human Service Dietary Guidelines (2010) it is recommended that pregnant and breastfeeding mothers should consume about 8-12 ounce of seafood per week from a variety of seafood source which accounts to nearly 300-900 mg EPA and DHA per day. This is found to be essential for the growth and development of the foetus. Omega-3 supplementation during pregnancy is also associated with longer gestation period and increases in concentration of EPA and DHA in foetal tissue. This is very important as prematurity is the cause of various infant diseases and can even lead to death. Some other reports suggest that mothers using omega-3 fatty acid rich diets during pregnancy and breast feeding may protect their children against allergies which may be due to the fact that fish oil supplementation leads to decreased levels of body cell associated with inflammation and immune responses.

Omega-3 fatty acids as skin care

Dietary consumption of fish oils rich in omega-3 fatty acids are known to adjust the balance of lipid inflammatory mediators thereby important in the treatment of inflammatory skin disorders. Excessive exposure to UV light is associated with many undesirable skin alterations. Increased exposure to sunlight also increases the likelihood of nonmelanoma skin cancer. Studies have shown that dietary supplementation with omega-3 PUFAs provides photo protection by being effective against UV-irradiation induced damage.

Psoriasis is a common skin disorder characterized by epidermal hyperproliferation and cutaneous inflammation. Severity varies from small localized area to whole body. Researchers carried out suggested that an increase in the dietary intake of fish oil and a reduction in the intake of foods rich in arachidonic acid (omega-6 fatty acid) would be beneficial treatment to counteract that exaggerated inflammation in psoriasis.

CONCLUSION

Present life style demands more attention towards health foods on account of the aggravating health problems being generated. The ill effects of chronic diseases like cardiovascular disease, inflammatory conditions etc can be reduced by regular consumption of seafood which are rich sources of omega-3 fatty acid like EPA and DHA. Hence more awareness on the importance of this healthy diet needs to be created for the betterment of the society.

REFERENCES

1. P.M. Kris-Etherton, S. H. William, J. A. Lawrence, *Circulation*, 106, 21: 2747-2757,2002.
2. P.K. Surendran, P.T. Mathew, T. Nirmala, V. N. Namibar, J. Jos, M.R.Boopendranath, P.T. Lakshmanan, P.G. Vishwanathan Nair, Eds. *Seafood Safety*, 2003, pp 173-175, SOFTI, Cochin.
3. P.M. Sherief, *Fishing Chimes*, 13, 10 25-28, 1994.
4. T.V. Sankar, M. Suseela, R. Anandan, K. K. Asha and B.P. Mohanty *Nutrient Profiling of fish*, 2010, 61p, central Institute of Fisheries Technology, Cochin.
5. S.S. Giri, B. N. Paul, S.K. Sahoo, P. V. Rangacharyulu, S.C. Rath and S.N. Mohanty, *fishing Chimes*, 30,2,37-39,2010.