Fish Oil and Human Health

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In recent times, seafood is getting more focus on account of its richness in omega-3 fatty acid. Numerous investigations carried out reveal the health benefits of omega-3 fatty acids as a nutritional supplement against various life-threatening diseases like cardiovascular diseases, 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 recommendation 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.

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 main fatty acids, eicosapentaenoic acid (EPA) and decosahexaenoic acid (DHA). These two fatty acids are polyunsaturated 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 of marine mammals such as seals and whales.

Fish lipids / oil consists of triglycerides, phospholipids, fatty acids, wax esters, sterols, other minor compounds like glyceryl esters, 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 acids 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-5 and omega-3 fatty acids with former being high in freshwater fishes and the latter being the major contributors in marine fishes. The omega-3 fatty acids which are important in human nutrition are α-linolenic acid, Eicosapentaenoic acid and Docosahexaenoic acid.

FISH OIL FOR HEALTH

Omega-3 fatty acids are dietary fibres having an array of health benefits. They are essential for various metabolic processes, form 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 developments 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 long 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 cancer.

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 deaths from cardiovascular disease.

The cardioprotective effects of n-3 fatty acids in the combined effect of increased heart rate variability, reduced atheroma development and decreases platelet aggregation. In simple terms, omega-3 fatty acids decrease the platelet aggregation leading to a modest prolongation of bleeding time. Apart from these benefits, omega-3 fatty acid intake results in changes in blood lipid levels. It was observed to reduce the serum triglyceride concentration by 30% with associated increase in HDL (Good Cholesterol). This HDL increase reduces the risk of heart diseases.

Omega-3 Fatty acids and cancer

Cancer is one of the most threatening lifestyle diseases having widespread occurrence irrespective of the generation. Several studies have reported possible anticancer effect of omega-3 fatty acids

particularly in breasts, colon and prostate cancer. Omega-3 fatty acids were found to reduce the tumour growth as well as slowed histopathological progression. Experimental and epidemiological studies suggested anti-tumour effects of n-3 fatty acids during the initiation and post initiation stages of colon carcinoma. Studies carried out in Sweden showed an inverse association between fatty fish consumption and prostate cancer. Similarly, studies conducted in America population also revealed that long term consumption of fish meat and omega-3 fatty acids slowed down the progression of prostate cancer. Few epidemiological studies assessed on the effect of dietary n-3 fatty acids and breast cancer showed their protective effects against breast cancer risk by inhibition breast carcinoma development by influencing the biochemical events that follow tumour initiation.

Omega-3 Fatty acids and inflammatory diseases

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 of omega-6/omega-3 ratios were 21% less likely to suffer from Crohn disease.

In vitro and human studies suggest that omega-3 fatty acids serve as effective therapeutic agents for the management of inflammatory arthritic diseases.

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 is a prerequisite for synaptogenesis. The Canadian Government has reported that DHA have a biological role 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.

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 ounces of seafood per week from a variety of seafood sources 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 increase 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.

Omega-3 fatty acids and 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 non-melanoma 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. Researchers carried out suggested that an increase in the dietary intake of fish oil and a reduction in the intake of food rich in arachidonic acid (omega-6 fatty acid) would be beneficial treatment to counteract the exaggerated inflammation in psoriasis.

CONCLUSION

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

'Any error in this manuscript is silent testimony of the fact that it was a human effort'

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