Journal of Animal Science and Products (JASP)
International peer-reviewed journal
http://www.trjasp.com
2 (1): 54-66, 2019

Omega-3 Fatty Acids and Their Health Potentials to Human Life

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ARTICLE INFO

Review

Received: 23 August 2019
Accepted:10 December 2019

Keywords

Fisheries products
Omega-3 fatty acids
EPA and DHA
Health benefits

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ABSTRACT

Fish oil supplementations play major roles in the biological processes, essential dietary omega-3 fatty acids. The lower consumption of EPA and DHA are suggested to be in connection with improve inflammatory activities likewise as defective fetal development, overall cardiovascular health, and risk of formation of Alzheimer's Disease (AD). Fish oils from salmon, mackerel, herring and sardine species are the only source that is very rich in EPA and DHA. These can be obtained from one whole fish about 1.5 and 3.5 g. Intake of 1 g of fish oil capsule per day could supply almost 300 mg omega-3 fatty acids. Daily consumption of n-3 PUFAs is around 100 mg. Omega-3 fatty acids which are EPA and DHA are regarded as dietary fats that consists variety of benefits to health. EPA and DHA are molecular antecedents to a family of eicosanoids which possess anti-inflammatory, antithrombotic, antiarrhythmic, and vasolidatory properties. LA is transformed into AA, and it's the antecedent to a separate category of eicosanoids which have proinflammatory and prothrombotic properties. This contention is biologically essential due to the fact that eicosanoids are obtained from these two essential fatty acids that are n-6 and n-3. EPA and DHA have a directly contrary effect. The growth of fetus brain experience acceleration in the second trimester of pregnancy and this increase in growth continues throughout the first year of life until several years. The quantity of omega 3-fatty acids required of pregnant women is higher over normal women, as this will help to support fetal growth, especially of the brain and eyes.

Introduction

Fisheries products consist of protein, healthful nutrients like vitamin D, selenium, iodine, long-chain omega -3 polyunsaturated fatty acids. The most essential and active omega-3 fatty acids are eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). It is important to get them sufficient quantity for the proper functioning of the system (Mahaffey et al., 2011). EPA and DHA are the antecedents of various metabolites which are strong lipid intermediary, considered by many types of research to be useful in the precaution of various diseases. It is very demanding to get an adequate quantity of EPA and DHA from food alone (Serhan et al., 2008). Fish oil supplementation play major role in the biological processes, especially omega-3 fatty acids (Leaf and Hatcher, 2009; Mann et al., 2010). The lower consumption of EPA and DHA are suggested to improve inflammatory activities likewise as defective fetal development, overall cardiovascular health, and risk of formation of

Lütfen aşağıdaki şekilde atıf yapınız / Please cite this paper as following;
Ogunkalu, O.A. 2019. Omega-3 fatty acids and their health potentials to human life, Journal of Animal Science and Products (JASP) 2 (1):54-66.

Alzheimer's Disease (AD) (Swanson et al., 2012). Fish oil from salmon, mackerel, herring and sardine species are the only source that is very rich in EPA and DHA. Intake of 1 g of fish oil capsule per day could supply almost 300 mg of omega-3 fatty acids. Consumption of n-3 PUFAs it around 100 mg/day (Meyer et al., 2003). Omega -3 fatty acids which are EPA and DHA are regarded as dietary fats that consists variety of benefits to health (Su et al., 2008). Long-chain PUFA are absorbed in several parts of the body with inclusion of cell membrane (Lazzarin et al., 2009) and contribute to anti-inflammatory activity and in the thickness of cell membrane (Smith et al., 2010). The two important omega-3 fatty acids are crucial for appropriate fetal growth and healthy aging. They are also used for the treatment of dry eyes and glaucoma (Dunstan et al., 2007). According to Das (2004), EPA and DHA have a useful outcome in glomerular disease, which attributes to the outcome on the pro-oxidant and antioxidant degree and EFA metabolism. PUFAs is, also, utilized for age-associated macular deterioration (AMD). This is a very regular condition in elderly people which result in critical sight complications (Furuhjelm et al., 2009). The intake of long-chain n-3 PUFAs, EPA, and DHA have shown physiological advantages on blood pressure, heart rate, triglycerides, possibly inflammation, endothelial function, and cardiac diastolic purpose (Burr et al., 1989; Ristić-Medić et al., 2011). The growth of newborn and little children are greatly influenced by LA and ALA. The lowest consumption levels for important fatty acids for the prevention of deficiency manifestation have been evaluated at 2.5%ELA and 0.5% EALA (Kostecka, 2015). According to epidemiological studies and randomized controlled tests of coronary heart disease (CHD) activities, PUFAs are needed for reducing of LDL and total cholesterol concentrations, improving HDL cholesterol concentrations and reducing the risk of CHD activities (WHO, 2008).

Origin of fatty acids

The major source dietary of omega-3 fatty acids is ALA from seed oils. Linseed oil obtained from flaxseed (*Linium usitatissimun*) is available source of ALA. It is converted in the body to EPA and DHA. Several other sources encompass canola, soybean, walnut and plants sources, dark green vegetable, while n-6 fatty acid is available in vegetable oils corn, sunflower, and soybean (Martins et al., 2008). According to Kus and Mancini-Filho (2010), EPA and DHA could be derived from dietary source by several sources encompassing the following;

Marine which is the most abundant source of n-3 such as fish and fish-like products. Oily fish like tuna, salmon, and herring has approximate levels from 862 to 1840 mg of EPA and DHA for every 100g. DHA is the main n-3 PUFAs and it is essential that several popular species of fish like cod and clams, shrimp, crabs, and oysters consists of a reduce quantity of DHA.

All animals consist of n-3 as a piece of cell membrane phospholipids, with a level close to 0.40 mg for 100 g

meat, thus, this makes meat products a poor source of EPA and DHA. There has been an improvement step in the market to supplement foods products from industry with omega -3 fatty acids mostly DHA. The foods are enriched with n-3 PUFAs by enhancement of products. Also, there has been a need to use microencapsulation, increase algae and vegetable oil production (Arbex et al., 2015).

Metabolism of essential fatty acids

The LA and ALA could be enlarged and desaturate by the activity of capable enzymatic procedure into effective essential extended chain n-6 and n-3 PUFAs. ALA could be transformed into a lower quantity of EPA which consists of 20 carbons and possibly lesser one which is DHA (Burdge and Calder, 2005; Brenna et al., 2009). EPA and DHA are molecular antecedents to a family of eicosanoids which possess antiinflammatory, vasolidatory, antithrombotic, and antiarrhythmic properties.

LA is transformed into AA, and it's the antecedent to a separate category of eicosanoids which have proinflammatory and prothrombotic properties. n-3 and n-6 PUFAs included similar enzymes (delta-5 and delta-6 desaturate) for transformation into the lengthen–chain n-3 and n-6 fats; This contention is biologically essential due to the fact that eicosanoids are obtained from these two essential fatty acids that are n-6 AA and n-3. EPA and DHA have a direct contrary effects (Martins et al., 2008).

Pregnant women and fetus growth

These most essential omega-3 fatty acids have proved to have potential effects on the health of humans, which helps in promoting childhood development when consumed by pregnant women (Jensen, 2006). The growth of fetus brain experience acceleration in the second trimester of pregnancy and this increase in growth continues throughout the first year of life until several years. The quantity of omega 3-fatty acids required of pregnant women is higher over normal women, as this will help to support fetal growth, especially of the brain and eyes (Stern, 2007). Pregnant women have always be advised for the inclusion of sufficient fatty acids, especially EPA and DHA in their diets (Ramakrishnan et al., 2010). This is because the inclusion of EPA and DHA during pregnancy proved to have various benefits in the developments of the fetus. In Pregnancy these essential omega fatty acids are transferred from the mother to the child (Helland et al., 2008). The quantity of EPA and DHA transferred to the fetus by the placenta is determined by the quantity consumed by the pregnant woman, for the fetus to have adequate quantity of EPA and DHA which is of great importance for the pregnant woman to consume adequate quantity (Dunstan et al., 2007). Fish oil is, also, utilized for the treatment of problems in association with pregnant women such as high blood pressure in late pregnancy, premature delivery, abortion (Olsen et al., 2000; Dunstan et al., 2008; Kremmyda et al., 2011). DHA plays a crucial contribution to cognitive functions. Thus, its consumption is very

essential for pregnant women, young children, adult and elderly. DHA is concerned in normal growth of fetal brain and retina and it continues till the first two years of early life (Cetin and Koletzko, 2008). There are positive connections between DHA levels in healthy children blood and enhancements on tests of cognitive and visual role (Ryan et al., 2010). Another evidence has been found about pregnant women that include EPA and DHA to their diets through supplement and during lactation, it is found that these omega 3 helps in prevention of allergies in children (Furuhjelm et al., 2009). This resulting effects may be due to the potentials of fish oil used as a supplement to reduce the number of body cells which is in connection with inflammation and immune system (Krauss-Etschmann et al., 2008).

Coronary heart diseases

The consumption of fish in good quantity has the potential to decrease death as a result of coronary heart disease. DART research proved that an acute coronary syndrome was decreased by %30 in patient-reported to consume fatty fish two times per week (Saravanan et al., 2010). Studies on omega-3 fatty acids showed that supplement with fish oil helps to reduce cholesterol levels Gunnarsdottir et al. (2008) decreased the constant incidence in patients with stroke records undergoing low-dose stain therapy (Tanaka et al., 2008) and enhance cardiometabolic profiles in high-risk patients (Barbosa et al., 2017). EPA and DHA can reduce sudden death, frequency of atherosclerosis, and, also, faintly reduce blood pressure. Thus, American Heart Association (AHA) suggested that fish should be consumed more than two times or two times per week or fish oil supplement therapeutic plan can be adopted to decrease cardiovascular diseases (Kris-Etherton et al., 2002). Omega-3 fatty acids showed to function in atherosclerosis and peripheral arterial disease (PAD). There is an opinion that EPA and DHA enhance plaque firmness, reduce endothelial stimulation, and enhance vascular permeability, thus, lowering the opportunity to encounter a cardiovascular occurrence (Dawczynski et al., 2010). PAD is an indication of atherosclerosis, which is identified by the accumulation of plaque in the arteries of the leg and can finally result in a complete blockage of arteries (Swanson et al., 2012). EPA and DHA supplement has shown to enhance endothelial performance in patients with PAD through reduction of plasma levels of soluble thrombomodulin from a median value of 33.0 mg/L to 17.0 mg/L. Also, there is an enhancement in brachial artery flow-mediated dilation from 6.7% to 10.0% (Schiano et al., 2008). Patients with PAD were placed on EPA supplementation encounter a significant reduced vital coronary event compared with patients without EPA supplementation (Ishikawa et al., 2010).

Cancer prevention

Omega-3 fatty acids have suppressive activities on the tumor development, possibly through modification of prostaglandins combination and restriction of cell

growth in colon and breast cancer (Weisburger, 1997; Brown et al., 2003). A useful effect of omega-3 supplements throughout antineoplastic therapy was established base on weight, lean body mass, and treatment results. Fish oil as supplement could block cachexia in patients with pancreatic cancer (Vučić and Ristić-Medić, 2012) The study on 35,016 postmenopausal women reported a connection between fish oil supplement and a reduced chance of breast cancer (hazard ratio [HR] =0.68; 95% confidence interval=0.50-0.92) (Brasky et al., 2010). Some studies recommended that fish oil supplement could improve the potency of chemotherapy, increase survival. It, also, helps to preserve muscle mass in a patient with non-small cell lung cancer (Murphy et al., 2011).

A supplement enhance with eicosapentaenoic was found to enhance the rate at which the chemotherapy can be tolerated in patients with an increased colorectal cancer (Trabal et al., 2010). It is effective for treating endometrial cancer and weight loss (Brasky et al., 2010).

Depression and memory loss

Omega-3 fatty acids have been found to have potential and are recommended for treating depression and loss of memory. A survey conducted in 3,204 adults revealed that the less consumption of fish was found in connection with a higher rate of depression (Tanskanen et al., 2001).

Sarcopenia

Omega-3 fatty acids could be a possible therapeutic substitute for treating and preventing sarcopenia (Gingras et al., 2007). Moreover, omega-3 has been proved to be used as a supplement in the prevention of muscle mass loss in burned guinea pigs (Alexander et al., 1986). EPA and DHA, also, consist of anti-inflammatory properties which could function in alleviation of the muscle anabolic resistance in ageing adults (Fetterman and Zdanowicz, 2009).

Bronchial asthma

There are two major features of bronchial asthma which are airway hyperreactivity and inflammation. Eicosanoids, interleukin-4, interleukin-5, also, tumor necrosis factors are crucial receptors of bronchoconstriction and inflammation which appeared in asthma patients. Findings on animals when coax with lung inflammation showed the beneficial effects of omega-3 fatty acids (Fetterman and Zdanowicz, 2009). The application of omega-3 fatty acids decreased the formations of thromboxane B2 which happens with acute lung injury in pigs, while reduction of the edema quantity noticed in rabbits lungs throughout the acute inflammation (Murray et al., 1995).

Alzheimer's disease

Alzheimer's disease (AD) is a traumatic disease with restricted treatment alternatives and no cure available. Loss of memory is an early sign of this disease, which is developing, and resulted in the inability of the patient to control his or her body and finally leads to death (Freund-Levi et al., 2006).

It is utilized for Alzheimer's disease, psychosis, ADHD and several other memory-related problems (Morris et al., 2003; Connor and Connor, 2007). Docosapentaenoic acids (DHA) is available in substantial quantity in neuron membrane phospholipids, in which it is concerned with the adequate function of the nervous system, and this makes it suitable to be effective in the treatment of AD (Tully et al., 2003). A research results found that a diet categorized by high intakes of foods rich in omega-3 fatty acids such as fish, nuts, tomatoes, poultry cruciferous vegetables, and fruits and a low consumption of foods low in omega-3 fatty acids such as high-fat dairy products, red meat, and organ meat was highly connected with a reduced risk of AD (Gu et al., 2010). Unplanned weight loss is an issue faced by many patients with Alzheimer's disease, a supplement that includes EPA and DHA had shown a productive effect on weight recovery in patients with the disease (Faxén Irving et al., 2009).

Renal Disease

The PUFAs on the advancement of renal disease based on its effects on inflammation on the renal fibrosis activity is proposed in the study of animal model to be possible preventive (Baggio et al., 2005). PUFAs activity intrudes directly with mesangial cell renewal, multiplication, and extra-cellular matrix protein formation, and they are concerned in the guideline of pro-inflammatory cytokine production (Graber et al., 1994; Di Marzo, 1995).

Heamatology parameters

The study on omega-3 supplementation revealed potential effects on the red blood cell deformation and assemblage (Cartwright et al., 1985; Bowden et al., 2007). The outcome of the research proposed that n-3 PUFAs have anti-progressive, antithrombotic, and antiaggregatory platelets reactions (Mori et al., 1997).

Blood pressure

Omega-3 fatty acids are generally utilized by people to reduce blood pressure. It, also, is effective in preventing heart diseases and stroke (Djoussé et al., 2012). Studies confirmed that when fish oil is consumed in recommended dosage it is very helpful in preventing heart-related disease like stroke (Hu and Manson, 2012). A study on animal model and cell culture revealed that PUFAs reduced blood pressure and proteinuria, possibly by the vasorelaxation effects of n-3 PUFAs with improved endothelium-obtained releasing factor (Das, 2004).

PUFA and oxidative stress

The n-3 and n-6 PUFAs are extremely permissible to oxidation due to their versatile double bonds. The peroxidation of lipid results to pro-inflammatory oxidized LDL and HDL which is presumed to affect the pathogenesis of atherosclerosis. Various research revealed that dietary supplement of n-6 PUFAs improved the lengthen of LDL oxidation in vitro in comparison to dietary augment in mono-unsaturated fatty acids (Abbey et al., 1993).

Conclusion

Omega-3 fatty acids displayed an important role in human health. Its utilization is focused on the precaution of a large body of critical diseases, majorly concerning lowering of cardiovascular risk, cognitive health, and eye-health complications. Eicosapentaenoic acid (EPA) and Docosapentaenoic acid (DHA) are more abundant. They can be obtained naturally from fish oil, the inclusion of these important acids in human diets its of great benefits to health. The omega-3 (EPA and DHA) are necessary for fetal growth, it reduces immune-related diseases in infants.

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