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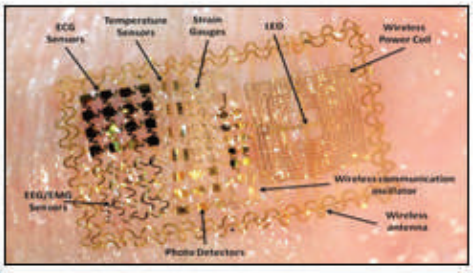

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GENERAL

Omega-3 Fatty Acid and its importance

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Introduction

Omega-3 fatty acids are polyunsaturated fatty acids (PUFAs) with a double bond at the third carbon atom from the end of the carbon chain. The three types of omega-3 fatty acids involved in human physiology are α-linolenic acid (ALA) (found in plant oils), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) (both commonly found in fish oil that originally come from microalgae that is further consumed by phytoplankton, a source of diet for fish). Omega-3 fatty acids play a critical role in metabolism and cellular function and they are available as daily supplements.

Omega-3 fatty acids are considered essentials as they are necessary for human health, but can't be synthesized endogenously. So we depend on exogenous sources for it. Omega-3 fatty acids are found in fish, such as salmon, tuna, and halibut, other sea-foods including algae and krill, some plants, and nut oils. Also known as polyunsaturated fatty acids (PUFAs), omega-3 fatty acids play a crucial role in brain function, as well as normal growth and development. They are gaining popularity as they may reduce the risk of heart disease.

Research shows that omega-3 fatty acids reduce inflammation and may help lower risk of chronic diseases such as heart disease, cancer, and arthritis. Omega-3 fatty acids are highly concentrated in the brain and appear to be important for cognitive (brain memory and performance) and behavioral function. In fact, infants who do not get enough omega-3 fatty acids from their mothers during pregnancy are at risk for developing vision and nerve problems. Symptoms of omega-3 fatty acid deficiency include fatigue, poor memory, dry skin, heart problems, mood swings or depression, and poor circulation.

Review of Literature

Public Health Recommendations

WHO Foods recommendations based on the research studies that we have reviewed.

Summary of Omega-3 Recommendations

- Total omega-3 fats: at least 2.4 grams per day
- EPA+DHA included within body total omega-3s: 400-500 milligrams per day

EPA and DHA intake recommendations by various organizations:

- The **American Dietetic Association** recommends an average of 500 mg of total EPA and DHA per day. This would be approximated by having two 4-ounce (after cooking) servings of fatty fish per week.
- The **American Heart Association** recommends two servings of fish per week, preferably fatty fish.
- The **World Health Organization** recommends one to two servings of fish per week, with each serving providing between 200 and 500 mg of total EPA and DHA.
- The **NIH** (National Institutes of Health) working group recommends 220 mg each of EPA and DHA per day in a 2000-calorie diet.

There are also some specific recommendations for target population:

- The Child Health Foundation recommends that pregnant and lactating women should receive an average of at least 200 mg per day of DHA.

History of Dietary Recommendation in India

The history of dietary recommendations in India began at a much later date. In the Cantor Lectures in 1936, McCarrison, the founder director of the National Institute of Nutrition, Hyderabad, India referred to the differences in the qualities of diets from various parts of India. Most nutrition-related research in India dealt with the problems of malnourishment and lack of availability of the basic nutrients. In the surveys conducted by the Director General of the Indian Medical Services in the 1930s and 1940s it was mentioned that only 39 per cent of the population were well nourished, while 41 per cent were 'poorly nourished' and 20 per cent were 'very poorly nourished'

After independence, several indigenous measures were taken to improve the nutritional status of the populace, and while the green revolution went a long way in reducing malnutrition, it had a number of deleterious outcomes. The main negative feature of this program was the focus on

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only two crops – rice and wheat at the expense of nutritionally important accompanying crops such as pulses and millets.

The role of fats in the diet was never a part of nutrition debates in India, until the 1980s and 1990s, when the initial dietary guidelines and Recommended Dietary Allowances (RDA) were published, for implementation on a national level. At this point, it was clear that the dietary patterns of Indians were vastly different from a typical 'Western' diet, with relatively high intakes of CHO and low intakes of fat. In the first RDA report, a minimum intake of total fat of 15%E was recommended to ensure adequate consumption of calories, essential FAs and fat-soluble vitamins. Based on the FAO/WHO (1977) recommendations, the upper limit was set at 30%E, which was increased to 35%E in the 2010 publication of the Indian RDA.

Recommendations for individual FAs were generally based on the minimum requirement to prevent deficiencies. Since SFA and MUFA can be synthesized in the body, no RDA was specifically mentioned for these. The requirement of LA, one of the essential FAs was based on a minimum of 3%E required to prevent deficiency. While the rationale behind setting the minimum requirement for ALNA was not clear, the AMDR for LA and ALNA was set as 2.5-9.0%E and 0.5-2%E, respectively. In addition, the recommendations also included the daily consumption of at least 200 mg n-3 PUFA. This was based on the US Dietary Guidelines Advisory Committee (USDGAC) recommendations, which in turn, was based on average intakes of marine fish in the USA. The upper limit for TFA intake was based on global recommendations of <1%E.

In both the RDA reports, it was cautioned that in large parts of India, the major thrust ought to be to increased in fat intakes since the major issue at hand was that of low intakes of total fat and n-3 PUFA. However, this word of caution appears to have been lost in the general risk reduction clamour against the intake of fats. Therefore, the general emphasis in India, for all the population, continues to be on a relatively low-fat diet, with examples of a typical healthy diet comprising 20-25%E fat and 60-68%E from CHO.

Discussion:

Omega 3 Fatty acids can be used in High cholesterol, High blood pressure, Heart disease, Diabetes, Rheumatoid arthritis, Systemic lupus erythematosus (SLE), Osteoporosis, Depression, Bipolar disorder, Schizophrenia, Attention deficit/hyperactivity disorder (ADHD), Cognitive decline, Skin disorders, Inflammatory bowel disease (IBD), Asthma, Macular degeneration, Menstrual pain, Colon cancer, Breast cancer, Prostate cancer.

Omega-3 fatty acids are triglycerides that get broken down into smaller fatty acid units. They act to reduce plasma triglyceride levels which however increase the cholesterol levels and are thought to possess potent anti-arrhythmic effects. Polyunsaturated fatty acids including eicosapentaenoic and docosahexaenoic acid mediate important cellular function such as inhibition of platelet function, prolongation of bleeding time, anti-inflammatory effects and reduction of plasma fibrinogen. Polyunsaturated fatty acids are components of the phospholipids that form the structures of the cell membranes and also serve as energy source. They form eicosanoids which are important signaling molecules with wide-ranging functions in the body's cardiovascular, pulmonary, immune and endocrine systems. DHA tends to exist in high concentrations in the retina, brain (via uptake by Mfsd2a as a transporter), and sperm.

ALA, DHA and EPA are metabolized and oxidized in the liver, which is the site of biosynthesis of n-3 fatty acid intermediates, synthesizing VLDL that transport fatty acids in the plasma to tissues. Major enzymes that generate lipid signaling molecules from EPA, DHA and ALA are lipoxygenases and cyclooxygenase..

After ingestion, dietary lipids are hydrolyzed in the intestinal lumen. The hydrolysis products—monoglycerides and free fatty acids—are then incorporated into bile-salt– containing micelles and absorbed into enterocytes, largely by passive diffusion. The absorption rate is about 95%. Within intestinal cells, free fatty acids are primarily incorporated into chylomicrons and enter the circulation via the lymphatic system where they are delivered to various tissues for metabolism, oxidation and storage.

Omega-3 fatty acids mediate anti-inflammatory effects and increased levels of EPA or DHA has shown to decrease the levels of PGE2 and 4 series-LT. Eicosapentaenoic acids compete with constitutive levels of arachidonic acid in cell membranes for the same desaturation enzymes and produce 3-series prostaglandins and thromboxanes, and 5-series leukotrienes which have low pro-inflammatory potential.

The alteration in leukotriene biosynthesis due to higher concentration of omega-3 fatty acids compared to arachidonic acid underlies the anti-inflammatory effects. EPA and DHA also give rise to resolvins and related lipid signaling molecules such as protectins via cyclooxygenase and lipoxygenase pathways, which have anti-inflammatory effects. They inhibit transendothelial migration of neutrophils and inhibit TNF and IL-1β production. Omega-3 fatty acids also decrease adhesion molecule expression on leukocytes and on endothelial cells and decrease intercellular adhesive interactions. Omega-3 (or n-3) polyunsaturated fatty acids (PUFAs) and their metabolites are natural ligands for peroxisome proliferator-activated receptor (PPAR) gamma that regulates inflammatory gene expression and NFκB activation. PPAR alpha activation is also associated with induction of COX-2 expression. The role of EPA and DHA in reducing triglyceride levels include inhibition of acyl-CoA: 1, 2-diacylglycerol acyltransferase, increased mitochondrial and peroxisomal-beta-oxidation in the liver, decreased lipogenesis in the liver, and increased plasma lipoprotein lipase activity. They also may reduce triglyceride synthesis because they are poor substrates for the enzymes responsible for TG synthesis, and EPA and DHA inhibit esterification of other fatty acids.

As a whole, the Indian omega-3 market is not performing up to expectations due to the lack of promotional activities to make consumers aware of health benefits associated with the intake of omega-3 fatty acids. Therefore, it is imperative to look for sources of PUFA, particularly DHA and EPA, and other fatty acids for steady supply for health and nutrition of millions of people in the developing countries.

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Benign paroxysmal positional vertigo (BPPV) is one of the most common types of vertigo caused by peripheral vestibular dysfunction. It is characterized by short, intense vertigo episodes associated with predominantly horizontal – rotational nystagmus. They are provoked by a quick change in head position such as lying down, rolling over in bed, bending over, or looking up. Although head trauma, migraine disease, long-term bed rest, extended travel, Meniere disease, viral labyrinthitis, vestibular neuronitis, and upper respiratory infection are believed to predisposing factors, most cases of BPPV (50 to 70%) are idiopathic. Ear surgery is another causative factor in BPPV.

The pathophysiologic mechanism of BPPV can be caused either by canalithiasis or cupulolithiasis. Canalithiasis is most commonly accepted; the endolymph system of posterior or lateral semicircular canals is disturbed by free – floating otoliths, which detach from the utricle or saccule and accumulate in the long arm of the posterior semicircular canal. It moves with gravity. This concept was first described in 1979 by Hall, Ruby, and McClure, and the phenomenon was first demonstrated in vivo by Parnes and MC Clure in 1992.

- Medical Excellence

Malaria – Disease of Complications

These include cerebral malaria, normocytic anemia, hypoglcaemia, metabolic acidosis, acute renal failure and fluid disturbances. Acute pulmonary edema/ARDS, septicaemia with algid malaria and coagulation avnormalities contribute to morbidity and mortality.

The clinical indicators of poor prognosis are deep coma, convulsions, papilledema, decerebrate/ decorticate rigidity or opisthotonus, circulatory collapse, renal failure, ARDS and metabolic acidosis.

- Journal of The Association of Physicians of India