



## Fish: A Top Food for Brain and Mental Health

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**Abstract** – A top source of dietary lipids for brain is fatty fishes. Human brain consists of about 60% lipids and the half of the lipids is omega-3 fatty acids. Fish is also good sources of high-quality protein which consists of all the essential and other important amino acids, a set of minerals and vitamins, that are required for brain development and function. Overall fish are an important food for all ages in growth and development, health and diseases. There are also numerous plants foods that are known to be good sources of minerals, vitamins, energy, adaptogens etc. for brain and mental health. The review is an attempt to highlight the important roles of fish as an effective major contributor and other plant foods for mental health.

**Keywords:** Fish, Lipid, omega-3 fatty acids, DHA, Plant foods, Adaptogens, Mental health.

### 1. INTRODUCTION

With increasing mental work and changing lifestyles, the demand for the knowledge of good functional brain foods is increasing. Brain health is a serious affair throughout the world. Avoiding developing errors, developing a good brain and preventing neurodegenerative diseases are very important in this age. Food habits have changed during the evolution with discovery of technology and agribusiness. A correct ratio of omega-3/omega-6 is important [1]. So, food choices are up to us. There are a good number of food materials that are known to be good for the brain. The list may include fish especially fatty fishes, grass fed beef, eggs, nuts, seeds, dark chocolate, green tea, coffee, turmeric, broccoli, berries, gensing, shwagandha, tulsi, leafy vegetable etc. [2,3]. Questions are: "how they are good for brain? What do they contribute to brain

development and function? The number one top position will be determined by the amount of contribution they give". Brain is the most important organ whose complex functioning depends on a varieties of different ingredients and elements. A comparison of similarity of the composition of the food source and the composition of brain will prove the food which can occupy the number one position.

### 2. FISH, SHELLFISH, TERRESTRIAL ANIMAL FOODS FOR BRAIN HEALTH

Fish and shellfish are important sea foods. Definitions of sea foods are different between the American and British English. Fish or seafood may be also from fresh water, warm or cold water. Studies of fatty acids profiles of the fishes show presence of good amount of essential omega-3 polyunsaturated fatty acids [4,5]. Some researchers write those tropical freshwater fishes are more similar to the composition of human brain due to the presence of DHA, EPA, ARA in these fishes. Fish with its wide biodiversity is most popular and most dominant foods that inhabit the aquatic systems, oceans, seas, lakes, rivers etc. Fish was a part of daily diet of a larger section of the world population. But the availability is decreasing, and cost is increasing. The similarity between fish muscles and human brain was shown by Ackman [6]. The number one top position of the fish in brain nutrition can be proved by the extent of the contribution of the brain components and their roles. The major component of brain is lipid which shares about 60% and half of the lipid is omega-3 fatty acids. Though three important fatty acids that are most abundant in the brain are docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), and arachidonic acids (ARA), the most important fatty acid is DHA. Fatty fish like salmon, mackerels, sardines, herrings, trouts,



tunas are famous sources of mega -3 fatty acids. Source of these Omega-3 fatty acids in fish are algae and sea plants that are consumed by the fishes. Some people use the sea plants as food [8]. Overall, fatty fish is excellent choice for brain health. Among the terrestrial animals, grass fed beef and other grass-fed animals contain some amount of omega -3. Beefs are not consumed popularly by all sections of society. Dry grain fed animal products contain more saturated fats and trans-fat and Omega-6 fatty acids which affect cognitive function. Saturated fats from animal products should be kept to a minimum. Terrestrial animal protein muscles are not superior to fish muscle protein that are impregnated well with high amount of essential omega fatty acid and highly digestible. Even fish meals are used in animal nutrition for reproduction and increasing meat quality. The level of omega contents of eggs can be increased by feeding fish meals. Consumption of fish or fish oils increases the level of the essential fatty acid in the consumers [1,7].

The human brain develops rapidly during the last trimester (13 weeks) of pregnancy and the first months following birth [9]. This brain growth depends on an adequate supply of docosahexaenoic acid (DHA) and arachidonic acid. Deficiency of these essential fatty acids at these stage gives long term effects on the quality of the brain. So, the supply of the food sources to the pregnant and lactating women is very important. Recent studies have shown that an adequate maternal intake of seafood, especially oily fish, or fish oil supplements improves verbal communication skills at 6 and 18 months of age, reduces the risk of pre-term birth (low birth weight), improves an infant's problem-solving capacity and eye and hand coordination, and results in a higher intelligence quotient (IQ) in children at 4 years of age [9]. Omega-3 fatty acids are known to have anti-inflammatory properties [1]. An increased intake of fish or omega-3 fatty acids, especially DHA, can substantially reduce the risk of developing Alzheimer's disease. Supplementation with EPA-rich fish oil has been reported to result in

improvements in general health, sleep patterns, concentration, and sociability and reductions in irritability, aggression, and hyperactivity among autistic children [10,11]. Fish oils consumption has been found to be protective against schizophrenia, dementia, depression and mental decline [12].

In addition to it, fish is also a good source of high-quality food protein which contains important neurotransmitter producing amino acids. Deficiency of high-quality protein affect immune system, other organs, and affects brain functions in long term condition. A good set of vitamins and minerals that are present in the fish muscles and whole small fishes are a good saver of the brain. Fish also contain some amount of carbohydrates which give glucose. Brain is the highest consumer of energy. Vitamin B, A, E, D cte, are known for mediating nervous functions. Key minerals for brain health are **Magnesium, zinc, copper, iron, iodine, selenium, manganese, and potassium [7]**. Too little of any of these minerals would slow your brain down. So, they make fish a more perfect food for the brain.

### 3. PLANT FOODS AND ADAPTOGENS FOR BRAIN HEALTH

There are many known food products of plants that are known to be good for brain. Neglecting the plant products will result in serious mental deficiency. Nuts are good sources of omega-3 fatty acids like alpha-linolenic acids and many important ingredients and bioactive compounds. and flax, rape seeds are reported to be nice sources of omega-3 fatty acids alpha- linolenic acids which are precursors of long chain fatty acids DHA, EPA which are in the fatty fishes. Manufacturing of DHA by the body from the precursor ALA is insufficient to meet the needs of the brain for better development [13]. Further plant proteins are incomplete protein as they as they don't contain all the essential amino acids as compared to fish protein which is highly digestible and called complete protein. There are many plant foods which are good sources of carbohydrates, minerals, vitamins and phyto-compounds [1,2]. Cognitive health ingredients can be grouped into two categories (1) ingredients that are naturally



occurring building blocks of our bodies (for example omega-3 fatty acid DHA, amino acids, choline, certain vitamins and minerals), and (2) botanicals (for example, Ginko biloba, *Gensing*).

Many plants food products are used as sources of adaptogens for brain. The concept of adaptogens is reported to originated in the twenty century. Even most U.S. consumers aren't yet familiar with adaptogens, with only 4% currently consuming functional foods and drinks that contain them. The beautiful thing about an adaptogen, is that, like a thermostat, it can decrease anxiety and calm you even while increasing energy. Though There is no well accepted formal definition of adaptogens, it is generally described as "naturally occurring, nontoxic plant-based ingredients that help promote stress reduction and physiological balance" [14].

### 3.1 Some important Adaptogens

Ginseng is the most popular adaptogen overall. Ashwagandha (in Ayurveda) is valued for its apparent role in supporting youth, fertility, and vitality, as well as immunity. Clinical studies have also suggested that it could play a part in calming the nervous system. Tulsi, or holy basil has traditionally been used for bronchial and cardiovascular support, Maca, an indigenous Andean botanical product, has claimed a measure of fame as a superfood, this herb is also a powerhouse of vitamins, minerals, and other nutrients. It can easily be included in drink mixes or smoothies. And mushrooms from maitake and shiitake to chaga, reishi, and beyond are attracting attention as adaptogens. Practitioners of traditional Chinese medicine have administered both the fruiting bodies and mycelia of reishi mushrooms for more than two millennia thanks to their impressive list of medicinal qualities [13]. Reishi is even known as the mushroom of immortality. Tonics made with reishi revitalize energy while reishi's polysaccharides and beta-glucans support immune health. Demand for stress relief will only increase in 2020. Adaptogens that offer a dual benefit of stress reduction and immune support have the potential to thrive in a post-COVID world as stress takes a toll

on the immune system, leaving us more susceptible to illness [13]. Coffee, green tea and other beverages are used as reliefs, reducing stress and relaxing. Coffee contains caffeine and antioxidants which stimulate the body to reduce stress and anxiety. Turmeric contain curcumin which has many positive effects on brain like memory, depression and brain cell growing. Blue berries and other deeply colored berries are sources of anthocyanins, a phytochemical with anti-inflammatory and antioxidant effects [2]. So many plants products help to stress, anxiety, disorders to keep the brain fresh and calm and are used as adaptogens. They save the stress of cells, and diseases.

### 4. CONCLUSION

So, fish is the most suitable food in contributing the growth of the brain mass and important functional ingredients occupying number one top position. Knowledge of foods as best sources of essential fatty acids, amino acids, vitamins, minerals, carbohydrates, antioxidants and adaptogens will help maintain the physical brain fit and active as higher power of brain is desired by every body .and preventing neurodegenerative diseases. Every mind work is done in brain. Brain is often compared to the hardware of a computer while mind is compared to the software of a computer. Mind is the medium through which the civilization was developed, and every goal can be achieved. So next how to use the mind is also very important for to be wise, rich and healthy for overall mental health.

Consumers should consider the factors affecting quality in choosing the fish, and fish products, and other plants products. Sustainable development of these important products is important with the increasing world population.

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