JULY 2010 EDITION

KOFINAS PERINATAL
Providing care to the unborn

UPDATES ON PERINATAL ISSUES AND NEWS ABOUT KOFINAS PERINATAL

Essential Fatty Acids: health benefits and risks

Part I: general health benefits

Alexander Kofinas, M.D.

This issue of the news letter is part I of a two part series. The subject is about essential fatty acids and their health effects. We tried to give a general simplified introduction of the physiology of these very important and healthy fats in order to make it easier to understand the reasons why these nutrients are so important for human health. In Part I we discuss the benefits on general health that apply to all and in part II we will present benefits that relate mostly to women's health and pregnancy. Finally, we will make an effort to provide simple advice on how to obtain the best omega 3 and omega 6 supplements for

When I was 8 years old, my mother would force me to swallow this unpleasant fish oil so I can grow healthier, smarter, with good vision etc. This was most likely a great thing my mother did for me and as much as I hated it at the time, I am immensely grateful for doing it then. Of course, I am not 100% sure but I believe the fish oil I consumed many years ago was fresh and not rancid. One thing I know for sure though, this fish oil was free of all industrial pollutants, carcinogens, and heavy metals (mercury) that current fish oil products are contaminated with. Is fish oil as good as it was then? Does it still offer the benefits it did in the past? Would I give it to my young child or grandchild today? Well, the answer is a bit complicated but the short answer is that I would not do any of the above unless I know for sure that the fish oil I use is as clean as possible and within the lowest permissible limits of contamination. The simple reason is that fish oil today is not what it used to be 50 years ago. Our environment has been polluted to a degree that nobody would expect 50 years ago. The industrial revolution and the explosion of the petrochemicals industry have created thousands of industrial chemicals that one way or another have become part of our biology and our extended environment. The problem is that such chemicals have never been tested for safety on humans and animals; we are now the observers and at the same time the "guinea pigs" of some of the largest population based experiments that were done without our consent, at our financial expense, health expense, quality of our life expense and yes, at the expense of our lives. Millions of people die every year around the globe as a result of

diseases that were caused from excessive and uncontrolled exposure to industrial chemicals (toxicants).

Pollution related deaths1 Pollution related deaths2

Pollutants of all kinds have found their way into fresh and salt water and have changed forever the environment in which marine life grows. All creatures of the sea and other water worlds are heavily contaminated with industrial toxicants to the degree that if consumed, the damage they cause to our health may exceed the benefit in many cases. There are very few exceptions to this rule and they get to be fewer by the day. Many fish oils are produced from fish liver. In all creatures, liver is the place where all the toxic substances accumulate waiting to be destroyed or modified and thus become harmless. The liver has a given capacity to detoxify such pollutants and if consumed in greater quantities then such toxins accumulate and become harmful to the organism. When fish liver is used to produce fish oil and the liver is contaminated with all these pollutants, you get the idea! All you get is a lot of toxic substances with a nasty fishy liver taste. That's all!

A primer on the physiology and supply of essential fatty acids

Let us examine now the science regarding essential fatty acids (EFAs) and some of the not so good fats. These fatty acids are called essential because they are required by our bodies for good health and to sustain life but our bodies are unable to synthesize them. This is the reason we must obtain such fatty acids with our daily nutrition. Essential fatty acids are polyunsaturated fats that include: (a) the omega-6 fatty acid – linoleic acid (LA), and its by-products, gamma-linolenic acid (GLA) and arachidonic acid (AA), (b) the omega-3 fatty acid – alpha-linolenic acid (ALA) and its byproducts, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Fish oil is one of the main sources of ready-made EPA and DHA. Fatty fish like salmon, mackerel and tuna are common sources. Depending on the source, fish and fish oils vary in the amount of EPA and DHA they provide.

Arachidonic acid is found in high amounts in eggs, fish and meat from grass fed animals; because of this abundance in the food supply supplementation is not usually necessary. Too much arachidonic acid can actually be harmful, leading to inflammation and excessive blood clotting. Linoleic acid (LA) is present in many vegetable oils – safflower, evening primrose seed, sunflower, corn, hemp, pumpkin, peanut,, borage, canola, and olive. LA is abundant in our food supply and there is no need for supplementation. Gamma-Linolenic acid (GLA) is found in borage oil, black currant oil and evening primrose oil. GLA is present in small amounts in human breast milk and some foods, but not in high enough amounts that we can maintain our nutritional needs through diet alone. Alpha-Linolenic acid (ALA) is found in perilla oil, flaxseed oil, flaxseed, and hemp oil and in small amounts in some nuts, green leafy vegetables, wheat germ and black currant seeds.

I would like here to bring to your attention a very important physiological issue that many of us forget. EPA and DHA as well as AA are the final products that our body use and they are the base for all the benefits that omega-3 and omega- 6 oils afford to our bodies. As noted before, these are complete and if we could assure ourselves that we can get enough through our diet, then we would not need any of the incomplete fatty acids such as alpha-linolenic acid, linoleic acid and gamma-linolenic acid. The last three are found primarily in vegetables and nuts. Vegetarians who do not consume meat and fish depend on these last three fatty acids. The problem is that these acids need to be converted by certain enzymes into the active forms. There are individuals that might have certain genetic mutations and they cannot produce the enzymes necessary for the conversion. Such individuals are vulnerable to suffer from omega-3 deficiency with all the bad health consequences. In this case, one will need to obtain EPA and DHA in the form of supplements. Non-fish oil EPA and DHA supplements are produced by extraction from various algae. After all, algae are the original source of EPA and DHA that fish consumes and then we get it from fish. Direct consumption of organically produced algae might be the best source of omega-3 fatty acids given

the well established fact that fish and its products are heavily contaminated with toxic substances.

Scientists now know that EFAs are required for the proper structure and function of every cell in the body, and are critical for optimal health. EFAs increase the absorption of vitamins and minerals; nourish the skin, hair and nails; promote proper nerve functioning; help produce hormones; ensure normal growth and development; and prevent and treat disease. EFAs are part of the membranes of all cells and many of the intracellular organelles (small intracellular organs that perform specific tasks that keep our cells healthy). There are over 45 essential nutrients, including EFAs, vitamins and amino acids that must be supplied by the diet. Improper nutrition and, more specifically, an imbalance of dietary fats, have had a significant impact on the development of modern diseases. Omega -3 and omega -6 EFAs are metabolized by the same enzymes and the intake ratio has been found to have significant health implications. Ideally, the ratio of omega 3 to omega 6 should be 1:1 and under the worst circumstances should not exceed 1:4. For example, for every 1 part of omega 3 that we consume we should never consume more than 4 parts of omega 6 fatty acids. To understand the magnitude of the problem with the American population in regards to essential fatty acids is that the average ratio of omega 3 to omega 6 is 1:20; this is severely unhealthy. Sufficient amounts of docosahexaenoic (DHA) a type of omega 3 fatty acid and arachidonic (AA) a type of omega 6 are required for proper intrauterine development. With fetal EFA sufficiency entirely dependent on maternal intake and transfer, it is estimated that in the 3rd trimester the fetus accrues about 70 mg per day of DHA and a comparable amount of AA. While omega 6 are abundantly found in the typical western diet, DHA is found in only a few foods – particularly in seafood – which are consumed sparingly by much of North American and European populations. DHA can also be produced to some extent through maternal conversion of another omega 3 fatty acid known as alpha linolenic (ALA) – present in selective non-marine foods such as walnuts and flax seeds. As this conversion to DHA is variable and dependent on enzymatic availability as well as functionality of metabolic conversion mechanisms, recommendations to secure gestational DHA requirements generally focus on direct ingestion of seafood or of supplements that derive the DHA from clean seafood sources.

As omega 3 fatty acids are essential components of the human brain and are involved in fetal insulin regulation, growth and development, blood vessel formation and central nervous system (CNS) maturation it is important to maintain gestational sufficiency. With biochemical and metabolic individuality in each person as well as limited available laboratory testing for EFA status in most clinical settings, it is difficult to quantify pre-existing maternal DHA levels and to determine specific individual requirements. Average intake of about 200-300 mg per day of DHA has been recommended in general to supply the omega 3 fatty acids needs of mother and child – a requirement that many women fail to meet by diet alone. Increasing numbers of individuals consume minimal fish because of dietary preference or in response to public health warnings about toxicant contamination of seafood. One study for example reported a significant decline in fish consumption in response to national mercury advisory. Accordingly some pregnant women have deficient omega 3 fatty acid intakes with potential sequelae for themselves and their offspring. Various authors in the medical literature have explored this issue and have endeavored to find a sustainable solution to this public health concern.

Health benefits of essential fatty acids

Weight loss and fat burning

We are all very much aware of the obesity epidemic. We have been blaming fat in general as the cause of this epidemic. This of course is not true as you can see in the related article (link). Did it ever occur to you that one might loose fat by eating fat? I am sure you are surprised to hear that but here is the trick. Studies have shown that gamma-linoleic acid has the potential to increase serotonin, a brain chemical that keeps us in good spirits and makes us

feel satisfied and full. This helps reduce food intake and it makes us less likely to overindulge. Conjugated linoleic acid (CLA) is considered to be necessary for both cell growth and a building block of cell membranes. CLA is found naturally in dairy products and grass-fed beef and lamb; it is produced by the intestinal bacteria of these animals by means of conversion from omega-6 linoleic acid. Needless to say that grain fed animals (the norm for USA beef) does not contain any CLA. Several studies have shown that CLA not only promotes loss of fat but also stimulates growth of lean muscle mass. Another study reproduced the results and in addition, showed that individuals that stopped taking CLA (by means of supplements) regained fat; in contrast, individuals who continued to obtain proper amounts of CLA maintained the improved muscle lean mass at the expense of fat. A Norwegian study reported that individuals who participate in regular training for 90 minutes three times per week, lost more weight if they took CLA supplements in comparison to subjects who took the placebo. Recent research revealed that essential fatty acid deficiency is related to leptin levels. Leptin is a hormone that regulates appetite, body fat and more importantly, it stimulates burning of brown fat to produce heat. Individuals with decreased burning of brown fat are more likely to add fat as an insulation mechanism from the cold.

Type II (adult onset) Diabetes

Type II diabetes used to affect 1-2% of the population. With increasing use of highly refined foods, rich in calories and poor in nutrients, obesity skyrocketed and along with it, diabetes became one of commonest diseases. The incidence of type II diabetes increased almost five fold to 10% and still rising. Even children between 9 and 20 years old suffer from type II diabetes. This was unheard of. By definition, type II diabetes appeared only in adulthood, thus its name, adult onset diabetes mellitus. The main treatment of type II diabetes of course is a proper diet, calorie restriction, exercise and weight loss. Unless one fails to do the above, then medication with all its side effects is the only solution but not the best one. Essential fatty acids impart a lot of benefits for the control of blood sugar in diabetic patients. Conjugated linoleic acid increases the sensitivity to insulin and helps the body to perform insulin's tasks with lower levels of insulin. This leads to fat burning, lean muscle mass increase and lower blood sugar. These are the main mechanisms that control diabetes in a natural way. In a study presented at the American Physiology Society's 2002 annual meeting, flaxseed fed to obese animals decreased the bad cholesterol as well as lowering blood sugar. Flaxseed provides a high content of alpha-linolenic acid, large quantities of soluble and insoluble fiber, a protein profile similar to soy and is the richest known source of lignans (antioxidant and phytoestrogen qualities). Populations with diets high in fish are much less likely to develop diabetes. Increasing dietary essential fatty acids can confer significant benefits in prevention of diabetes.

Cardiovascular (heart) disease

Essential fatty acids have shown to decrease LDL (bad) cholesterol and increase HDL (good) cholesterol. This has a very beneficial effect on patients with heart disease and reduces the risk of heart disease in normal individuals. Longevity is directly proportional to HDL levels. In other words, the higher the HDL the longer we live. Studies in humans demonstrated the gamma-linoleic acid supplementation reduces stress-induced hypertension. Omega-3 acids are known to reduce cardiac arrhythmias a major cause of sudden cardiac death. It is very much accepted by the medical community and the population at large, that diabetes, hypertension (high blood pressure), obesity, inactivity, smoking and abnormally high levels of cholesterol are high risk factors for heart disease. In a

study done in men with increased levels of bad cholesterol and a family history of heart disease, 240 mg of gamma linolenic acid from primrose taken daily reduced the bad cholesterol and increased the good cholesterol. Such actions reduce the risk for heart disease significantly. To make things better, GLA was found to reduce stress-induced hypertension. This is really getting better! One gram of GLA from currant seeds prior to stress testing kept the blood pressure by 40% lower in comparison to test subjects who did not take GLA. A study examining the relationship between the Mediterranean diet and prevention of coronary heart disease clearly showed that increasing ALA (alpha linolenic acid) in the diet reduced the occurrence of sudden death from heart disease by 70% after two years. In another study it became clear that higher blood concentrations of ALA are associated with lower cholesterol levels. ALA in the Cretan Mediterranean diet comes from purslane, walnuts and other wild green leafy plants. In fact, Greek diet contains a significant number of green vegetables that contribute to its health benefits. Consumption of large quantities of various green vegetables either in the form of cooked dishes or in the form of salads is in part responsible for the increased life expectancy in Greek population despite increased rates of smoking. Had the Greeks refrain from smoking as a nation, they would have the longest life expectancy. Unfortunately, smoking remains a problem and of late, highly processed foods are taking a toll on Greek longevity. Here in America, one of the largest long term prospective studies –Nurse's Health Study- revealed that nurses with higher ALA blood levels had 30% fewer fatal heart attacks. A large number of well designed and executed studies have over and over again demonstrated that EPA and DHA have significant beneficial effects on human physiology and metabolism. These effects help our bodies combat obesity, reduce blood sugar levels, reduce blood pressure, improve vascular elasticity, improve cardiac rhythm and reduce the incidence of arrhythmias, reduce risk for sudden cardiac death, fight inflammation, reduce age related tissue degeneration, improve mood and reduce the risk for depression, prevents joint diseases and the list goes on and on. These are all remarkable benefits that EFAs confer upon our health and it is really incomprehensible to me why 70% of Americans choose actions and diets that reduce the consumption of such beneficial EFAs.

Brain Function and Mental Health

The human brain is 60% fat. This is a lot of fat but fortunately, the good type of fat. About 20% of this fat is of the essential type that has to be acquired by diet and our bodies cannot make. The essential fatty acids the brain needs are mostly EPA, DHA and to a lesser degree alpha-linolenic acid. The brain requires more omega-3 fatty acids than any other part of our bodies. Normal brain function depends on a steady and abundant supply of omega-3 fatty acids such as EPA and DHA. These acids are usually obtained by eating fish or concentrated fish products. Unfortunately, with the exception of marine algae, vegetarian sources of EPA and DHA as noted previously in these pages is not reliable. Therefore, for good brain health, fish and fish oil type of omega-3s are very important.

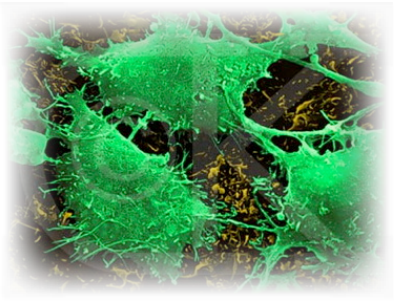
The incidence of depression has increased over the last 100 years significantly and in proportion to the changes in our diet that favor omega-6 fatty acids over omega-3s. The ratio of omega-3 to omega-6 has decreased from 1:1 to 1:20. This change has detrimental effects on brain function and all associated maladies, both, functional and emotional. Such maladies include but are not limited to learning disabilities, attention deficit disorder and attention deficit hyperactivity disorder, depression, bipolar

disorder, memory impairment, anxiety, psychological stress, Alzheimer's disease, Parkinson's disease and schizophrenia. These conditions are multi-factorial in nature and not any single factor can cause them. The lack of adequate essential fats from our diet increases the probability of this disorders happening significantly if the proper predisposition is in place. Studies have shown that low consumption of EFAs is associated with stress and that supplementation with EFAs reduces symptoms of stress; this in turn, reduces the damage to our bodies from the stress related hormones which are responsible for hypertension and heart disease. Many psychiatrists now use fish oil supplements as treatment for depression and bipolar disorders. Studies have shown that fish oil supplementation is more effective in combating depression than the multibillion dollar anti-depressive drugs. However, taking fish oil is known to have 0% of side effects in comparison to anti-depressants that cause many and severe side effects such as personality change, suicidal tendencies, dry mouth, memory loss and the list goes on. Additional human controlled studies in patients with bipolar disorder have shown that omega-3 fatty acids are successful in treating the condition. The patients who received omega-3s were significantly more likely to improve than patients who took the placebo medication. This is great considering that in similar studies comparing the multibillion anti-depressants drugs with placebo the results demonstrated that the benefit of these powerful and mind damaging drugs were slightly better than the placebo effect but with a number of devastating side effects. You do the math and decide for yourself if taking anti-depressants is an acceptable treatment.

Deficiencies in DHA have been associated with memory loss and depression. In a multi-center European study, elderly people supplemented with 90 mg DHA daily for six months showed improvement in apathy and social withdrawal symptoms. Another study revealed that the incidence of Alzheimer's disease is 60% lower in people who consumed fish once a week in comparison to people who rarely consumed fish.

Reduced incidence of cancer

It has been established by many scientific studies that consumption of "bad fats" and excessive consumption of calories increase the risk of cancer. Likewise, calorie restriction and reduced consumption of animal fat reduces the risk for cancer. In fact, researchers were able to either cure or reduce the size of cancerous tumors in mice only by restricting dietary calories by 30%. Animals destined to develop cancer when fed regular amounts of calories developed cancer. Animals with the same risk, who were fed a low calorie diet, did not develop the expected tumors. The association between fat and cancer has been studied most in breast, colon, and prostate cancers. Most of the evidence shows a link between poor dietary habits and cancer development. Such diets are usually rich in animal fat and poor in fresh vegetables and fruits. In a Swedish study, women who ate diets rich in olive oil, avocados and nuts were less likely to develop breast cancer. However, diets high in refined oils, such as canola oil and refined sunflower oil - found in grocery store salad dressings, mayonnaise, etc. – were associated with increased risk of breast cancer. A high-meat or high-fat diet is usually low in vegetable and fruit content, and therefore low in such protective nutrients as antioxidants and fiber. The connection between diet and cancer may have as much to do with what is not in the diet as with what is.



Essential fatty acids have been found to be beneficial to patients at risk for cancer; consumption of omega-3 fatty acids has been found to reduce the risk for breast cancer. Flaxseed has become a very important nutritional supplement in relation to cancer. Flaxseed is reach in lignans. Lignans are known to fight cancer. In addition, flaxseed is rich in fiber and the essential fatty

acid ALA that have also been linked to lowering breast cancer risk. Omega-3 fatty acids have been found to be decreased in patients suffering from lung cancer and pancreatic cancer. Such patients could be benefited by increasing the consumption of omega-3 fatty acids. Ideally, one should have a balanced omega-3/omega-6 ratio before the cancer develops; prevention is the name of the game and not treatment. Once the cancer takes hold, it is more difficult to cure it. Since most cancers are very much similar in the way they start growing, most other cancers could be preventable or ever curable with proper omega-3 nutritional intake. In fact, studies have shown that fish oil consumption protects from colon cancer. Omega-3 fatty acids were found to exert a protective effect on the skin from ultraviolet light exposure. It is not clear yet how fatty acids prevent cancer and improve cancer response to various treatments. We suspect that there is more than one mechanism but we believe that the most important ones are the health of the cell membranes and the beneficial effects on the immune system along with the anti-inflammatory effects.

Skin health and beauty

Our skin is not considered by many of us as one of our organs. In fact, it is the largest human organ and one of the most important ones. The skin produces Vitamin D3; we could not survive without it. The skin also is protecting us from thousands or even millions of insults that attack our body every day and night, it hosts all the censors of our body that feed the brain with important information about our environment; such information is vital for our survival. Our skin protects us from dehydration and plays an important role in the regulation of our body's temperature and fluid content. A sick skin makes us sick. There are several conditions such as dry skin, psoriasis, eczema and others that can affect the normal function of the skin and cause serious health problems. Elderly people are more susceptible to skin conditions because our skin loses its elasticity and water content as we get older. We all spend a significant amount of money every year for the health and beauty of our skin. Most of these ointments and creams are useless if not harmful. Good natural nutrition, hydration and protection from harmful UVA and UVB radiation are the most important means to have a healthy skin. Read about safety and efficacy of sunscreens High carbohydrate consumption for example causes our skin to develop "goose bumps" spider capillary complexes and other skin lesions. Omega-3 fatty acids either by mouth in the form of supplements or locally applied on the skin promote healthy skin that remains hydrated and young looking. Most of the skin disorders are caused by inflammation. Since omega-3 fatty acids are known to reduce inflammation it is not surprising that proper consumption of such fatty acids keeps our skin healthy and young looking. Gamma linolenic acid (GLA) is a vital component for healthy skin. Studies have shown that GLA deficiency is associated with increased risk for eczema and dry scaling skin lesions. Supplementation with GLA by means of diet or supplements helps skin heal and restore its normal functions. Eczema is a skin disorder that is usually associated with serious social and psychological problems due to the unpleasant and disfiguring lesions it creates. Such patients are treated with antihistamines and mostly with steroids. Steroids are drugs with serious complications when used. Studies have shown that the use of GLA in the form of Borage oil supplementation is as effective as the steroids in the treatment of eczematic lesions and this without any of the severe side effects. The use of fish oil and GLA were found to benefit patients with psoriasis, flaky skin and acne. Finally, GLA and other omega-3 fatty acids reduce premature skin aging since most of the skin conditions that are cured by GLA and fish oil contribute to premature skin aging and wrinkling.

To Your Health,

Alexander Kofinas, M.D.