Kofinas Perinatal
Providing care to the unborn

Essential Fatty Acids: health benefits and risks

PART III: HOW TO GET THE MOST OUR OF YOUR OMEGA-3 WITH THE LEAST RISK TO YOUR HEALTH

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Part III is the final segment on the essential fatty acids subject. This final part, presents the potential risks from the various forms of omega-3 nutrients (whole foods and supplements) as well as some advice how to get the best form of omega-3 nutrients with the least risk to your health. Enjoy it!

POTENTIAL HARM FROM SEAFOOD CONSUMPTION

By now, we have established in the two previous issues that essential fatty acids are very important to our bodies and a necessary nutrient for good health. The easiest source of essential fatty acids is seafood, and specifically fish. Many of us like shrimp and eat a lot of it thinking that we consume a lot of good essential oils. Not so fast; shrimp and lobster is not fish. Therefore, in this article, when I speak of seafood, I mean fish. However, there has been a significant amount of information over the last years regarding the safety of seafood due to contamination with industrial pollutants and various toxicants. There are such diverse opinions regarding the amount of pollution based on estimates of various governmental agencies (FDA, EPA, etc.) that most of us do not know what to believe anymore. The fact of the matter is that all marine life including fish is contaminated. The other fact is that seafood is rich in omega-3 fatty acids and therefore, seafood is beneficial to our health. What should one then do? Is the benefit of seafood such that it exceeds the risks that come with it? We do not know that. There is a dichotomy of opinion and this will remain so for years to come. Most of the governmental agencies should not be expected to be honest about the safety standards they propose. FDA is mostly concerned about the well-being of the food industry than our health. Therefore, the only sources of honest information we can trust are from non-governmental non-profit agencies such as the Environmental Working Group (EWG). Independent sources indicate that the harm from eating fish is more than the benefit they provide. This is true for most of the fish. There are certainly some exceptions to the rule and we will present them in this newsletter.

Juxtaposed with the many benefits of consuming seafood in pregnancy is the concern about potential heterogenic effects resulting from aquatic contamination by myriad toxicants including dioxins, PCB's, BPA's, heavy metals such as mercury and pharmaceutical residues including synthetic estrogens, androgens and a host of other hormones not to forget all the anti-depressants and other psychotropic drugs. Industrial waste, agricultural runoff and domestic sewage have tainted the aquatic system with diverse industrial chemical agents, which

proceed to contaminate the entire spectrum of marine life. The World Health Organization, for example, has recently identified seafood as the leading source of mercury exposure. As a result, various articles in the medical literature and some public health agencies including the U.S. Food and Drug Administration have issued recommendations over the last few years to limit some gestational seafood intake because of potential toxicity. Is the concern about toxic exposure sufficient to warrant seafood restriction in pregnancy?

Numerous publications confirm that in utero pollution by vertical transmission is an increasing dilemma with unknown long-term sequelae. In 2005, a study of newborn cord blood samples taken by the American Red Cross found that the average sample contained 287 toxicants including heavy metals, various pesticides residues, gasoline byproducts and flame-retardants; and this is 287 out of 300 toxicants they tested for. I do not even want to think about how many of the 70,000 toxicants that are currently in use by the various industries and reach our homes, cars, bicycles, dinner table, and all other aspects of our lives they would be found in fetal cord blood. We breath them, we drink them and we eat them. In the case of pregnant women, what they eat, drink and breath affects their unborn in ways far and beyond we have seen in adults. Fetuses change their genetic code for generations to come as a result of toxic exposures. There is literally no place to hide. Various studies have linked certain gestational chemical exposures with assorted subsequent pediatric afflictions including neurological problems, respiratory dysfunction, allergic disease, asthma and other autoimmune disorders, genital abnormalities, as well as behavioral and psychiatric disorders. There has been recent research to suggest that prenatal exposure to certain endocrine disrupting compounds (Equal, Splenda, Saccharin) has the potential to affect psychosexual indices. Furthermore, animal studies have found that toxic exposures may affect the epigenome (unborn's genetic code), with alterations persisting through subsequent generations. This actually means that the fetus is capable of changing his genetic code in response to the pollution and that can affect his life permanently after he is born. This change is sometimes voluntary as a defense mechanism and sometimes it is caused forcefully by the direct effects of specific toxicants.

The next issue of concern is that developing fetuses are not miniature adults and safe levels for mothers do not necessarily coincide with safety in the fetus. A recent study found that mercury levels, for example, were higher in the offspring than in fish consuming mothers. Fetal vulnerability is significantly greater for many reasons: the fetal liver is immature and unable to efficiently detoxify contaminants; lower levels of fetal binding proteins (proteins that bind to toxicants and neutralize them) result in high-unbound fractions of bioactive toxicants. Excretion pathways are undeveloped and excreted fetal urinary pollutants are recycled into the nose and mouth by means of amniotic fluid. The blood-brain barrier in the fetus is more permeable to toxic substances in comparison to adult brain, and more toxic substances may reach the fetal brain causing immense damage. There is evidence that fetuses have higher concentrations of toxic substances per weight unit in comparison to maternal levels. This can be highly damaging to the rapidly developing fetal organs. Although some researchers believe that the levels of contamination do not justify the concerns, the truth is that we do not fully understand the magnitude of the impact later in life as well as to future generations. Accordingly, at this time it is not possible to ascertain the final outcome of many prenatal exposures and it will be premature and dangerous to conclude that gestational exposure to low levels of existing and newly emerging chemical toxicants are without long-term impact.

WHERE DO WE GO FROM HERE?

There is a dichotomous opinion regarding the balance between the risk and the benefit of fish consumption. The practical outcome of this unresolved issue is that many prenatal educators and maternity care providers are not addressing this important concern with their pregnant patients much to the detriment of many women and their offspring. Accordingly, it behooves the medical community to develop and disseminate guidelines and recommendations that are effective and safe for reproductive aged women considering child

bearing. A few suggestions are provided for consideration.

In general, physicians dealing with women of childbearing age must become increasingly cognizant of potential toxicants in pregnancy and acquire the necessary skills to proactively educate their patients. Increasing recognition of the serious sequelae of adverse exposures combined with the ever-present problem of chemical toxicants has lead to the emergence of the mushrooming field of environmental medicine and comprehensive training in preconception as well as prenatal care. Regarding fish intake in pregnancy, it is clear that omega-3 fatty acids sufficiency is necessary for fetal development and maternal health. Accordingly, the uncertainty about long-term impact of various seafood contaminants must be balanced with the need to fulfill nutritional requirements.

In response to this challenge, numerous suggestions and approaches have been discussed. Some authors recommend eating small fish, which are lower on the food chain and have less contaminants than the bigger fish. Other suggestions include limiting fish intake during pregnancy (e.g. 8-12 oz per week), avoiding consumption of particular species, for example, predator and other large fish such as shark, dolphin, sword fish, tuna and any fish that exceeds 5 lb. in size and staying away from fish caught in waters deemed to be particularly polluted. Sighting potential differences in toxicant concentrations between varying types of seafood such as shellfish, shrimp and assorted fish, some suggest that selective intake might preclude adverse exposure. Each of these suggested options however is based on the presumption of long-term safety for offspring when exposure levels are maintained with currently acceptable reference limits - a construct that remains unproved scientifically.

Many chemical agents are new, however, with incomplete recognition of the totality of adverse effects. In addition, reference levels are generally determined by animal experiments: animal testing for safety levels may not be relevant for humans as experimental animals frequently possess inherent detoxification mechanisms not found in people. Furthermore, the existing safety levels frequently reflect one-time exposure and do not consider fetal bile accumulation, repeated exposure, pre-existing maternal toxicant load, genomic variants in toxicant response, and multiple toxicant synergisms. Although, probabilistic estimates of fetal toxicant levels based on maternal intake are currently being explored for some xenobiotic (chemicals foreign to our biological systems) exposure, most fetal contaminants have not yet been sufficiently studied and long term impact remains uncertain.

Another recommended approach to minimize exposure while assuring sufficient nutrients, is to avoid seafood intake and to routinely supplement with fish oil in pregnancy. Recent evidence, however, raises concern about routine gestation supplementation with fish oil products such as cod liver oil containing abundant omega-3 fatty acids. Although, many reports indicate benefit, there have been a few recent studies, which fail to confirm benefit or suggest harm as a result of gestational supplementation with fish oil from cod liver. For example, in contrast to various studies showing improved blood pressure control in pregnancy, a recent observational study with high dose cod liver oil demonstrated increased risk of gestational hypertension.

A major confounder in this research and some other interventional studies, however, is that regular cod oil from cod liver (the major organ of detoxification) is generally contaminated with the range of toxicants, including heavy metals, found in the tissues of the source fish. Accordingly, consumers of fish products may also

experience high levels of various toxicants, which may independently or synergistically affect physiological processes and influence metabolic outcomes. It is recognized, for example, that methyl mercury – a common aquatic contaminant – can induce hypertension in animals that may account for some adverse outcomes in consumers of regular fish oil. Furthermore, as it is documented that some toxicants may impair or modify absorption, utilization and metabolism of nutrients such as vitamin D adverse sequelae and lack of impact in some studies may represent confounding by toxicant accumulation. As some mothers are deficient in required DHA and at the same time avoid gestational seafood intake because of warnings about toxicant exposure, what advice can we give to assure that pregnant women and their offspring obtain these required nutrients in sufficient amounts? The provision of purified fish oil containing sufficient omega-3 fatty acids may provide the benefits without the attendant harms of toxicant contaminant products. Through a process of distillation and independent toxicology testing, both omega-3 fatty acid sufficiency and uncontaminated nutrients can be secured. Purified fish oil is readily available and supplementation should be explored as a potential strategy to meet maternal and fetal DHA requirements in pregnancy. In addition to supplementary purified fish oil, regular intake of plant source alpha linolenic acid (ALA) will provide substrate for maternal endogenous production of some DHA. For those individuals wishing to follow a vegan or vegetarian lifestyle it is possible to obtain organically produced DHA from oil derived from micro-algae the source of DHA in aquatic ecosystems.

SOME PRACTICAL ADVICE ON HOW TO RESOLVE THE DICHOTOMY OF EATING SEAFOOD

To make the long story short, eating healthy and clean seafood provides more benefit than harm. However, not all seafood is equal. One has to be careful and very selective of what one eats. There are several issues one has to consider in choosing the proper seafood:

1. Is it rich in omega-3 fatty acids?
2. Is it low in mercury?
3. Is it low in industrial pollutants?

4.Is it farm raised or wild?

There is considerable variability among fish species and their content of omega-3 fatty acids. Flounder, for example, contains one of the lowest if not the lowest omega-3 content of all fish. It is a wild fish however and although it contains low omega-3 fatty acids, it does not contain high omega-6 fatty acids. In contrast, Tilapia, the most frequently eaten fish by Americans, is clearly harmful because it contains a lot more of the bad omega-6 than the good omega-3 fatty acids. In other words, according to researchers at Wake Forest University of NC, Tilapia consumption causes inflammation and vascular damage that can lead to stroke and heart disease. Therefore, you should NEVER even touch Tilapia with a ten foot pole. The reason Tilapia is so bad for you is that it is farm raised and it is mostly fed with processed soy and other grains that are high in omega-6 fatty acids. On the other side of the spectrum are the sardines and Salmon species. They both contain the highest amounts of omega-3 fatty acids but they differ on the amount of pollutants. Sardines, anchovies and all finger-sized fish are the safest and most beneficial of all wild species. They are high in omega-3, low in mercury and all other pollutants. Salmon is high in omega-3 but when it comes to pollution, the story

becomes murky. There are several species of salmon, which vary in the amount of pollution wildly. There is farm raised salmon, wild pacific, wild Atlantic and wild Alaskan salmon. Farm raised salmon is the one you do not want to eat. Not only is problematic due to omega-6 content – although less than Tilapia – but more so because it is heavily polluted like all farm raised fish.

Farm raised fish are fed primarily a mixture of grain products (rich in omega-6 fatty acids) and processed byproducts from the processing of large predators and other large fish as well as scrap oceanic fish. Such fishmeal is rich in all kinds of heavy metals and industrial pollutants, such as, mercury, lead, arsenic, PCBs, dioxin, dieldrin, and other organochlorine contaminants. One should keep in mind; it is extremely rare to find wild salmon in a restaurant. Due to unpredictable consistency in contrast to the farm-raised variety, chefs around the world prefer farm-raised salmon to wild. In the wild variety of salmon, the least contaminated is the Alaskan salmon such as Chum, Pink, Coho, and Sockeye varieties. Other fish species that are relatively small and are appropriate to consume up to twice a week include red mullets, red snapper, black sea-bass, striped sea-bass, porgies, small fresh cod fish and any wild small fish you can find. Of note, trout is clean enough that the benefit of eating it is more than the risk.

For those of us who either do not like fish, or are afraid to consume it due to the negative publicity, there are some choices as you can see below:

1. DHA capsules derived from algae (marine plants that normally fish eats).
2. Vegetarian omega-3 fatty acids (Linolenic Acid).
3. Omega-3 fortified foods.
4. Fish oil supplements.
5. Whole marine foods (Marine algae and phytoplankton)

I would like to add some final words of caution regarding the above. Algae DHA, is just what the name means. DHA only, which is one of the beneficial omega-3 fatty acids; fish oil and fish, contain additional essential fatty acids, and especially they contain EPA, a very important omega-3 fatty acid. All of the prenatal vitamins that are available today and provide omega-3 fatty acids, in a separate soft gel capsule, provide DHA only and no EPA.

Vegetarian omega-3 fatty acids (Linoleic Acid) which, are present in flaxseed oil and other vegetarian foods, need to be converted to DHA and EPA. Although fish and other animals have the capacity to do so, humans have a limited and unpredictable capacity to convert Linolenic Acid into DHA and EPA. For this reason, we humans depend more on ready-made DHA and EPA from fish or fish oil and other marine creatures.

Most if not all of the omega-3 fortified foods are mostly fortified with linolenic acid and not DHA or EPA. Therefore, there are no much help to humans, since they have to be converted to DHA and EPA and we humans have limited and unpredictable capacity to do so.

I left fish oil supplements last because I believe they are the most important and significant supplements – and for many of us - the only form of complete omega-3 intake. I personally like fish. Being Greek, I grew up with fish and for the most part, the small,

finger-sized fish that is the most delicious and the healthiest one. So, I am spoiled in that respect, but also very unhappy, since I cannot get this kind of fish here in the States. Since I travel back home several times a year, when I find myself in Athens, I make it a point to only eat my favorite fish in my favorite restaurants. When I come back to the States, I settle for occasional fish eating in one of the many Greek restaurants of NY City and clean and stable fish oil. Since I expect most of you to depend mostly on fish oil for your essential fatty acids, I will present you with some essential tips about fish oil supplements provided by the University of California at Berkley:

- Before taking fish oil supplements for one of the diseases or conditions listed in the previous two newsletters, discuss this with your doctor.
- There is no contraindication to take Aspirin or other blood thinners while you take fish oil also. This has been an unfounded concern of the past with no scientific support.
- Healthy people should aim for 500 to 1,000 milligrams of EPA/ DHA a day, on average, from fatty fish and/or supplements.
- Look for the total amount of EPA and DHA on the label. It may say 1,000 milligrams of fish oil concentrate per capsule, but they contain only 300 milligrams of EPA and DHA (sometimes listed simply as "omega-3 fatty acids"), which is the important number. That would mean you need to take three capsules to get about 1 gram of omega-3 fatty acids a day.
- Claims about special qualities and origin of species may not be of much value since the industry is not regulated. Good manufacturing practices and "Pharmaceutical grade" could be useful assuming that the manufacturer is honest. However, take these attributes with a grain of salt.
- Like all OTC supplements, fish oil products are unregulated, so you don't really know what you are getting. For this reason one has to be very careful and try to identify information on the quality of the products that came from independent laboratories and not the manufacturers themselves.
- Some manufacturers claim to follow voluntary safety programs and standards, such as those from USP (U.S. Pharmacopoeia) or CRN (an industry group), but this is not verified. The only meaningful seal on OTC products is the special "USP Verified" seal (as opposed to the simple USP logo), though few supplements have this.
- To reduce gastrointestinal problems such as belching, take the capsules with food, divide the doses among your meals, and start at a low dose and gradually increase it. Discarding supplements that have a rancid smell or taste—a sign they have spoiled (oxidized) or, possibly, were poorly purified – may also help.
- Don't take cod liver oil. The oil usually contains very high levels of vitamin A, which may weaken bones and cause birth defects. And since it is made from livers, which filter out toxins, there is greater concern about contaminants, even though the oil is supposed to be purified.

To your Health

Alexander D. Kofinas, M.D., F.A.C.O.G