March 2008

FATS OF LIFE newsletter

Quarterly News for Consumers About Healthy Fats

Volume 3 • Issue 1

March 2008 Contents

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HEART HEALTH

Irregular Heart Rhythms

National Heart Lung & Blood Institute Gets Cold Feet on Omega-3s and Arrhythmias

A pattern of irregular heartbeats, also called arrhythmia, is the main cause of 80% to 90% of all sudden deaths from heart disease. For some, sudden death is the first indication of heart disease. The unpredictable nature of sudden death and the number of lives it claims make it a high priority for prevention strategies.

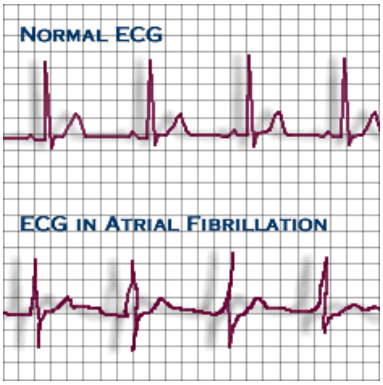

Figure 1. Electrocardiogram of the heart's rhythm showing normal (upper) and arrhythmic (lower) heartbeats.

There is substantial evidence showing that the long-chain omega-3 fatty acids (omega-3s) from fish and shellfish affect the electrical properties of the heart and contribute to more stable heart rhythms. The US National Heart Lung and Blood Institute (NHLBI) noted that these fatty acids "indisputably" affect the basic elements of the heart's electrical activity. They further observed that, "the weight of evidence from epidemiological and clinical trials supports the hypothesis that the long-chain omega-3 fatty acids found in fish reduce risk of sudden cardiac death."

With these remarks, it came as a surprise that the NHLBI concluded its review of the science by saying that more evidence was needed before public policy guidelines could be developed. Why was the Institute so cautious? Couldn't it encourage people to consume more seafood omega-3s and lower their risk of sudden death?

The reason for the NHLBI's caution may lie with the results from 3 large studies in heart disease patients with implanted cardioverter defibrillators (ICDs), devices that prevent the heart from developing fatal arrhythmias. In these studies, patients who consumed fish oil experienced either no benefit or a greater likelihood of developing arrhythmia. These conflicting results in patients with ICDs caused everyone to pause and reconsider. Upon closer examination, however, it turns out that not all arrhythmias are alike. The type may depend on the patient's clinical condition, such as chest pain or heart attack (myocardial infarction), and the cause of the arrhythmia. As a result, it makes sense to consider some patients separately from all heart patients. The studies in ICD patients, while not conclusive, indicate that these patients should be considered separately from patients who have had a heart attack.

Although "the weight of evidence from epidemiological and clinical trials supports the hypothesis that the omega-3s found in fish reduce the risk of sudden death," the NHLBI authors concluded that more evidence was needed before public policy guidelines could be developed. Public health deserves a bolder public policy.

Unlike the NHLBI, the American Heart Association recommends that everyone consume two fish meals per week and that people who have doctor-diagnosed heart disease consume even more—1 gram/day of EPA and DHA, the long-chain omega-3s in fish. For many, taking fish oil supplements would be the most convenient way to meet this recommendation.

One can understand NHLBI's caution about fish oil consumption in certain sets of high-risk patients. However, for the larger public, where many cases of sudden death could be prevented by the stabilizing effects of seafood omega-3s on heart rhythms, a bolder public policy is needed.

Seafood Omega-3s Improve Electrical Recovery After Abnormally Rapid Heartbeats

Keeping a steady pace of heartbeats is the task of the pacemaker cells in the upper chambers of the heart or atria. When the heartbeats become disorganized and the pattern of beats becomes irregular a condition called atrial fibrillation develops. People with this condition are 5 times more likely to develop stroke and

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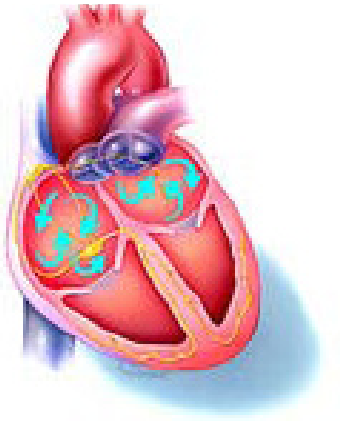

Figure. Cut-away view of the heart showing blood circulation in the upper chambers (atria). Image reproduced with permission of the Heart Rhythm Society.

are at increased risk of heart failure. Controlling this condition early makes more serious conditions less likely to occur.

Several studies have demonstrated the ability of the long-chain omega-3s found mainly in fish and shellfish to stabilize abnormal heart rhythms. Although not all studies have observed a beneficial effect on atrial fibrillation, there is little doubt that these fatty acids affect the electrical properties of the heart. As noted in the preceding article, some of the differences in studies may relate to different characteristics of the patients. Thus, it is important to identify the types of patients who might not respond to these fatty acids and those who would. It is also likely that the cause of the atrial fibrillation needs to be understood, too.

Provision of long-chain omega-3s following rapid atrial stimulation prolonged the electrical recovery period. As a result, abnormal rhythms and more dangerous electrical cycles could not become established.

A recent study reported that in animals with electrically induced rapid atrial heartbeats the provision of long-chain omega-3s prolonged the electrical recovery period following stimulation. As a result, the abnormal rhythms that usually develop following such stimulation did not occur. This was because the heart had sufficient time to recover and more dangerous electrical cycles could not become established. The omega-3s prevented fibrillation—uncontrolled rapid trembling—from developing. Fibrillation is fatal if not halted in time.

These findings are encouraging. It would be helpful to know if, in this particular animal model, prior feeding with seafood omega-3s had a similar effect on preventing fibrillation. In a different animal model of the condition resulting from increased atrial pressure, prior feeding with long-chain omega-3s significantly reduced the susceptibility to atrial fibrillation. There is also evidence from studies in people that those who eat fish regularly are less likely to develop the condition. As the old adage says, an ounce of prevention is worth a pound of cure. In this case, it could also be life-saving.

Coronary Artery Function

Fish Oil Consumption Linked to Greater Arterial Elasticity

Like spandex sportswear, the coronary arteries are built to withstand changes in pressure and volume by having plenty of stretch. Alas, as we age, the elasticity in these arteries diminishes and the heart's arteries become less able to respond to surges in blood flow. The result is an increased chance of developing high blood pressure, stroke or fatal cardiovascular disease. These conditions develop less frequently in people who consume seafood omega-3s regularly, but it is unknown whether arterial elasticity has anything to do with it. There is a report, however, that these fatty acids do improve arterial elasticity.

There was a 21% increase in arterial elasticity in the patients who took fish oil, but no change in those who took a placebo.

A group of researchers in China explored the effect of fish oil consumption on arterial elasticity in overweight patients with high blood pressure. The study participants consumed about 1 gram (900 mg) of seafood omega-3s daily for 8 weeks. The researchers determined the elasticity of their arteries at the beginning and end of the study using ultrasound measurements of blood flow. Rigid arteries permit faster blood flow, whereas more elastic arteries expand readily, allowing less rapid blood flow.

At the end of the study, the researchers observed a significant 21% increase in arterial elasticity in the patients who took the fish oil, but no change in those who took a placebo. Even though arterial elasticity increased,

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blood pressure did not change in these participants. It is noteworthy than in a relatively short time—8 weeks—with a moderate dose of long-chain omega-3s, arterial elasticity improved. This observation suggests another way in which seafood omega-3s protect heart health.

EPA Reduces Arterial Stiffness After a High-Fat Meal

Eating a high fat meal has several effects on blood flow, blood lipids and responses in the heart's arteries. The implications of these changes are not fully understood, but the additional stress put on the heart and circulation from the increase in blood fats increases the risk of heart disease. The particular fatty acids in a meal also affect the responses to a high-fat meal, with saturated fatty acids impairing blood vessel dilation and omega-3 fatty acids improving it. Because studies have reported conflicting findings and high-fat meals are a common facet of western dietary patterns, the effect of omega-3s is worth examining.

Stiffness in the heart's large arteries increases the chance of developing high blood pressure, stroke and fatal heart disease. Seafood omega-3s contribute to greater arterial elasticity.

A group of researchers in London, U.K., studied the effect of EPA (eicosapentaenoic acid), a long-chain omega-3 found mainly in fish and shellfish, on arterial stiffness, blood pressure and blood vessel tone—the degree of blood vessel constriction (tightening) relative to its maximum dilation. They wanted to find out how EPA might affect blood flow after a high-fat meal, a risky time in terms of heart health. The researchers gave a large dose of EPA (5 grams) to 17 young men as part of a high-fat meal and measured their blood pressure, arterial stiffness and vascular tone at intervals after the meal. Six hours after the meal, the men experienced a significant decrease in the stiffness of their larger arteries. How long this improvement lasts, however, is not known.

Thus, this study's findings support those of others and confirm that EPA contributes to healthier arterial function. The drawback of this study, however, is that the investigators used a very high dose of EPA, more than people would consume from eating fish often or from taking several fish oil capsules. As the preceding study among overweight Chinese patients observed, a more practical dose of seafood omega-3s also improved arterial elasticity.

Mothers & Infants

Child's DHA Status at Birth Linked to Better Motor Skills at Age 7

There is a growing body of evidence indicating that pregnant women who have a regular and sufficient intake of long-chain omega-3 fatty acids—the kind found mainly in fish and shellfish—have children with better developmental outcomes. The differences one sees early in infancy are better visual acuity, improved eye hand coordination and better motor function. In childhood, the improvements continue, with the mother's intake of these fatty acids being linked to the child's having higher mental processing scores and IQ, and improved social development.

A long-running study in the Netherlands has followed the development of children whose mothers had varying intakes of seafood omega-3s during their pregnancy. The investigators examined the relationship between the children's omega-3 status at birth and their subsequent motor, cognitive and visual development at different ages. Children whose mothers consumed fish during their pregnancy had higher omega-3 levels at birth than children whose mothers ate little or no fish.

The investigators now report their evaluation of the children's motor development at age 7. They assessed the children's motor skills on a quantitative (how much or how long) and qualitative basis (type of movement, awkwardness, steadiness etc.). All children had neurological development scores in the normal range. The investigators found that the children's DHA levels at birth were related to their total motor scores and the quality of their motor skills, but not to the quantity of

their motor abilities. Children with the highest levels of DHA (docosahexaenoic acid, a long-chain omega-3) at birth had significantly higher total motor scores at age 7 compared with children having less DHA at birth. Interestingly, the current DHA status of the children was unrelated to their motor scores, only their DHA status at birth.

Children with the highest levels of DHA at birth had significantly higher total motor scores at age 7 compared with children having less DHA at birth. This suggests that the prenatal supply of DHA matters most in the development of motor function.

What does this finding mean? The authors suggest that the prenatal supply of DHA matters most in the development of childhood motor function. This means that the mother's consumption of seafood omega-3s is the most important for the child's later motor development. Other studies have reported that children with higher DHA at birth have higher neurodevelopment scores compared with children whose levels are lowest. Motor scores have also been related to learning abilities, so they may indirectly reflect the child's mental abilities as well.

Mother's Low Intake of Omega-3s Linked to Greater Chance of Infant's Low Visual Acuity

A new study from Canada suggests that pregnant women may have shortfalls in providing enough long-chain omega-3 fatty acids, found mainly in fish and shellfish, for optimal infant visual development. There is now considerable evidence that women following a typical western diet and eating little seafood have about half the amount of seafood omega-3s they need to support fetal nervous system development. Unless they boost their seafood intake or take fish oil supplements after birth, their breast milk will also be relatively low in DHA (docosahexaenoic acid), the most important omega-3 for infant development.

In this study, researchers assessed the intakes of omega-3s in some 135 healthy pregnant women. Half the mothers consumed 110 mg of DHA or less, whereas

There is now considerable evidence that women following a typical western diet and eating little seafood have about half the amount of seafood omega-3s experts think they need to support fetal nervous system development. Do these low intakes risk the infant's brain and visual development?

the most recent expert recommendation is that pregnant and nursing women should consume at least 200 mg of DHA/day. Individuals vary greatly in how much DHA they consume on average. Estimates suggest that some consume as little as 20 mg/day, while others may consume more than 500 mg/day. It is the low intakes that worry many child health experts. The concern is that having too little DHA during early development puts proper growth and function of the brain and retina at risk, which may result in behavioral and learning difficulties later in childhood.

To see whether the usual DHA intakes of healthy pregnant women affected the early development of their infants, half of the mothers took a DHA supplement to ensure that their intakes would be more than adequate. The rest received capsules without fish oil. The women consumed the capsules in the second and third trimesters of pregnancy until they gave birth.

Visual acuity measurement with Teller Acuity Cards. Image courtesy of Grendahl Eye Associates.

The investigators assessed the visual acuity of the infants when they were 6 months old. Visual acuity depends on healthy retinal function, which requires sufficient DHA. Infants with low levels of DHA generally have lower visual acuity scores than those with higher amounts. Lower visual acuity in the unsupplemented infants would suggest that they did not receive sufficient DHA for more mature visual acuity.

Mothers consuming the DHA supplements had a third more DHA in their red blood cells than women taking the placebo capsules. At 6 months of age, their infants had higher visual acuity scores than infants of the placebo mothers as well, but the difference between the two groups did not reach statistical significance. This means you cannot rule out chance as a reason for the difference. When factors, such as birth weight, duration of breast-feeding and other conditions, were taken into consideration, infants of unsupplemented mothers were 3 times more likely to have below average visual acuity scores than infants of DHA-supplemented mothers. There is now considerable evidence that women following a typical western diet and eating little seafood have about half the amount of seafood omega-3s they need to support fetal nervous system development.

Infants of unsupplemented mothers were 3 times more likely to have lower visual acuity scores than infants whose mothers consumed 400 mg of DHA/day.

The suggestion from this study is that low intakes of DHA contribute to lower visual acuity scores, which are a reflection of neurodevelopment. But other conditions influence nervous system development and visual acuity varies from person to person. Thus, it is not certain that DHA was the most important factor accounting for the differences between the placebo and DHA-supplemented mothers. However, other reports indicate that the more abundant DHA is and the longer time it is available in the first year of life, the higher an infant's visual acuity at one year of age. This report is a reminder that current diets during pregnancy lean toward having too little DHA.

Immune Function

Children With Allergies at Age 3 Have Less EPA at Birth Than Non-Allergic Children

The increasing occurrence of allergic diseases, especially in infants and young children, has scientists scrambling for the reasons. There is no single obvious cause, but many factors have been associated with different allergic conditions. What matters, though, is whether these associations are causal. Establishing a direct link between a factor and a health condition requires several types of

evidence. Some factors that have been linked to a higher risk of childhood allergy are family history of allergies, exposure to pollen and airborne disease agents, living in a city rather than a rural area and early exposure to infections. Some might add the mother's low consumption of fish during pregnancy to this list. The connection between allergies and eating little or no fish is unsettled, however. The long-chain omega-3 fatty acids in fish and shellfish are linked to beneficial responses in several immune and inflammatory conditions, but with allergies, such a relationship is much less clear.

People with immune-based allergies have higher levels of immunoglobulin E (IgE), a substance produced by the immune system to protect against the causative agent, such as pollen. High levels of IgE are usually found in people with more serious allergy symptoms, such as those in asthma, eczema, or rhinitis. It is thought that controlling the production of IgE might ease the severity of the allergy symptoms.

Several substances are involved in regulating the production of IgE, including specialized proteins such as one called CD23. Blocking this protein was shown to improve the symptoms in patients with allergic asthma and to lower their IgE levels. This suggested to researchers in Norway that CD23 might be involved in childhood allergies and be related to seafood omega-3s. They decided to examine the CD23 and long-chain omega-3 fatty acid levels in the cord blood of allergic and non-allergic children who had allergies and allergic eczema at age 3.

The investigators observed that children with the highest levels of long-chain omega-3s had the lowest levels of CD23, but total omega-3 levels did not differ between allergic and non-allergic children. However, allergic children, especially girls, had lower levels of EPA compared with those free of allergies. The children's IgE levels were unrelated to their omega-3 levels. This last observation

Children with allergic diseases at age 3 had lower levels of EPA, a long-chain omega-3, compared with non-allergic children. This observation was especially clear in girls. How omega-3s might reduce the chance or severity of allergies remains unknown.

throws doubt on the importance of a link between omega-3s at birth and levels of CD23.

The bottom line is that an interesting and possible link between omega-3s and the regulation of immune responses turned out to be unclear, possibly non-existent. The observation that EPA levels were lower in allergic children agrees with other reports, but how omega-3s might contribute to a lower risk or severity of allergies remains elusive.

Eating Fish During Pregnancy May Ease Respiratory Illness in Offspring

Several reports have suggested that mothers who eat fish regularly or take fish oil supplements during pregnancy have children whose allergic symptoms are less severe. Although this field of study is fraught with conflicting results, a woman's intake of the omega-3 fatty acids from fish and shellfish is clearly linked with a variety of better developmental outcomes in her children. Although these fatty acids do not prevent allergies, they have been associated with less severe symptoms.

A new study suggests that fish consumption in pregnancy might reduce the time a child spends coughing in his first 2 years.

In a novel study from Poland, investigators looked to see whether there were connections between a mother's exposure to fine particles in the air during pregnancy, her fish consumption and the occurrence of respiratory illnesses in her children. Airborne particles can increase the risk of allergies in susceptible people and the dangers of tobacco smoke are well known. However, the women in this study were non-smokers. They had the particles in their home air during the second trimester assessed by portable air monitors that screened for very fine air particles. The investigators monitored the occurrence and duration of cough, difficulty in breathing and wheeze in the offspring during the children's first 2 years of life.

Results from the study noted that the duration of each type of breathing difficulty was somewhat longer in children whose mothers were exposed to higher levels of fine air particles. While the greatest risk of the children developing respiratory illnesses was linked to molds in the air, the mother's exposure to fine air particles nearly tripled the chance of respiratory illness. However, children whose mothers were in the top half of fish consumption, spent significantly less time coughing in the first 2 years of life.

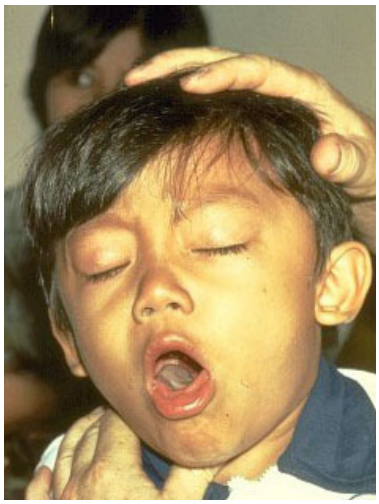


Image courtesy of the Centers for Disease Control.

A child's consumption of fish has been linked to a lower chance of developing wheeze. A mother's fish consumption in pregnancy has also been connected to a lower chance of her child developing asthma. This study suggests that fish consumption in pregnancy might reduce the time a child spends coughing in early life. A common thread among these studies is the mother's fish intake, and therefore, how much long-chain omega-3s she consumes. Mothers who consume more of these omega-3s have more of them to pass on to their infant during fetal development. Many experts think that higher levels of these long-chain omega-3s in mothers and their infants benefit the development and function of the immune system as well as many aspects of neurodevelopment. Establishing these links with certainty remains a challenge, but considerable research points in that direction.

Mental Health

EPA Eases Anxiety, DHA Cools Anger in Substance Abusers

Connections between long-chain omega-3 fatty acids, mental health and behavior continue to expand. These

fatty acids, found mainly in fish and shellfish, contribute to brain structure and function and appear to influence mental health in various ways. One seafood omega-3, DHA (docosahexaenoic acid), comprises about half of the polyunsaturates found in the membranes of all brain cells. Another long-chain omega-3, EPA (eicosapentaenoic acid), counteracts inflammatory responses and affects immune function in the brain. In ways not fully understood, EPA also appears to improve certain mood disorders, including depression, anxiety and hostility.

In a study of substance abusers, those who took omega-s—mostly EPA—for 3 months had significantly lower anxiety and anger scores.

It has been noted that people with a history of alcoholism or substance abuse often have low levels of long-chain omega-3s in their blood and may experience depression, anger, hostile behavior and anxiety. The few studies that have been carried out with such patients suggest that the provision of long-chain omega-3s, especially EPA, is associated with improvements in anxiety, hostility and violence.

A new study reports the results of treating patients enrolled in an outpatient substance abuse program with moderately high levels of long-chain omega-3s, mainly EPA. Patients were given 3 grams/day of omega-3s or placebo capsules for 3 months. They had their mood profiles assessed by questionnaire upon enrolment into the study and monthly thereafter. Their fatty acid levels were determined at the beginning and end of the study. All participants had low levels of omega-3s at enrolment.

At the end of the study, participants who consumed the omega-3s had significantly lower scores for anxiety and anger that were related to the increase in total long-chain omega-3s in their blood. Lower anger scores were related to the increased levels of DHA, but not to changes in EPA. In contrast, lower anxiety scores were related to the higher levels of EPA in blood, but not DHA. These observations tempt one to think that these fatty acids may be working differently according to the type of mood disorder, but data from one small study do not permit such a conclusion. Considering that treatments for people with a history of substance abuse have a low success rate, simple supplementation with long-chain omega-3s could enhance current treatments. First, however, additional studies must be conducted to determine how much omega-3s are needed and whether EPA, DHA or both are effective.

Possible Link Between Low EPA and Mild Neuroticism in Healthy Adults

Low levels of long-chain omega-3 fatty acids, those found mainly in fish and shellfish, are often observed in people suffering from depression, anxiety, anger, hostility and other mood disorders. Whether these low fatty acid levels are the result of these conditions or contribute to them is not certain, though it is plausible that insufficient seafood omega-3s increase the likelihood of these conditions.

The finding that in a healthy population higher blood EPA concentrations were linked to lower neuroticism scores supports several other studies linking low EPA status to depression and other mood disturbances.

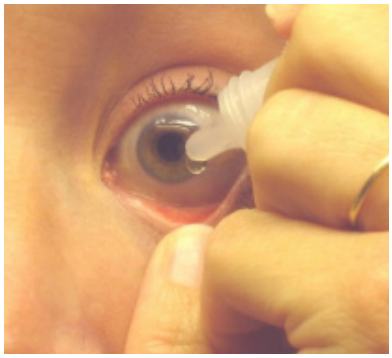
In this brief report, researchers evaluated blood fatty acid levels and responses to a widely used questionnaire assessment of depressive symptoms and personality characteristics. Participants in the study were healthy adults ranging in age from 30 to 55 years. The investigators focused on neuroticism—the enduring tendency to experience negative emotional states—because its presence increases the risk of depression. Facets of neuroticism include anxiety, angry hostility, depression, self-consciousness, impulsivity and vulnerability.

What the investigators observed was that the overall score for neuroticism was related to low blood levels of EPA (eicosapentaenoic acid), a long-chain omega-3.

Four of the 6 aspects of neuroticism, including anxiety, angry hostility, self-consciousness and impulsivity, were also related to low levels of EPA. Higher levels of the main long-chain omega-6 fatty acid found in cells occurred in those with higher neuroticism scores, but it is unclear whether this observation was the result of the low levels of omega-3s in these adults. Interestingly, levels of DHA (docosahexaenoic acid), the other main long-chain omega-3, were unrelated to any of the neuroticism scores. This study suggests that even in healthy people, without clear symptoms of depression, there are early signs of who might be more susceptible to developing the condition.

Visual Function

Plant Omega-3 Helps Heal Damaged Cornea in Dry Eye



Patient treating dry eye with eye drops. Image reproduced by permission of www.vision-expodoctors.com.

Dry eye syndrome, a condition associated with eye discomfort and insufficient tear flow, affects more than 10 million people in the U.S., mainly women. In an earlier report linking fish consumption with a lower chance of developing this condition, people who ate tuna frequently—more than 5 times a week—had more than a 30% lower chance of developing dry eye compared with people who ate tuna once or less often a week. Tuna can be a good source of long-chain omega-3 fatty acids, which are known to have anti-inflammatory properties.

In dry eye, the surface of the eye and adjacent tissue become inflamed and, combined with low lubrication, contribute to corneal damage. People who have chronic inflammatory conditions, such as rheumatoid arthritis or diabetes, are prone to developing dry eye. Treatment of dry eye usually involves using artificial tear drops.
Researchers wondered whether omega-3s would be effective in treating dry eye inflammation if they were applied topically in a typical eye drop solution. To find out, they used alpha-linolenic acid, the plant-based omega-3, added to a lubricating solution. This omega-3 has previously been reported to have anti-inflammatory properties in animals and healthy humans. Because it is unethical to conduct such experiments in humans without first having evidence of safety or effectiveness in animals, the investigators examined the effect of alpha-linolenic acid eye drops in mice with dry eyes.

After only 4 days of eye drop treatments, the mice had 45% less damage in their corneas compared with mice given eye drops without the omega-3. After 10 days, the difference was a 62% improvement with the alpha-linolenic acid eye drops compared with the eye drops having no omega-3s. The improvement was even greater compared with mice receiving no treatment.

This is the first report of significantly reduced inflammation and corneal damage in dry eye syndrome with eye drops containing the plant-based omega-3, alpha-linolenic acid.

The investigators also measured various marker substances for inflammation and, as expected from the clinical observations, they reported a significant decrease in the level of pro-inflammatory substances in the eyes of animals treated with alpha-linolenic acid. Animals receiving only the lubricant drops had increases in several pro-inflammatory substances, with amounts ranging from 5-fold to nearly 100-fold greater.

This is the first report of significantly reduced inflammation and corneal damage in dry eye syndrome with eye drops containing the omega-3 fatty acid, alpha-linolenic acid. These promising results suggest a simple and effective way to protect the eyes from the corneal damage and inflammation associated with dry eye. Because the long-chain omega-3s and some of their derivatives have even more powerful effects in suppressing inflammation than alpha-linolenic acid, it would useful to find out whether small amounts of these substances would be as effective as, or even more so, than alpha-linolenic acid. Either way, these findings may herald a safe and easy way to take the sting out of this condition.

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Clinical Conditions

DHA Treatment Right After Spinal Cord Injury Rescues Nerve Cells and Limits Cell Damage

Individuals who suffer spinal cord injury, usually from motor vehicle accidents, falls or violence, sustain losses of neurons and their supporting cells and greatly diminished nerve cell communication. Secondary damage, such as inflammation and over-activity of some types of cell communication, make the original injury worse. Currently, there are no treatments that can restore spinal cord function, although some types of surgery and clinical interventions are helpful. If there were ways to limit the nerve cell loss, injury and damage from injury, patients might have better recoveries.

As researchers uncover more of the strategies the body uses to protect itself from cell damage, more promising ways to preserve nerve cell function are emerging. For example, in the brain, neurons can be protected from the damage associated with stroke or oxygen deprivation by a substance called neuroprotectin. This substance is made from DHA (docosahexaenoic acid), a long-chain omega-3 fatty acid found mainly in fish and shellfish. DHA is a key component of brain cells. DHA also encourages new nerve cell growth and the development of connections between neurons. Thus, it would seem an ideal candidate to study in spinal cord injury. In fact, treatment of trauma and spinal cord injury is emerging as a potentially important application of long-chain omega-3s, particularly DHA.

Treatment of trauma and spinal cord injury is emerging as a potentially important application of long-chain omega-3s, particularly DHA.

A new report from the United Kingdom describes the effects of early and sustained treatment with DHA in animals with spinal cord injury. This model is similar to what a person might experience from a severe motor vehicle accident. The researchers gave the injured animals an infusion of DHA or salt-water 30 minutes after the injury. Another group of animals was given the DHA infusion plus a DHA-enriched diet and these groups were compared with animals fed a standard control diet.

One week after the study began, the investigators examined the survival of neurons and their supporters, glial cells, in the spinal cord. They also looked at cell survival in animals after 6 weeks, when the effects of dietary DHA might be apparent. The investigators included a variety of evaluations for nerve damage, motor function, inflammation and damage from harmful lipids.

Within 1 week of the injury and DHA treatment, animals receiving the DHA infusion within 30 minutes experienced a 48% protection of their spinal cord neurons. Those receiving both the infusion and DHA-enriched diet had even greater neuronal protection—58%. At the end of 6 weeks, neuronal cell survival had increased to 70% of the control animals in animals given both the DHA infusion and dietary enrichment. A similar but less extensive protective effect was observed in the glial cells, suggesting that DHA protects several types of spinal cord cells. Likewise, the axons of the cells in the white matter—the part of the spinal cord with sensory and motor nerve cells—were better protected in the DHA-treated animals. Axons conduct nerve signals from one nerve cell to another.

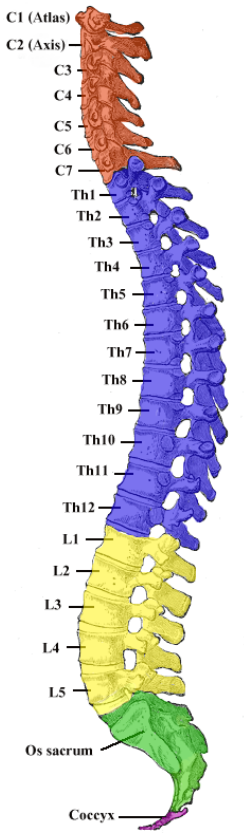

Illustration of spinal column. Injury in this study occurred in the Th12 region. Image: Wikipedia.

Other signs of nerve cell protection were improved motor function in the hind limbs, lower inflammatory responses, better preservation of tissue in the spinal cavity, reduced production of harmful lipid breakdown products and less damage to spinal cord proteins. These results, along with the protection of nerve and glial cells, would be important in limiting the damage to the nervous system that follows spinal cord injury.

The investigators also noted that when treatment

Immediate infusion of DHA combined with dietary DHA increased the survival of nerve cells, improved recovery of motor function and limited tissue damage in experimental spinal cord injury.

with DHA infusion was delayed for 3 hours, the beneficial effect of DHA disappeared. When given after 1 hour, DHA had a protective effect on motor function after 1 week. Treatment with only dietary DHA was insufficient to protect nerve cell survival or motor function, but did have anti-inflammatory benefits.

In the context of human injuries, these findings suggest that treatment with DHA within the first hour after a spinal cord injury could be effective in limiting the extent and spread of damage. Fast action in providing DHA should be feasible with current emergency on-the-scene treatments. This impressive research suggests that DHA might have great potential in traumatic and spinal cord injury if it reaches the patient quickly.