Omega-3 makes Babies Brainier

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Seafood is one of the richest sources of omega-3 essential fatty acid. Recent data suggest that even small amounts of seafood consumed during pregnancy can make a significant difference to the development of the foetal brain, nervous and visual systems as well as overall growth. Omega-3 also provides excellent long-term health benefits for children such as improved motor co-ordination, communication and concentration skills. Clinical studies have paved the way for a much better understanding of its use as a food supplement for children with learning disabilities, asthma, eczema and attention deficit hyperactivity disorder (ADHD).

Over the past 50 years, omega-3 consumption has been replaced by a high intake of omega-6 essential fatty acids from plant oils. In the UK, the intake of omega–6 to omega–3 has increased by as much as twenty fold. There is good evidence to suggest that high levels of omega-6 can increase the risk of diabetes, obesity, fatigue, depression, cardiovascular disease and cancer cell growth in adults.

The role of essential fatty acids

Humans lack the enzymes required for the production of omega-6 and omega-3, so these essential fatty acids must be obtained from the diet. Meat, cereals, margarine and the oils of grains and seeds such as sunflower, soy, peanut and corn oil are particularly rich sources of omega-6. Raw nuts, flax, mustard, sunflower and pumpkin seeds and dark green leafy vegetables such as Brussels sprouts, broccoli and spinach contain trace amounts of omega-3. However, the richest sources are obtained through sea foods.

Both omega-3 and omega-6 play an important role in the production of hormones that regulate metabolism, blood pressure, blood clotting, inflammation, allergic responses and kidney function. Imbalances can interfere with healthy cell membrane development, nerve transmission and the ability of cells to communicate with each other.

Omega-6 is used to make the blood-brain barrier, a membrane that acts as a filter and protects the brain from potentially dangerous toxins in the bloodstream. However, recent research suggests that high concentrations can affect the ability of the messenger molecules to pass through the blood-brain barrier thus increasing the risk of degenerative diseases such as Alzheimer's.

Omega-3 is incorporated into brain cells during the last three months of pregnancy, where it performs vital functions relating to memory. It is crucial to the formation of the fatty myelin sheath that covers the brain cells, which enables electrochemical signals to be conducted from one neuron (brain cell) to another. Several studies have shown poor memory to be associated with low levels of this essential fatty acid. Omega-3 is a major structural component of the retina or eye tissue responsible for the conversion of light energy into electrical impulses which are conducted to the rear part of the brain where they are processed and stored. Omega-3 is also present in every cell membrane in the body including the microscopic structures (mitochondria) that make energy. When omega-3 is in short supply, omega-6 is incorporated into the nerve and brain cell membranes. However, this has the effect of slowing down communication between the cells.

Omega-3 is so important to the developing baby's brain that during late pregnancy, high levels are absorbed from the mother's blood at a phenomenal rate. If maternal levels are low, omega-3 is obtained from the mother's brain, which may account for the 2 to 3 per cent shrinkage in maternal brain size in

some women. Shrinkage accounts for the slight memory loss and vagueness that many women experience during the last few months of pregnancy. In the newborn, brain size and head circumference are also believed to be linked to levels of omega-3 in the blood.

Omega-3 makes up 50 per cent of the weight of each retina and is vital for visual development. Studies have shown that babies given formula milk enriched with the fatty acid develop better visual acuity than babies given a standard formula. High intake of omega-3 in early infancy is also associated with good hand-eye coordination and superior brain function in toddlers. There is good evidence to suggest that regular intake of omega-3 enhances social skills (the ability to make friends) in children aged three-and-a-half years.

Omega-3 and evolution

The 'Aquatic Ape' hypothesis proposes that the divergence of our early ancestors from the apes was caused by a semi-aquatic existence. It has been suggested that the abundance of omega-3 in seafood was responsible for the development of the large human brain. Other researchers claim that a terrestrial diet of seeds and nuts would have provided the essential fatty acid. Most scientists now favour the view that our early ancestors spent much of their time gathering food in or near shallow water and that their diet contained foods that were rich in omega-3. Archaeological evidence also suggests that because our ancestors were lean, fit and free from heart disease, their diet contained a balance of omega-6 and omega-3 fatty acids.

Modern diets however, are very different to those of our hunter-gatherer ancestors. Since the emergence of farming ten thousand years ago and more recently with cattle being fed on grains rather than on grass, omega-6 intake has steadily increased at the expense of omega-3. Processed food products such

soy and corn-oils contain high levels of omega-6 and are largely responsible for imbalances in the consumption of fatty acids. However, this has not been compensated for by an increased intake of fish. If we look at Mediterranean countries where fish is consumed as part of a regular diet, it becomes clear that cardiovascular and inflammatory diseases occur less frequently than in the UK and USA.

Sea food risk to health

Regular intake of fish has reduced dramatically in recent years, mainly due to the risk of foetal exposure to methyl mercury and other chemical toxins associated with birth defects, brain damage, seizures and developmental disabilities. This is particularly worrying in the light of work which shows that many disorders and diseases may be the result of poor intake of omega-3 during pregnancy.

Mercury is a metal that occurs naturally in rocks and the soil, but is also released into the air through industrial processes. Mercury returns to the earth in rain, where much of it settles in mud and sediment at the bottom of rivers and oceans. Bacteria then convert it to the organic form of methyl mercury. Fish absorb the toxin when they eat smaller aquatic organisms. Larger, older fish at the top of the food chain have the highest levels of methyl mercury because they've had more time to accumulate it.

Much of what we know about methyl mercury stems from events that occurred in the mid 1950s. People that consumed large quantities of fish caught in waters near factories that discharged vast quantities of mercury became seriously ill or died over a period of several years. In Iraq in 1970, thousands of people died after eating bread made from seeds treated with methyl mercury. In both cases, exposure levels were much higher than would be normally expected.

Recent studies have shown that methyl mercury in fish is not as toxic as was originally proposed. Individual cases of toxicity are reported only rarely.

As a precautionary measure, the Food Standards Agency suggests that women of childbearing age, pregnant women, nursing mothers and young children should avoid large fish such as tuna, shark, swordfish and king mackerel and only eat smaller fish such as sardines, organic natural salmon, halibut and herring. Sashimi and sushi should be avoided because they may contain large fish. However, some waters have lower than average levels of methyl mercury than others so it is always best to check where the fish are caught.

For people who don't like fish or wish to avoid it, omega-3 can be obtained from cod liver oil and algae-derived supplements, which do not contain methyl mercury. Indeed, studies suggest that certified dietary supplements taken during the second half of pregnancy are beneficial to neurological development and growth. However, people on medication for blood pressure or blood thinning and individuals who bruise very easily should check with their GP before taking fatty acid supplements.

Omega-3 and learning difficulties

Processed foods with high levels of omega-6 have been blamed for the increasing prevalence of ADHD, which is characterised by poor attention, lack of concentration and the inability to modulate impulsive actions. ADHD is generally a chronic condition with a strong genetic component, but difficulties in pregnancy and early infancy, severe illness, poor diet and environmental toxins can exacerbate the problem.

Clinical studies have found omega-3 to be very beneficial to children with ADHD. Work at Oxford University for example, has shown fish oil supplements to be

useful in controlling aggression and in improving concentration. The findings have brought hope to the parents of children with ADHD and other behavioural disorders.

Difficulties in learning to read and write are also thought to be linked to deficiency of omega-3 in brain and nerve cells. Scientists have already found that the condition can be improved by a diet rich in seafood. A recent study in Durham for example, involved giving fish oil supplements to primary school children with learning difficulties and reading, handwriting and spelling problems. The results were dramatic. After only three months of taking the supplements, the learning abilities of some children leapt ahead by two years. In one case, reading age improved by four years.

Government drives to improve reading standards recommend that children should have at least two portions of fish in their weekly diet. Adults that remember being told that a teaspoon of cod liver oil 'would make you brainy' might be comforted to know that it was true! Even so, only a third of parents provide fish regularly.

Summary

It has been demonstrated that access to a diet that includes a balance of omega-6 and omega-3 essential fatty acids enhances intellectual development during the early years. It is also clear that eating more fish or including omega-3 food supplements in the diet enhances overall health and development as well as intellectual capacity, vision and motor co-ordination.

The brain is a delicate, sensitive organ that needs care and nourishment in times of growth and development. Simply eating oily fish or taking at least 600mg of omega 3 daily can have a significant impact on brain health and help avoid the

growing epidemic of childhood illnesses such as asthma and allergy. Unfortunately, poor nutrition means that many children are deficient in omega-3 essential fatty acids.

Practitioners and parents can help by including fish as part of a healthy diet, by involving children in projects about seafood and marine life, by letting children plan menus, by joining in cooking activities together and by making omega-3 an essential 'buzz' word. Outings to sea-life centres and fish markets can also provide an invaluable source of information for everyone. Joining in with activities will help children understand why it is so important to eat properly in order to keep healthy.