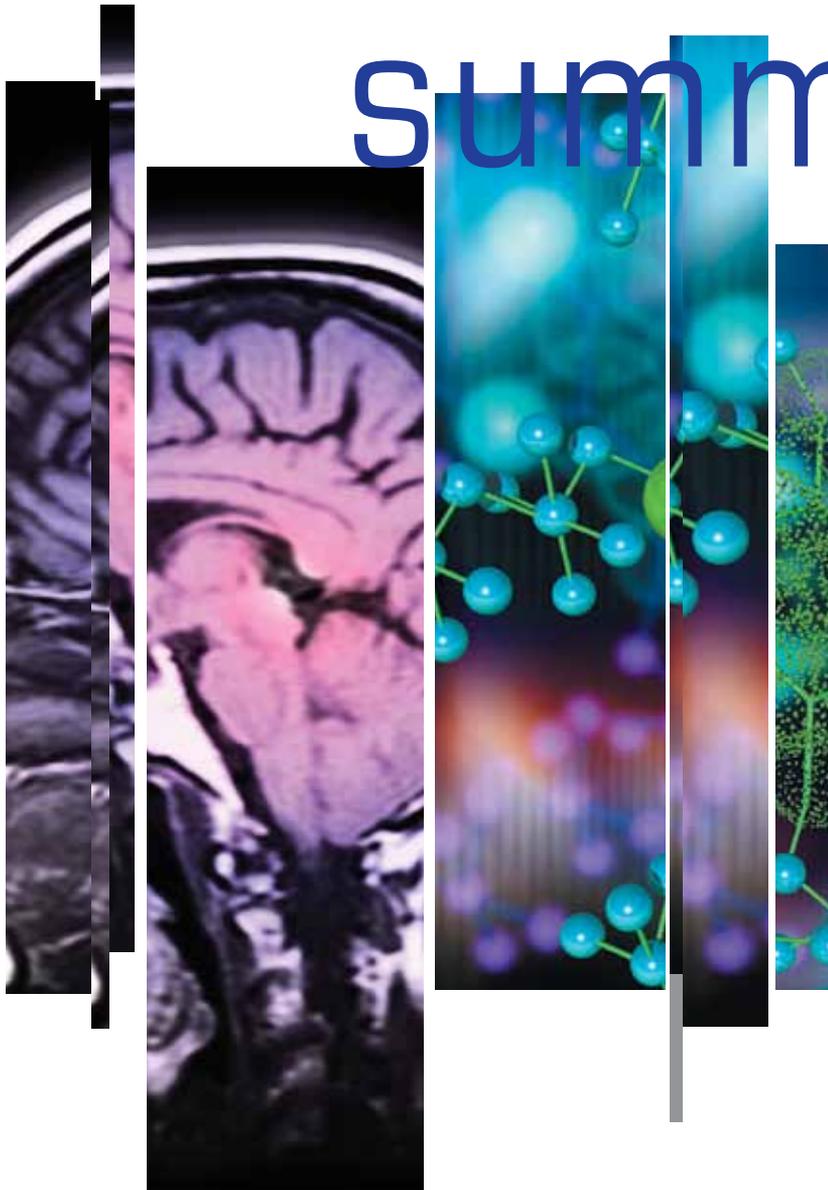


# SCIENTIFIC BACKGROUND INFORMATION ON

# MARINOL®

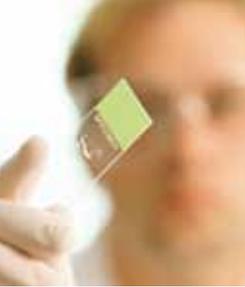
Neural Health

# summary



Marinol®

**Stepan**<sup>®</sup>  
Lipid Nutrition  
*The Natural Way to Better Health*



## Essential Fatty Acids

Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are omega-3 fatty acids needed for optimal functioning of the body, but cannot be effectively produced by the human body. Although they can be produced from alpha-linolenic acid (ALA), an essential omega-3 fatty acid, the conversion of alpha-linolenic acid into EPA and DHA is highly ineffective. EPA and DHA must therefore be provided by the diet; adequate amounts of omega-3 fatty acids need to be consumed daily. Fish oil, such as Marino1<sup>®</sup>, provides the richest source of omega-3 fatty acids. DHA is the longest and most highly unsaturated of the omega-3 fatty acids, and is formed by the elongation and desaturation of ALA. DHA is known to play a pivotal role in brain function throughout life. It influences brain development, visual function, cognitive decline, depression and ADHD.

## Brain Development

DHA is essential for the formation of human brain tissue. During pregnancy, especially in the third trimester, the demand for DHA by the fetus is high (figure 1). Unfortunately, the DHA levels of the mother decrease by 50% over the nine months of gestation. As a result, the DHA levels of the newborn may not be optimal. We know that babies receiving infant formula without DHA have lower levels of these fatty acids than breast-fed infants. Supplementing the mother with omega-3 fatty acids during pregnancy increases her and her newborn's DHA levels significantly. After birth, DHA-supplemented infant formula can result in DHA levels comparable to those of breast-fed babies.

It is generally accepted that babies require an adequate supply of long-chain polyunsaturated fatty acids before and after birth for optimal growth and neural development. Studies have shown that pre-term babies, who have missed the most important period of DHA accumulation, perform better on tests for mental development and complex problem-solving skills when they receive infant formula enriched with DHA. It has also been shown that high DHA levels at birth are a good predictor of better neuromotor function by seven years of age. It seems there exists a correlation between mental development and prenatal DHA availability. In a recent study, maternal consumption of a DHA-enriched functional food during pregnancy was shown to improve the infant's problem-solving skills at the age of nine months. Other beneficial effects of maternal supplementation with fish oil on infant intelligence can be seen at four years of age (figure 2). Finally, a study of children with developmental coordination disorders showed an improvement in reading, spelling and behavior after three months of fish oil supplementation.

## Visual Function

In addition to its role in neural development, DHA — being a major fatty acid of the retina — also has an important role in early visual development and visual function throughout life (figure 1).

Studies have demonstrated that pre-term babies fed formula enriched with DHA develop better visual

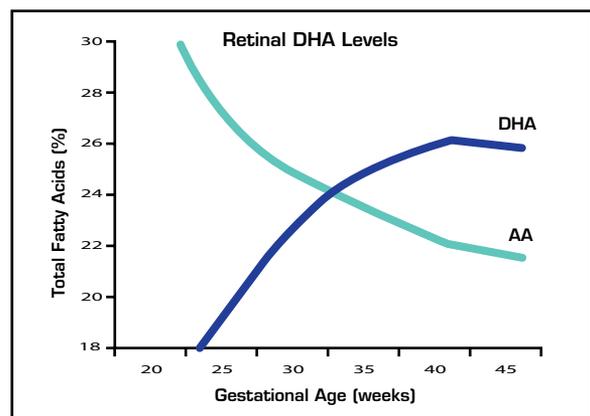
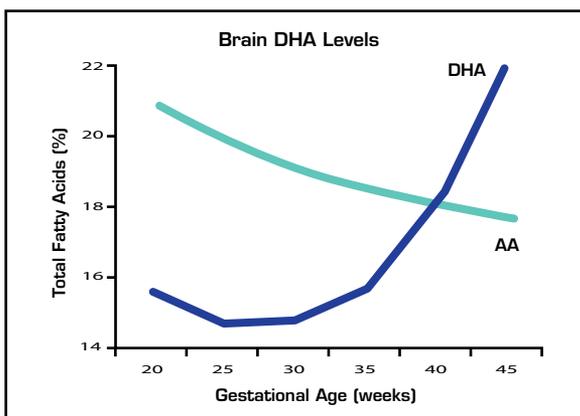


Figure 1

Docosahexaenoic acid (DHA) and arachidonic acid (AA) concentrations in the brain and the retina according to gestational age (from Martinez M, J Pediatr 1992;120:S129-38)

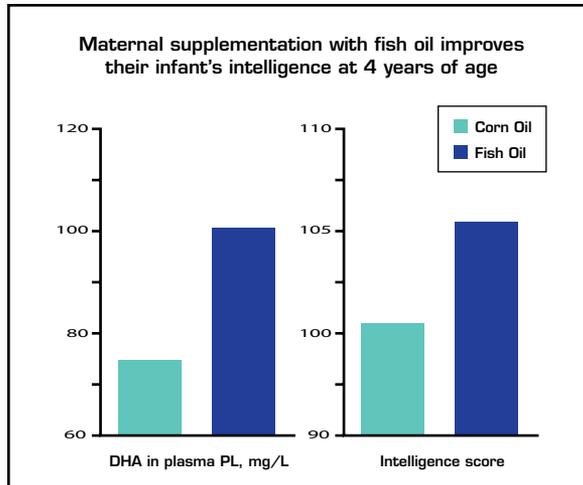


Figure 2

DHA concentration in plasma and mental composite scores of infants from mothers who received fish oil and mothers who received corn oil [from Helland IB, et al., *Pediatrics* 2003;111:39-44]

function (acuity), better retinal response to light, and more rapid visual development than babies fed a standard formula. It has also been shown that DHA levels at birth are associated with visual acuity at eight years of age. Very recently it has been shown that four-year-olds who received DHA-enriched infant formula had better visual acuity than those who received non-enriched formula.

Also, in the elderly, omega-3 fatty acids may be involved in eye function. People who had high fish consumption had less neovascular age-related macular degeneration (AMD), a disease causing poor vision in elderly people. Several studies now suggest that omega-3 fatty acids may prevent AMD.

## Cognitive Decline

It is known that the levels of DHA in the brain decrease with advancing age. Several researchers suggest that this decrease may be related to cognitive decline, which is often seen in the elderly. Indeed, the levels of DHA in the brain and blood of Alzheimer's disease patients are lower than in healthy elderly people. This suggests that low levels of DHA may be one of the risk factors for Alzheimer's disease. This was confirmed in a very large study in the U.S.,

showing that people with high DHA levels had a 47% reduction in their risk of developing all-cause dementia. On top of that, it has been shown that elderly people who regularly eat fish have a much slower cognitive decline than those who do not eat fish (figure 3). Current evidence from intervention trials suggest that fish oil may help in the prevention of cognitive decline and may even improve the status of patients with very mild Alzheimer's disease.

## Depression

Low levels of plasma DHA have also been associated with depression. Recently several studies have shown that a low intake of fish or fish oil is related to a higher risk of depression; depression is less common in people who consume high quantities of omega-3 fatty acids, and more common in people with low levels of these fatty acids. It is known that DHA levels at the end of pregnancy are low, and several studies suggest that postnatal depression is related to the intake of omega-3 fatty acids. It has been shown that diets containing insufficient amounts of omega-3 fatty acids may enhance the risk for depression.

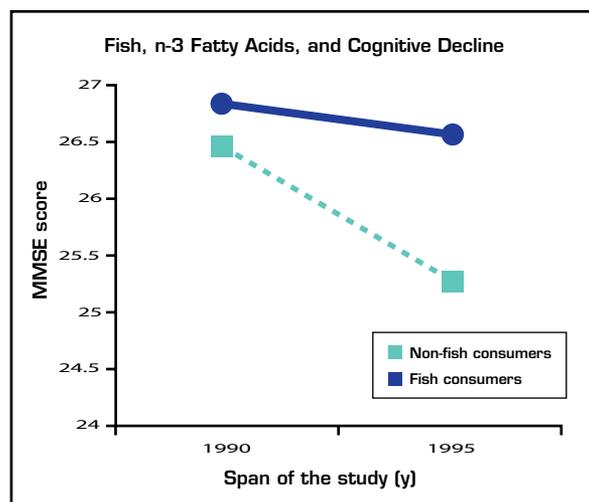


Figure 3

Cognitive decline over five years in elderly fish consumers and elderly people who do not eat fish [from van Gelder BM, et al., *Am J Clin Nutr* 2007;85:1142-1147]

## ADHD

Increasing evidence suggests that omega-3 fatty acids may improve psychomotor development and play a part in the physical symptoms of Attention Deficit Hyperactivity Disorder (ADHD). Some of the physical symptoms of ADHD are similar to those observed in people deprived of essential fatty acids. In addition, the levels of DHA appear to be reduced in hyperactive children. A recent trial effectively showed the benefit of omega-3 supplementation in children with ADHD; core ADHD symptoms, inattention and hyperactivity/impulsivity, were significantly reduced after 15 weeks. It seems therefore that omega-3 fatty acids may be beneficial for children with ADHD.

## Conclusions

Omega-3 fatty acids are essential for neurological development in babies before and after birth. They seem to be equally important in maintaining cognitive function throughout life and may even prevent Alzheimer's disease. Finally, omega-3 fatty acids may have a beneficial effect on depression and behavioral problems.

## The Health Benefits of Marinol® Include:

- optimizing neurological growth and mental development
- supporting visual function throughout life
- helping to prevent cognitive decline
- improving mood
- assisting in the control of ADHD

## Suggested Reading

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