

NUTRITION FOR THE BRAIN: FEEDING YOUR BRAIN FOR OPTIMAL PERFORMANCE

By Dr. Charles Krebs

(Excerpts courtesy of Dr. Charles Krebs. You can order Dr. Krebs' new book from [Michelle Anderson Publishing](#), Melbourne, Australia)



Figure 1a Old Model of Health and Wellness: where the absence of Sickness or Disease is considered to be Well, and RDAs are believed to keep you healthy.

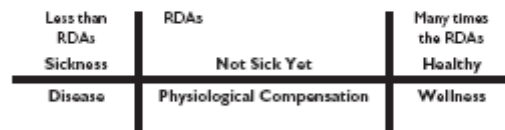


Figure 1b A True Model of Health and Wellness: There is a large area of physiological compensation between Wellness and Sickness, a whole range of Not Sick Yet RDAs were only developed to prevent absence of overt Sickness or Disease, not to make you Healthy or Well. Thus while the RDAs may keep you over the Sickness line, they are unlikely to keep you truly Well and Healthy.

NUTRITION AND HOW IT WORKS

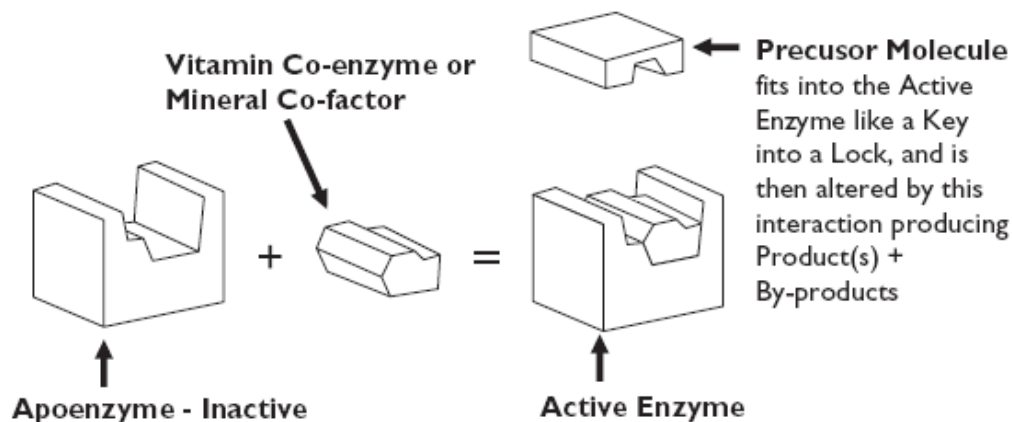


Figure 2 Vitamin Co-enzymes or Mineral Co-factors: are necessary in order to convert the inactive Apoenzyme into the Active Enzyme so that it can interact with the Precursor Molecule.

FATTY ACIDS OPTIMISE MENTAL PERFORMANCE

Saturated fatty acids, such as sunflower and corn oils, and polyunsaturated Omega-6 fatty acids are also important in the structure and function of nerve membranes, but are abundant in most Western diets, in fact often too abundant in many people's diet today. In contrast, the poly-unsaturated Omega-3 fatty acids are often deficient, especially DHA, the primary fatty acid in the brain controlling neural signaling and receptor activity. However, both Omega-6 and the Omega-3 poly-unsaturated fatty acids EPA and DHA are needed for effective brain function.

In the past several hundred years, the ratio of Omega-6 to Omega-3 fatty acids has changed dramatically from an original 1:1 ratio of our ancestors. Today the ratio of Omega-6 to Omega-3 fatty acids varies from between 20:1 in general to as high as 45:1 in some mother's milk. (See Fig. 16.) Infant formula commonly has a ratio of 10:1, but until 1997 none of this was in the form of DHA. This changing ratio of fatty acids appears to have serious implication for brain function. This excess of Omega-6 fatty acids affects Omega-3 fatty acid uptake and metabolism, because competitive inhibition of the Omega-3s by the more abundant Omega-6s reduces the concentrations of Omega-3s available to the cells of the brain. Because of the far lower amounts of the Omega-3s, especially DHA, in most people's diet today it may be important to take a supplement containing these fatty acids to optimize your brain function. Indeed, supplementing with Omega-3 amino acids has been shown to increase the speed of nerve conduction and visual acuity, thus helping children with their physical coordination and reading.

One condition that may result from or is definitely exacerbated by fatty acid deficiency, especially a deficiency of the Omega-3 fatty acids EPA and DHA is Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity (ADHD). Children and Adults suffering from ADD or ADHD and dyspraxia (poor motor co-ordination or clumsiness) have been shown to improve when their diets have been supplemented with EPA and DHA from fish oils. While the Omega-3 fatty acid, alpha-linolenic Acid (ALA), found in flax seed oil can be converted into EPA, and then EPA into DHA, this conversion is usually inefficient for most people, especially people with ADD and ADHD, and fish oil supplements have been shown to be superior to flax seed oil in improving ADHD symptoms.

However, which Omega-3 DHA/EPA supplement do you use?

For optimising mental performance, it is important to have the correct ratio of EPA to DHA. My research on brain integration using direct muscle feedback has shown that the most effective ratio for optimising brain function, especially the executive functions of the frontal lobes is 3:1 DHA to EPA. Almost all fatty acids supplements available today, and all salmon oil, have considerably more EPA than DHA, the reverse of what the brain needs to support optimal performance. Having an excess of EPA relative to DHA may slow neural transmission, thus reducing the degree of brain integration.

Only high quality tuna oil has the correct ratio of DHA to EPA, and thus supports optimum mental performance. It is important today to be sure the tuna oil is of the highest quality, as the cheaper fish oils are often contaminated with various toxins, especially PCBs and mercury. Because tuna are at the top of the food chain, miniscule amounts of these toxins are concentrated thousands of times in top level predators like tuna. So, unless the oil is cleaned by distillation or other processes, the contaminants may negatively affect your memory and neuronal function – the very thing you are trying to support.

Key Concept: Types and Ratios of Fatty Acids to Optimise Mental Performance

The brain is approximately 60% fatty acids by weight, with fatty acids important in the structure, stability and function of neuronal membranes controlling the speed and efficiency of nerve conduction. Unsaturated Omega-6 fatty acids like Arachidonic Acid and other saturated fatty acids are important in neuronal membrane structure, while the unsaturated Omega-3 fatty acids like DHA and EPA primarily control its function. DHA and EPA are conditional essential fatty acids that must come from the diet for most people, and the correct ratio of DHA to EPA is important to maximize brain function.

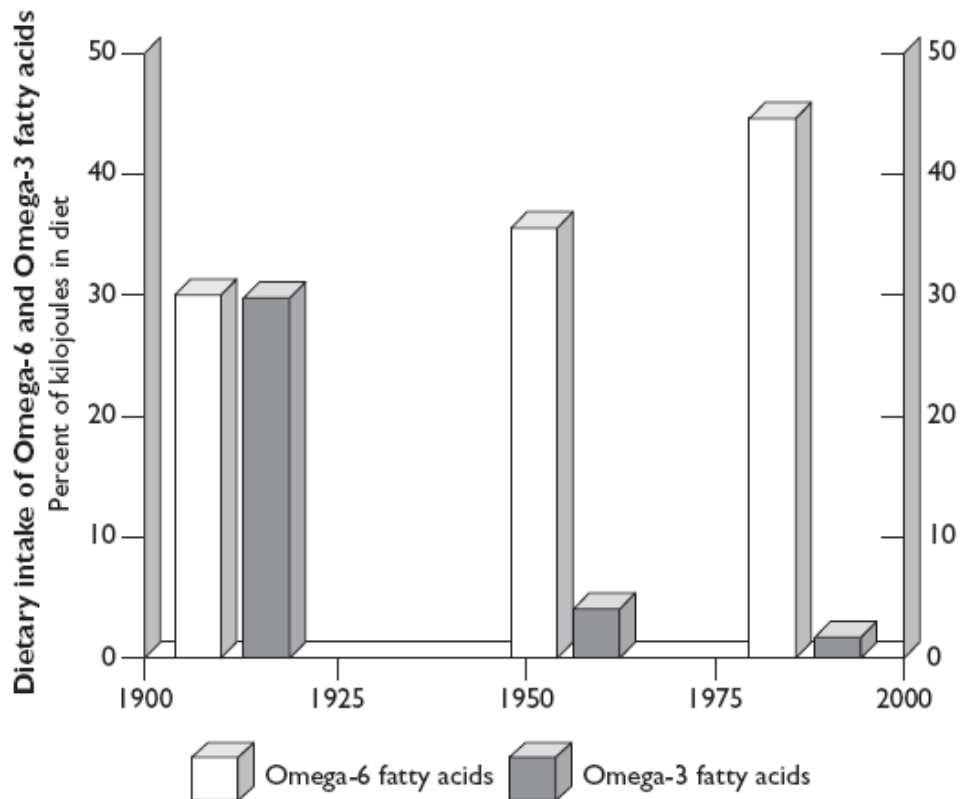


Figure 16 Changes in Omega-6 and Omega-3 Fatty Acid intake in Western Diets over the past 100 Years.

Free Radicals: Renegades out of Control

The other major function of vitamins and certain minerals is to scavenge ‘free radical’ molecules. Free radicals are molecules ‘broken’ during active metabolism leaving them with an unpaired electron, and the brain is one of the most metabolically active sites in the whole body. The presence of this unpaired electron sends free radicals on a fanatic quest to find another electron at any cost. So strong is their lust for the ‘missing’ electron that they will literally ‘tear apart’ other molecules like DNA, membrane fatty acids and both structural and enzyme proteins to satisfy this need. This theft now leaves the damaged molecule with an unpaired electron often initiating a chain-reaction of molecular destruction. (See Fig. 17.)

The result is free radical damage called oxidative damage, and hence, the need for cells to have ‘anti-oxidants’ to protect themselves from this damage. Anti-oxidant molecules like vitamins B₁, B₃, B₅, C and E and the minerals lithium, zinc and selenium have the capacity to quench these free radicals and are often called free radical scavengers. Having a sufficient supply of these protective molecules is critical to normal brain function and guards against damage to the hippocampus, the short-term memory centre, and other brain structures!

NUTRITION FOR OPTIMUM MENTAL PERFORMANCE

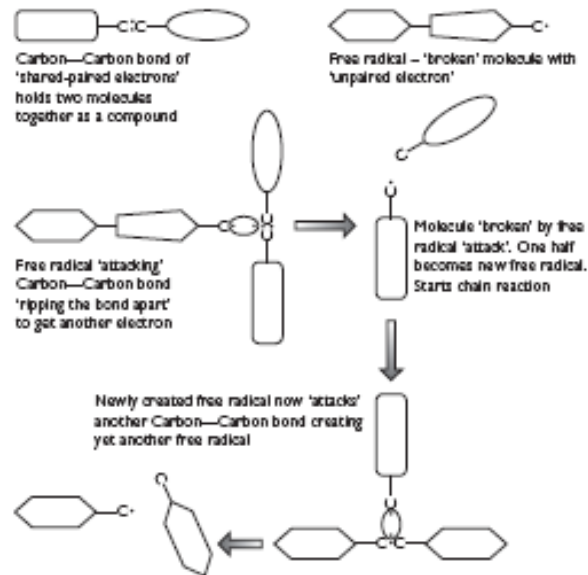


Figure 17 A Schematic of a Free Radical and Free Radical Damage.

Antioxidants are the brain's first defense against free radicals and when in sufficient supply, intercept free radicals preventing them from damaging delicate molecular structures. When antioxidants are in short supply, free radical damage may lead to cell death. Indeed, one of the major causes of damage following a stroke is brain cell death resulting from the massive release of free radicals with not enough free radical scavengers to mop them up. Likewise, much of the brain damage resulting from alcoholism may result from the production of free radicals in the brain coupled with a dietary deficiency of mineral and vitamin free radical scavengers, especially the B-group vitamins.

Key Concept: Role of Antioxidant control of Free Radicals in the Brain

The brain is the most metabolically active organ in the body, and Free Radicals are molecules 'broken' during normal metabolism producing an un-paired electron. This 'broken' Free Radical molecule seeks another electron, often by ripping it out of another molecule like DNA, fatty acids in the cell membrane or proteins like enzymes, creating another free radical starting a cascade of destruction. Antioxidants are molecules that 'quench' the free radical reactions by absorbing the un-paired electron, thus protecting the surrounding molecules from damage. Because the brain produces high levels of Free Radicals it needs high levels of Antioxidants to prevent damage to its vital structures and molecules. The Vitamins B₂, B₃, and B₆ and the micro-minerals zinc and selenium are all powerful antioxidants.