

Be kind to your health

Clinical nutrition for chronic fatigue syndrome/myalgic encephalomyelitis

Overview

Chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) is primarily characterised by prolonged periods of fatigue, but is also associated with cognitive symptoms including: poor concentration, decreased memory and somatic symptoms such as painful joints and muscles, disordered sleep patterns and gastrointestinal issues. There is increasing evidence that CFS/ME is associated with persistent viral infection that impairs the body's ability to make omega-3 and omega-6 long-chain polyunsaturated fatty acids – the precursors to eicosanoids responsible for the regulation of inflammatory and immune processes.[1] This reduced capacity to metabolise omega fats and produce the eicosanoids needed for immune function and fighting viral infections can exacerbate CFS symptoms. Mitochondrial dysfunction and depletion of Coenzyme Q10 (CoQ10) is also associated with CFS/ME and results in reduced energy supply to muscles, causing not only fatigue but also disturbances in sleep patterns and cognitive impairment.[2]

Evidence also supports the role of increased oxidative stress and blockage of the methylation cycle in CFS/ME. The methylation cycle is an important biochemical process involved in amino acid metabolism and antioxidant production. Low or blocked methylation leads to elevated homocysteine levels, with corresponding depletion of the antioxidant glutathione, which is involved in detoxification. [3] The observed depletion of CoQ10 and glutathione further contributes to oxidative stress; this, together with corresponding shifts in immune response (associated with glutathione deficiency), further exacerbates viral load.[4]

Igennus offer a comprehensive support protocol for CFS/ME, based on strong research evidence and excellent clinical results. Supplementary nutritional intervention comprises:

- fatty acids needed to support immune function (EPA, DHA and GLA)
- the activated form of CoQ10 – ubiquinol – to support ATP production and combat oxidative stress
- a micronutrient blend for homocysteine management, shown to support the methylation cycle and increase glutathione levels, further combating oxidative stress and supporting detoxification pathways.

Research**Essential fatty acids and phospholipids**

Chronic activation of inflammatory and cell-mediated immune pathways, a lowered antioxidant status and increased levels of pro-inflammatory cytokines, observed in CFS/ME patients, are known to induce fatigue and somatic symptoms. [5] The omega-3 fat eicosapentaenoic acid (EPA) plays a crucial role in regulating inflammation, as well as a large number of other physiological processes such as immunity and brain function. As a result, the body's requirement for EPA is very high and stores must be regularly replenished. Individuals with CFS/ME often display deficiencies in specific types of fatty acids including EPA; this is in part due to a persistent viral infection associated with CFS/ME. Such infections have been shown to impair the ability of the body to make omega-3 and omega-6 long-chain polyunsaturated fatty acids by inhibiting the action of the enzyme delta-6 desaturase. [1]

This poor fatty acid metabolism in turn impairs the proper functioning of cell membranes and has an adverse effect on the biosynthesis of eicosanoids produced from the long-chain polyunsaturated fatty acids dihomo-gamma-linolenic acid (DGLA), arachidonic acid (AA) and EPA. [1] A high AA to EPA ratio, itself a marker of inflammation, is also significantly correlated with symptoms and fatigue in CFS/ME patients.[6] Since AA is consumed in abundance in our modern diets, low levels of EPA due to poor conversion is a significant issue for CFS sufferers. As such, prioritising pure EPA in the initial phase of the treatment process is advisable.

Choline is essential for cellular membrane composition and is required by the body for regulation of the transmission of nerve and brain impulses. In CFS/ME the hypothalamus can be overactive, which leads to an overloaded autonomic nervous system and may contribute to fatigue. [7] Acetylcholine, responsible for excitation of the CNS, is produced in excess amounts when the brain is in overdrive and breaks down into acetate and choline. In normal conditions, choline combines with fatty acids, forming structural phospholipids. With the deficiencies in fatty acids observed in CFS/ME, however, sufferers have a reduced ability to construct phospholipids. This, together with the hypothalamic over-stimulation, results in excess levels of free choline. When the manufacture of omega-3 is significantly compromised there is a corresponding increase in free choline, arising from the reduced availability of omega-3 to construct phospholipids. An increase of choline has indeed been found in the occipital cortex of CFS/ME sufferers, [8] whose symptoms of CFS/ME were successfully treated by restoring omega-3 levels using pure EPA fish oil.

The methylation cycle and homocysteine

The methylation cycle plays an essential role in supplying methyl groups for a large number of biochemical reactions, as well as being essential in the production of glutathione – an important antioxidant required for the efficient running of detoxification processes. As part of the methylation cycle, homocysteine is either re-methylated to

methionine (a vitamin B12-dependent step) or converted to cysteine by the transsulfuration pathway, which supports glutathione synthesis. The redox/methylation hypothesis, associated with CFS/ME, suggests that increased oxidative stress causes a partial block of the methylation cycle through inhibition of methionine synthase (MS), with a subsequent negative impact on glutathione production. High free radical levels and low glutathione levels have been reported in CFS/ME, supporting the redox/methylation hypothesis. [9] A statistically significant positive correlation between homocysteine levels and levels of fatigue has also been found in CFS/ME.[3]

Elevated homocysteine and low B-vitamin status [10] found in CFS/ME are primary indicators of poor methylation, which can lead to the depletion of glutathione, thus impeding normal detox pathways, further exacerbating oxidative stress and further impacting on MS. This inhibition of MS then further exacerbates reduced glutathione production. As glutathione levels drop, oxidative stress increases, toxins accumulate, and there is a subsequent shift of the immune response from Th1 cell immunity to Th2 cell immunity.[4] Th1 cells drive the immune system towards fighting viruses and other intracellular pathogens, whilst Th2 cells target extracellular pathogens – thus diverting the immune system away from targeting viral infection towards dealing with oxidation and toxins that are accumulating. The immune shift observed results in CFS/ME sufferers becoming effectively immune compromised, which may exacerbate poor long-chain fatty acid production yet further.

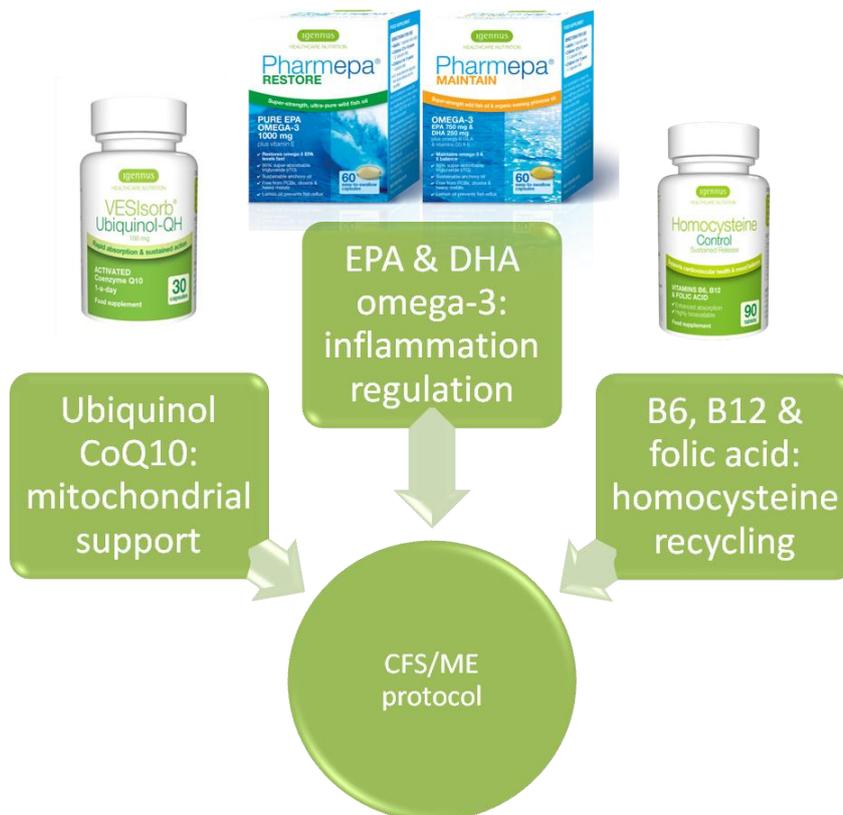
The methylation cycle also directly affects the synthesis of numerous proteins, enzymes and biological chemicals involved in energy production, such as carnitine and CoQ10. Deficiency of either can result in muscle weakness and pain, exercise intolerance and debilitating fatigue. Both carnitine [11] and CoQ10 [12] levels are known to be compromised in CFS/ME patients.

Mitochondria and CoQ10

Mitochondrial dysfunction and CoQ10 deficiency are key players in the symptoms of CFS/ME. CoQ10 in its reduced, activated form (ubiquinol) plays an essential role in mitochondrial electron transport and, as such, a fundamental role in energy production. In addition, ubiquinol is a potent antioxidant and antioxidant recycler, playing a vital

role as a scavenger of free radicals, reducing oxidative stress and inflammation. Ubiquinol depletion and the subsequent impact on oxidative stress also play a considerable role in symptoms associated with CFS/ME such as fatigue, increased oxidative stress, pain, sleep disturbances and reduced cognitive performance. [12]

Recommended protocol for CFS/ME support



Nutrition support protocol mechanisms

Supplementation with Pharmepa RESTORE & MAINTAIN provides the pre-formed omega-3 fatty acids EPA & DHA and the omega-6 fatty acid gamma-linolenic acid (GLA), thereby bypassing delta-6 desaturase and helping to restore normal eicosanoid production. Pure EPA in Pharmepa RESTORE directly increases EPA levels in relation to AA and thus helps to restore an optimal AA to EPA ratio, resulting in reduced inflammation and enhanced immune function. EPA and GLA present in Pharmepa MAINTAIN also give rise to end products

that inhibit viral replication and act as antiviral compounds.[13]

Phytosterols, present in cold-pressed organic virgin evening primrose oil (EPO), the source of GLA in Pharmepa MAINTAIN, exhibit antibacterial and antifungal activities and numerous anti-inflammatory effects, including the reduced production of pro-inflammatory products derived from AA.[14] In addition, triterpenes, also unique to unrefined EPO, possess free radical-scavenging and cyclooxygenase inhibitory properties, [15] thus

further reducing the conversion of AA to pro-inflammatory mediators.[16]

Homocysteine levels are directly influenced by blood levels of the B-complex vitamins folic acid, vitamin B6 and vitamin B12, [17] Supplementation with Homocysteine Control supports homocysteine recycling and thus increases glutathione antioxidant

CoQ10 is one of the key raw materials needed by the body to produce ATP – the body's energy currency – that is often depleted in individuals with CFS/ME because of mitochondrial failure. Ubiquinol is the most potent, body-ready form of CoQ10 and

status. This, in turn, combats oxidative stress and helps to maximise methionine synthase activity by reducing free radicals, thereby also supporting normal methylation cycle functions. Supplementation with these B vitamins also helps improve neurotransmitter production and cognitive function – a useful mechanism to help address 'brain fog'. [18]

is especially beneficial for overcoming CoQ10 deficiency, improving energy levels, enhancing sleep and improving cognitive performance.[12]

References

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For technical queries, recommended dosages or questions regarding any information contained in this protocol, please contact our nutrition scientists on 01223 421434 or email info@igennus.com.