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BAD AIBLING

DR. DOUWES, MD *informs!*

Treating Mitochondrial Dysfunction with Natural Supplements

Mitochondrial dysfunction, resulting in impaired cellular energy production, produces excess fatigue, making the simplest tasks feel onerous. It occurs in aging and in all kinds of chronic diseases: neurodegenerative, cardiovascular, metabolic, autoimmune, gastrointestinal, chronic infections, neurobehavioral, and cancers. Non-genetic, acquired mitochondrial dysfunction responds to treatment with natural supplements (G. L. Nicolson, 2014). During the process of creating energy, mitochondria also produce damaging free radicals that cause oxidative damage to cellular and mitochondrial membranes. As a result, function is impaired and inflammation occurs. People with chronic fatigue typically show signs of excess oxidative stress in blood tests, including elevated peroxynitrite levels. We consider alpha-lipoic acid, L-carnitine, coenzyme Q10, and phospholipid therapy to be among the “most promising supplements” for improving mitochondrial function and reducing fatigue.

Alpha-lipoic acid is a necessary co-factor for important mitochondrial enzymes. In addition, it helps reduce oxidative stress by stimulating the production of glutathione. Alpha-lipoic acid has the added benefit of being able to remove excess metals associated with hemochromatosis, Parkinson’s, and other chronic diseases. Although α -lipoic acid’s effect on chronic fatigue has not yet been studied in controlled clinical trials, its widespread use as a safe supplement (usually 200-600 mg/d) to support mitochondrial function and reduce oxidative stress has justified its incorporation into various supplement mixtures.

L-carnitine transports fatty acids into the mitochondria for oxidation and removes excess acyl groups. It also increases the rate of mitochondrial oxidative phosphorylation, which tends to decline with age. Reduced phosphorylation impairs energy production and increases damaging reactive oxygen species and reactive nitrogen species. A study in which 70 centenarians who took L-carnitine for six months experienced significant improvement in physical and mental fatigue. They also showed improved cognitive function, increased muscle mass, and better endurance (M. Malaguarnera, 2007). Studies involving L-carnitine, most of which have focused on insulin resistance and cardiovascular disease, indicate doses up to 2 grams per day are safe.

Coenzyme Q10 is vital for electron transport along the mitochondrial electron transport chain. It also affects the expression of genes associated with cell signaling and metabolism. Coenzyme Q10 has the added benefit of being a strong antioxidant in its reduced form. Clinically, it has been used in doses up to 1200 mg per day, but most studies used lower doses. Lipid replacement therapy provides the molecules needed to replace damaged phospholipids in mitochondrial membranes, thereby improving mitochondrial function. Oral phospholipid supplementation, in doses ranging from 500 to 2000 mg per day, have decreased fatigue in people with Gulf War illness, chronic fatigue syndrome, fibromyalgia as well as fatigue associated with aging.



In addition to the supplements the pineal hormone melatonin is useful for mitochondrial dysfunction, according to Reza Sharafati-Chaleshtori et al. Melatonin helps regulate mitochondrial function. It also stimulates antioxidant enzymes, including superoxide dismutase, glutathione peroxidase, glutathione reductase, and catalase; and it inhibits lipoxygenase, an enzyme that takes part in oxidation of unsaturated fatty acids. The authors say melatonin is an inexpensive, safe medication with mild adverse effects. Drug interactions, however, have occurred with anticoagulants, immunosuppressants, anti-diabetes, and birth control pills.

References

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Friedrich R. Douwes, MD
Medical Director | Internal Medicine
Oncology | Medicinal Tumor Therapie

Medi-Therm Kliniken GmbH & Co. KG
Rosenheimer Straße 6 - 8
83043 Bad Aibling
Germany
www.klinik-st-georg.de

