



Highly Effective Treatments for Pain and Fatigue

by Jacob Teitelbaum, MD

The Importance of Nutrition in Fatigue and Pain Part 3 – Jump-Starting Your Body’s Energy Furnaces

In previous columns, we have looked at the role that ordinary dietary nutrients play in Chronic Fatigue Syndrome and Fibromyalgia (CFS/FMS). Other nutrients that affect the body’s production of energy at the cellular level (in the mitochondria) can also be very helpful in these syndromes. Evidence suggests that mitochondrial problems in CFS/FMS may be a root cause that can trigger hypothalamic dysfunction. This may be caused in part by the glutathione deficiency that we discussed in earlier columns.

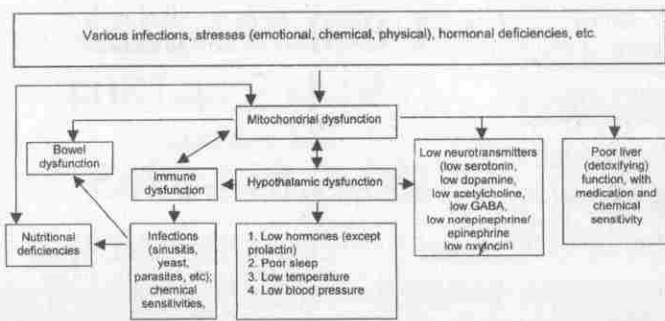
The Consequences of Mitochondrial Dysfunction

Besides the fact that fatigue in itself suggests low energy production, a large number of clinical findings common in CFIDS/FMS can be explained by mitochondrial malfunction. These include “brain fog” and decreases in levels of neurotransmitters (e.g. dopamine, acetylcholine, serotonin, and oxytocin). Particularly severe changes in the hypothalamus have been seen in mitochondrial dysfunction syndromes. This could account for the hypothalamic suppression characteristic of CFIDS/FMS.

In the liver, you would see a decreased ability to eliminate toxins and medications. This could contribute to sensitivities to both medications and environmental factors. In the muscles, mitochondrial dysfunction would lead to low energy production and accumulation of excessive amounts of lactic acid, causing achiness and post-exertional fatigue.

And although there are many causes of the bowel dysfunction seen in CFS/FMS, mitochondrial dysfunction can also cause digestion to suffer. In the immune system, you would expect to see poor white blood cell function and therefore a decreased ability to fight infection (especially in combination with a deficiency of glutathione – the white blood cell’s armor). Thus, mitochondrial dysfunction might well be the root cause of – or at least a contributing factor to – the hypothalamic, immune, neurotransmitter, nutritional, detoxification, sleep and other disorders seen in CFIDS/FMS. (See Figure).

The CFIDS/FMS Cycle



Improving Mitochondrial Function

Fortunately, there are a number of natural treatments available to improve mitochondrial function.

Aspartates and Malic Acid

Aspartates and malic acid are compounds that are needed to “rescue” part of the Krebs cycle when levels of the nutrient thiamine pyrophosphate (TPP) are low (as is seen in CFS/FMS). As dietary supplements, aspartates and malic acid have at least three excellent qualities: They are very effective; they are safe and nontoxic, even for those with chemical sensitivities; and they are cheap! Although the other supplements I will discuss in this chapter are also safe and usually have no side effects, they can be expensive.

Aspartates are compounds based on the amino acid aspartic acid. Many studies show aspartates to be helpful for various fatigue syndromes. Over 3,000 patients have been studied, with many in placebo-controlled trials. To achieve the desired effect, the potassium and magnesium needs to be *chemically attached* to the aspartate. Studies using each component separately or in various combinations did not show the desired effect.

When the proper type of aspartate was used, about 70 to 85% of patients improved, compared with 25% of patients given a placebo. Results often begin in ten days. The usual dose is 1 gram (1,000 milligrams) twice a day (or 250 milligrams four times day) after meals. Patients can stop taking the supplement after twelve weeks. If fatigue recurs, they can resume the aspartate for six- to eight-week periods as needed.

The combination of magnesium and malic acid is also critical. Malic acid is a compound that occurs naturally in foods, in fruits in general and in especially high levels in apples. (Remember the old saying: “An apple a day keeps the doctor away.”) When levels of malic acid and the other compounds discussed in this article are low, the body often has to shift to a very inefficient (anaerobic) means of generating energy. This contributes to the abnormal buildup of lactic acid (noted above) that occurs after exertion in CFIDS/FMS. This causes muscle pain, achiness and fatigue.

Malic acid is critical during both healthy (aerobic) and inefficient (anaerobic) muscle metabolism. Interestingly, malic acid can be converted to aspartate as well.

L-Carnitine and Acetyl-L-Carnitine

Low levels of the carnitine compound acetylcarnitine in the blood or muscles of people with CFS/FMS have been found by two different research centers. Carnitine plays many roles in the body. It has the critical function of preventing the mitochondria from being shut down when the system backs up. It does this by keeping a substance called acetyl coenzyme A from building up and shutting down the TCA cycle and the

electron transport system, the cell's effective energy burning systems. Also, without sufficient carnitine, the body cannot burn fat (and makes excess fat), resulting in large weight gains. The average weight gain in CFS/FMS is 32 pounds!

L-Carnitine is a naturally occurring form of carnitine that is only found in animal flesh. Beef is high in carnitine. Carnitine can also be synthesized in the body. This process requires adequate amounts of the amino acid lysine, which is low in rice-based vegetarian diets (which, in addition, also have no carnitine). I suspect that the real reason many CFS patients who take lysine to prevent herpes outbreaks see their symptoms improve may be that this increases the body's carnitine production.

In my experience, and that of other clinicians, taking supplemental L-carnitine has *not* been very helpful, and D-L-carnitine can actually worsen symptoms. Taking 500 to 1,000 milligrams of acetyl-L-carnitine a day, however, can be very helpful (more is not better!). It has no side effects except for its cost, usually – \$1.50 for 1,000 milligrams. Adding 500 to 1,000 milligrams of L-lysine, which is cheaper, can decrease the amount of acetyl-L-carnitine needed. The body also requires vitamin C and B-complex vitamins to make carnitine. I suspect that most people can lower their dose of acetyl-L-carnitine after eight to twelve weeks – for example, to 500 milligrams a day – or even stop it. Any brand is fine as long as it is *pure* acetyl-L-carnitine.

NADH

Nicotinamide adenine dinucleotide hydrogen (NADH), also known as coenzyme 1, is necessary to carry the energy made by burning carbohydrates, proteins, and fats from the TCA cycle

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to the electron transport system in the mitochondria, so that it can be converted into ATP. NADH's ability to be turned into energy depends on the proper functioning of various enzymes and other compounds.

In people with CFS/FMS, the body has difficulty producing NADH. Because NADH has many other functions, a lack of it is problematic for the body. One major function of NADH is in stimulating the production of the important neurotransmitters dopamine, norepinephrine, and serotonin. NADH stimulates the enzyme tyrosine hydroxylase (TH), which is the key enzyme for the production of dopamine. Taking supplemental NADH can stimulate the production of dopamine and norepinephrine by up to 40 percent.

In addition to the above-mentioned functions, dopamine lowers levels of prolactin, a hormone that (because of hypothalamic dysfunction) is often elevated in people with CFS/FMS, and lowers appetite. In a placebo-controlled study at Georgetown University Medical School, patients were given 10 milligrams of NADH a day for one month. In that time, 31 of the CFIDS patients showed at least a 10% improvement. Although this may be considered modest compared to the average 90% improvement seen by 91% of patients in our placebo-controlled study using an integrated protocol, one out of four patients do find the NADH to be very helpful. Clinical experience also suggests that it may take 2 months to see the full effect.

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I use only NADH that is made by the company that produced it for the Georgetown study – the Menuco Corporation. Their brand name for NADH is Enada. I recommend a dosage of 10 milligrams daily. Unfortunately, NADH is very sensitive to stomach acid. Because of this, it is more likely to be effective if people use the sublingual tablet form.

Coenzyme Q10, Iron, and Copper: The Electron Transport System

Coenzyme Q10, iron, and copper are critical for electron transport system (ETS) function. A great deal has been written on coenzyme Q10 and CFIDS/FMS. Studies have demonstrated it can do the following:

- Enhance immune function and improve symptoms in CFS/FMS
- Assists weight loss when dieting
- Improves exercise tolerance in sedentary people

In addition, coenzyme Q10 may decrease allergies. I recommend taking 200 milligrams of coenzyme Q10 a day. Sadly, most brands of coenzyme Q10 in a recent test were found to not have the amounts claimed on the label, or the oil-base needed for proper absorption. Because of this, the only brand of Coenzyme Q10 that I recommend is the one often used in research studies. This is the Vitaline brand.

Iron and copper are also critical to ETS function. Iron deficiency is easy to test for and treat. Ferritin levels should be kept over 40 and iron percent saturation over 22 percent. Iron is important because an iron level that is too high or too low can cause fatigue, poor immune function, cold intolerance, decreased thyroid function, and poor memory. A surprisingly large number

of people display early hemochromatosis (excess iron) on their iron studies. Early in the disease, fatigue is often the only symptom. If caught early, hemochromatosis is remarkably easy to treat. If caught late, however, it is disabling and even life threatening. This is an additional reason to check the iron level carefully and to not treat unless the iron is suboptimal. Adequate copper is also needed (for SOD function as well) but too much may aggravate CFS/FMS. I recommend 1/2 milligram a day.

To sum up, the following is my recipe for treating mitochondrial dysfunction and jump-starting your patients' energy production. The supplements are listed in order of priority.

1. Take a good multivitamin daily (needs to include magnesium and malic acid, high level B vitamins and C). I would use the "Daily Energy Enfusion" powder, which replaces 25 supplement tabs/day (by PhytoPharmica). This is also an excellent daily nutritional support for most people.

2. Take 200 milligrams of coenzyme Q10 daily (Vitaline brand).

3. If the ferritin test is under 40 or the iron percent saturation is under 22%, give an iron supplement. Iron needs to be taken on an empty stomach, and not within six hours of taking any hormones.

4. Give vitamin B12 shots, especially if the B12 level is under 540 picograms per milliliter (pg/mL) of blood. I recommend giving 3,000 micrograms intramuscularly one to five times a week for ten to twenty injections, then as needed.

5. Take 500 to 1,000 milligrams of acetyl-L-carnitine a day for three months. Then take it as needed or discontinue it.

6. Take 10 mg of *sublingual* NADH each morning.

7. Take 2,000 milligrams of magnesium-potassium aspartate a day for three months, then stop. Be sure to take a brand that is *fully reacted*.

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Jacob Teitelbaum MD is a board-certified internist and director of the Annapolis (Maryland) Research Center for Effective CFS/Fibromyalgia Therapies. Having suffered with and overcome these illnesses in 1975, he spent the next 27 years creating, researching, and teaching about effective therapies. He is senior author of the recently published landmark study "Effective Treatment of CFS and Fibromyalgia—a Placebo controlled Study" (which can also be found on his web site). Dr. Teitelbaum lectures internationally and gives two-day practitioner workshops. He is also the author of the best-selling book *From Fatigued to Fantastic!* His newest book is *Three Steps to Happiness: Healing through Joy* (Deva Press 2003). For more information visit Dr. Teitelbaum's web site at www.endfatigue.com. He does not take money from any company whose products he recommends and all royalties from products he makes are donated to charity.

