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Vitamin and supplement production has become big business and many people spend a lot of money on these without having a reasonably good understanding about their effects (especially how one might interact with another and with pharmaceuticals), potency, and even their personal need for some of these.

It is essential to keep in mind that although dietary supplements are promoted as "natural" alternatives, they will still contain many potent compounds that trigger various biochemical reactions or changes in the body. After all, the reasons for using supplements are to use some as substitutes for standard medications, or to make up for what one's body may be severely lacking. Check for additives, fillers and waxy coatings and realize that not all vitamins/supplements are extracted from "natural" food sources. Also, check for other ingredients in snacks and "enhanced" beverages, as these may contain stimulating herbs in vaguely stated amounts.

Consumers must beware of exaggerated claims or testimonials and promises of miracle cures. On a positive note, a number of vitamin and dietary supplement manufacturers do submit their products for quality assurance review by United States Pharmacopeia (USP) and NSF International (formerly National Sanitation Foundation). These are independent public health and safety organizations, and products for which ingredients and manufacturing processes were reviewed by them for consistency, safety and quality will display USP or NSF certified symbols. Herbal extracts will often display the term "standardized" which means the levels of key

ingredients are supposed to be uniform from one batch to another, but this does not necessarily mean better or stronger, nor does it take into account other substances used to manufacture them.

Many people routinely start their day with a multi-vitamin. These come in a large variety of forms, combinations and potencies. Recommended daily allowances (RDAs) were instituted well over 40 years ago, which were set at levels to ward off severe deficiencies and are now considered to be too low to achieve optimal effects. In contrast, some formulas contain excessively high and potentially dangerous levels. More is not always better, especially in the case of fat soluble (A, D, E and K) vitamins because they are stored in the liver and fatty tissues. There is also a risk in isolating and taking certain vitamins by themselves for they may trigger an imbalance or deplete other nutrients. Therefore, balance and synergy of vitamins and minerals are two other important considerations.

One leading school of thought is that the most beneficial form of vitamins are those made from concentrated whole foods because the co-existing structures and properties of each will be retained and work together (in a more synergistic way). Most proponents of dietary supplements will agree these should never be used to replace food or a healthy diet. Formulas with added iron should not be used, unless specifically directed by one's doctor, as iron can be quite harmful when not needed.

Clinicians who work closely with Chronic Fatigue Syndrome/Chronic Fatigue and Immune Dysfunction Syndrome/Myalgic Encephalopathy (CFS/CFIDS/ME) and Fibromyalgia (FM) patients are turning to specific supplements or herbs to correct deficiencies and make use of their therapeutic properties. We have incorporated recommendations or opinions by some of the leading specialists in the field, such as Drs. Charles Lapp, Jacob Teitelbaum, Nancy Klimas and Roland Staud, on the top one dozen or so supplements used in the management of CFS/CFIDS/ME and FM. Other credible sources (such as the *Physician's Desk Reference for Nutritional Supplements*) were referenced and data included from multiple sources on these and a few other products in order to provide enough basic information so individuals can make informed decisions. It is strongly urged that people consult with a qualified healthcare professional.

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Sleep aids

Melatonin—This is a hormone produced by the pineal gland in the brain and used by the body to regulate sleep/wake cycles. (It is at its highest level at night). It is considered to be fairly safe and has been found to be beneficial in far lower amounts than what most formulas contain. One CFS/CFIDS/ME and FM specialist recommends using only about 0.3 mg and not the standard 3.0 mg dose. Several precautions need to be taken with melatonin in those with cardiovascular risks, as it can affect blood pressure and trigger abnormal heart rhythm. It should be avoided by those taking blood-thinners. At higher levels it can also raise blood-sugar levels, aggravate Crohn's disease symptoms, and disrupt other hormones (which can lead to a change in menstrual patterns, for instance).

Valerian root (sometimes combined with lemon balm)—The rootstock portion of this plant (grown in North America and Europe) is dried and has been used as a mild sedative and sleep aid for hundreds of years. It is unique in that it will usually have a calming effect, but if someone is very fatigued, it can actually have a stimulating effect. Valerian root has been studied for treatment of anxiety and shown to have good results at 100 mg given 3 times per day for a 6-month period. The average dose for sleep will be 180 - 360 mg, depending on each individual's reaction. No clear benefit has been noticed at higher doses and therefore, the daily dose should not exceed 600 mg. Lemon balm is a member of the mint family and is known for its calming effect on anxiety and digestion. It is often combined with valerian in sleep formulas, to enhance the relaxing effect.

Sleep formulas—There are an overwhelming number of sleep formulas, many specifically marketed for CFS/CFIDS/ME or FM. These contain a wide variety of ingredients, most often herbs such as valerian, lemon balm, chamomile, passionflower and hops. Some formulas will also include amino acids, minerals, and Chinese herbs. Therefore, making a choice can become difficult. The best approach would be to work with a naturopathic doctor or holistic practitioner who is well informed about the medicinal use of these herbal preparations. Otherwise, consider preparations with the fewest active ingredients and use herbs which are familiar to you.

Calcium and magnesium are often used at night to help relax muscles and promote sleep. These minerals offer a wide range of other benefits further described under those for improved energy. *Since magnesium is an electrolyte which influences heartbeat and potassium levels (which also affect heartbeat), it is wise to only supplement with magnesium or potassium with regular checks by a doctor of serum blood levels of both minerals.*

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Improve energy, strength and/or mitochondrial function

Calcium—The advantages of calcium are many, such as maintaining healthy bones and teeth, healthy muscle tone and function, cardiac function, and nerve transmission. Calcium should not be taken in greater amounts than 500 mg at a time in order to maximize absorption, and it should be taken with meals. Too much calcium could lead to kidney stones. The average daily dose of calcium is 1000-1200 mg daily. Since magnesium works closely with calcium, the suggested ratio is 2:1, calcium to magnesium. Recent research has shown that calcium works best when Vitamin D levels in the blood are adequate.

Magnesium—This mineral is of particular importance in CFS/CFIDS/ME and FM because of its involvement in numerous biological and metabolic functions. Magnesium affects the production of cellular energy, stability of cells, nerve conduction and muscle contraction. It helps transport oxygen to muscles, which in turn, strengthens but also relaxes muscles. Furthermore, there is a link between magnesium and functioning of the immune system. An activated immune system uses magnesium and zinc at rapid rates.

Studies have shown that CFS/CFIDS/ME patients in particular have lower levels of intracellular magnesium than healthy controls. The typical magnesium test only measures serum levels of magnesium and while serum levels can be normal, intracellular levels can be low at the same time. Magnesium deficiency can cause low potassium. Other signs of magnesium deficiency are fatigue and muscle cramps. There is some evidence that magnesium has anti-osteoporotic activity. It definitely has anti-arrhythmic activity. Magnesium may have anti-hypertensive, glucose-regulatory and bronchodilatory activity and possible anti-migraine activity. *Since magnesium is an electrolyte which influences heartbeat and potassium levels (which also affect heartbeat), it is wise to only supplement with magnesium or potassium with regular checks by a doctor of serum blood levels of both minerals.*

Magnesium is contraindicated in those with kidney failure and certain types of heart problems. It should not be taken two-to-four hours before or after certain medications such as bisphosphonate, a quinolone or a tetracycline, as magnesium can interfere with their absorption. The standard recommended dose for healthy people is 100-300 mg per day. But it is often used in higher amounts of 500-750 mg for CFS/CFIDS/ME and FM while frequently combined with malic acid. In view of magnesium's effect on so many functions and other medical conditions, it would be advisable for one's doctor to determine the appropriate dose for each individual.

Malic Acid is a natural compound found in fruits, sometimes called fruit acid, which is involved in the Krebs cycle and mitochondrial creation of energy. The Krebs cycle (citric acid cycle) is part of a metabolic pathway involved in the chemical conversion of carbohydrates, fats and proteins into carbon dioxide and water to generate a form of usable energy. Other relevant reactions in the pathway include those in glycolysis and pyruvate oxidation before the citric acid cycle, and oxidative phosphorylation after it. Malic acid has been found to improve energy in CFS/CFIDS/ME as well as reduce pain and stiffness in FM. There are no known contraindications or precautions. A typical dose would be 1200-2400 mg daily with 300 to 600 mg daily magnesium.

Since magnesium is an electrolyte which influences heartbeat and potassium levels (which also affect heartbeat), it is wise to only supplement with magnesium or potassium with regular checks by a doctor of serum blood levels of both minerals.

Vitamin B-12 is a water-soluble vitamin found naturally in animal foods, fish, and dairy products. It is vital to red blood cell formation, absorption of foods, metabolic regulation, growth, and protection of nerve cells and function. Deficiency often presents as chronic fatigue, digestive disorders, pernicious anemia, various memory, mood or neurologic problems. B12 deficiency may also be present in some individuals who consume a very limited vegan-type diet. Long-term use of proton pump inhibitor medications which reduce stomach acid (like those controlling GERD) may also interfere with the absorption of B12.

Therapeutic treatment with this vitamin is often delivered as hydroxocobalamin injections and for CFS/CFIDS/ME and FM, at higher and more frequent doses than usual because of the amount needed to notice improvement. Not only does B-12 help to promote energy and overall better function, but also it works at a deeper level to reduce nitric oxide and peroxynitrite levels regarded by some researchers to be the main culprit in causing the CFS/CFIDS/ME process.

It is generally not found to be toxic or problematic in the majority of people, unless they are sensitive to the compounds that make up the vitamin, an ingredient in the injection material and/or have an unusual optic neuropathy. Vitamin B-12 injections, when used for CFS/CFIDS/ME, are often started at a high-dose of approximately 3000 mcg, several times per week, for 15 doses and then it is tapered down. Sublingual B12 is the preferred oral form, from 1000 up to 5000 mcg day.

Vitamin D—This vitamin has received a lot of attention over recent years because low levels have been detected in many people, but this can be a fairly tricky vitamin to use. Vitamin D deficiency, in particular, is often associated with bone loss and multiple sclerosis, but also with persistent musculoskeletal pain.

There are two types of Vitamin D—D-2 is derived from plant sources, and D-3 from animal sources and through the skin when exposed to ultraviolet-B (UVB) rays from the sun. Obtaining adequate Vitamin D from sunlight on a regular basis depends on geographic location, weather, and pollution and is adversely influenced by the current common use of sunscreen. It has been shown that the bodies of people in New England make inadequate amounts of Vitamin D most of the year. Those on certain medications or with autoimmune-driven conditions usually need to avoid direct sunlight, and their levels of Vitamin D can be low as a result.

Vitamin D helps to increase calcium and phosphorous absorption which, in turn, helps to strengthen bones and muscles. It is also commonly thought this vitamin helps to protect people against certain diseases while more recent research (on autoimmunity) has found routine supplementation might actually make some diseases worse by how it affects gene expression at the microbiologic level. It has definitely been established that Vitamin D helps the immune system fight certain viral and bacterial infections. Therefore, there is conflicting data on whether Vitamin D is beneficial or more harmful in certain situations.

Vitamin D-3 has become the preferred type because it is found to work better. Some doctors recommend Vitamin D-3 at about 1000 IU daily, but only for a set period of time, just to build up reserve levels. (It is important to remember this is a fat-soluble vitamin and stored in fatty tissues, so it has the potential of becoming toxic if levels get too high.) The daily dose would then be reduced to about 800 IU/ day and increased again only when patients are found to be deficient. It should be taken with calcium. In view of the emerging controversy on Vitamin D supplementation, patients should get their levels checked and then be advised and monitored by their own physicians regarding the best dose for their needs.

Coenzyme Q-10—Usually referred to as simply CoQ-10 (also called ubiquinone), it is a vitamin-like substance which has notable cardioprotective, cytoprotective and neuroprotective activities. It is vital for the energy generating process at the cellular level in the mitochondrial electron transport chain. CoQ-10 is well regarded and used by physicians to treat various metabolic and neurologic diseases, cardiovascular conditions and diabetes. There are no contraindications, but general side effects may include stomach upset, nausea and headaches.

Individuals with certain illnesses may need to have their medications adjusted or be more closely monitored such as those with type-II diabetes (CoQ-10 lowers blood sugar levels), those on anticoagulant drugs, and those using statin drugs (which decrease CoQ-10 serum levels). Some beta-blockers may block CoQ-10 dependent enzymes. The average daily dose recommended by CFS/CFIDS/ME and FM clinicians is 100-200 mg. However, mitochondrial specialists who see CFS/CFIDS/ME patients recommend the same dosage as used for mitochondrial disease patients—300-400 mg *twice* a day.

Acetyl-L-Carnitine—Acetyl-L-carnitine is one of several forms of carnitine. Carnitine has the chemical structure similar to an amino acid and is involved in fatty acid transport across mitochondrial membranes, which increases the use of fat as an energy source. Acetyl-L-carnitine may have neuroprotective, cytoprotective, antioxidant and anti-apoptotic activity. (Anti-apoptotic activity means it inter-feres with abnormal cellular suicide, which is a documented problem in CFS/CFIDS/ME). Mitochondrial membrane potential improves with acetyl-L-carnitine, which improves the functioning of mitochondria. People with seizure disorders should only use it under medical supervision. Adverse reactions are infrequent and are mild gastrointesti-nal symptoms such as nausea, vomiting, abdom-inal cramps and diarrhea. Antiseizure medications (valproic acid), *nucleoside analogues*, a type of antiviral treatment (didanosine, zalcitabine and stavudine), and pivalic acid-con-taining antibiotics may lead to secondary L-car-nitine deficiency and the need for acetyl-L-carnitine. Dosage may be 500-2000 mg daily in divided doses.

Nicotinamide adenine dinucleotide (NADH)—This is an active coenzyme form of Vitamin B-3 and necessary for energy production. NADH is located both in the mitochondria and cytosol of cells. (The cytosol is the cytoplasm or interior of the cell omitting the mitochondria.) It depends on the essential nutrient nicotinamide (a form of niacin) for its synthesis. The

*Physician's Desk Reference
for Nutritional Supplements*

notes that mitochondrial membranes are impervious to NADH. However, NADH in the cytosol can still be used in cellular energy production in certain cells

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mainly heart and liver cells. A small study was done on its benefits for CFS/CFIDS/ME and the dosage used in the trial was 10 mg daily, taken in the morning, about 45 minutes before eating. Clinicians who have used it since then find that if it is going to work, then about 30% will notice an improvement in 3 months, while 50% will show improvement in 6-12 months.

Dehydroepiandrosterone (DHEA)—DHEA is a steroid hormone produced by the adrenal glands and is converted to other hormones like estrogen and testosterone. DHEA levels start to decrease with age and are found to be prematurely lower in people with CFS/CFIDS/ME and

FM. A few specialists do prescribe this supplement to their patients; however, more are opposed to its use because of a strong potential to cause breast and ovarian cancer as well as prostate cancer.

The *Physicians' Desk Reference (PDR)* emphasizes that DHEA and its metabolite DHEA-S should not be used unless ordered by a doctor for documented abnormally low levels of DHEA. Canada and the UK have banned its sale over-the-counter.

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More Resources

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[*Review of Nutritional Supplements Used for CFIDS/FM*](#)

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