

## Maximizing Your Energy By Robert Pastore, Ph.D.

Did your "get up and go", get up and leave? Are you sick and tired of being sick and tired? Although there are factors such as overall state of health or having one of many illnesses, such as thyroid abnormalities, affecting and draining energy reserves, many people feel tired all the time seemingly without an identifiable cause. If you fit this profile, help is on the way.

The good news is that there are ways to maximize your energy, enabling you to perform your daily activities, with some energy left to spare!

### UNDERSTANDING ENERGY

Everything we do - walking, singing, your reading of these words - requires energy. But, what gives us our energy? The answer is ATP, adenosine triphosphate. This chemical compound is the energy currency that helps the body perform.

All activities performed by living things involve chains of reactions that use, move, carry, store and free energy. These chains of reactions are called metabolic pathways. In metabolic pathways, organisms couple *exergonic* reactions that release energy from molecules such as ATP with *endergonic* reactions, in which the products of the reaction contain more energy than the reactants, so the extra energy must be supplied for the reaction to proceed.

This process is similar to that within a car engine. In a car engine, gasoline is burned in the presence of oxygen. During exergonic reactions, in which the products contain less energy than the reactants and the excess energy is released, molecules of gasoline are broken down to carbon dioxide and water, releasing energy as heat. Explosive bursts of heat produce pressure that moves the pistons in the engine, propelling the car.

In your cells the mitochondria are the engines. In the engine of each of your cells, the products of the foods you consume are broken down and burned in the presence of oxygen. As discussed in the car engine, there is a series of exergonic reactions during which these molecules are broken down to carbon dioxide and water; and energy is released. Most of this energy is released as heat, helping maintain our body temperature. However, a good percentage of it is captured in molecules of ATP. Additionally, even in the absence of oxygen, your muscles can still effectively create ATP for energy by switching to an anaerobic metabolism.

The foods you eat, after numerous complex processes, eventually yield ATP. Glycolysis, tricarboxylic acid cycle (or Krebs cycle), and the electron transport chain, are the major steps to ATP synthesis. To illustrate the importance of nutrients in energy production, many of the food components you are familiar with act as coenzymes in the metabolic energy-yielding pathways. For example:

- Thiamin (B-1) provides the coenzyme thiamin pyrophosphate, which is involved in energy metabolism.
- Riboflavin provides part of the coenzymes flavin adenine dinucleotide and flavin mononucleotide, which are used in energy metabolism.
- Niacin (B-3) is involved in the formation of a very important coenzyme called nicotinamide adenine dinucleotide (NADH), which is a direct precursor to ATP synthesis.
- Coenzyme Q10 is essential in the electron transport chain of the energy sequence.

These are just a few of the many nutrients involved in energy production.

## ENHANCING ENERGY PRODUCTION

Now that we have an understanding of energy production, let's explore some ways to enhance ours. The first place to look when you are lacking energy is diet. Diet is a key player in energy production. We've covered the importance of obtaining all essential nutrients in optimal amounts. Let's continue by looking at diet from another angle.

### Carbohydrates, Fats, and Protein – The Appropriate Equation for You

As food is broken down into energy components, the division and percentages of macromolecule or macronutrient components (carbohydrates, protein, and fats) is key to keeping blood sugar in balance. If you ever have that mid afternoon slump, you are most likely experiencing a drop in blood sugar, resulting in fatigue. The best approach is to consume a diet that prevents such fluctuations in blood sugar.

By choosing protein rich meals, mixed with complex carbohydrates and a small amount of healthy fats, you can create a steady flow of blood sugar, and feel an increase in energy, *providing that you don't skip meals*. Eliminate all refined sugars and as many refined flours as possible from your diet. Keep your total fat calories at 30%, and try to find the best amount of carbohydrates for your individual needs.

Some fast burners, individuals that have rapid metabolism and the people that exercise regularly, can sometimes handle higher complex carbohydrate totals than those with slow metabolisms. Many factors influence the total amount of carbohydrate in the diet. Amounts and types of exercise, present states of health (including certain conditions such as diabetes, elevated cholesterol and obesity), are all factors. If you were absent from such a health condition, my advice would be to start at 40 to 50% of your total diet from complex carbohydrates. This way you can decrease incrementally if needed or as advised by a medical doctor or nutritionist. Many individuals feel better with 45, 40 or even 35% carbohydrates in their diet. The best approach is to work with a nutritionist to help identify a total that may be right for you.

After you secure your total carbohydrate content, add 30% from fat, and the remaining percentage should come from protein. For example, if you are comfortable

having 50% of your diet from carbohydrates, and 30% from fat, that leaves you with 20% for protein.

Being conscious of macromolecule percentages can help you choose meal components more appropriately. And remember to avoid junk food!

Eliminate as much junk food as you can, and make sure you are increasing your vegetable and fruit servings. Build your diet foundation on solid ground. Whole grains, legumes, vegetables, fruits, lean protein, low fat dairy or dairy substitutes fortified to match the nutritional profile of dairy, seeds and nuts, along with healthy oils, should compose your diet.

### **Exercise**

Exercise equals energy. Building more muscle through strength training, and increasing cardiovascular fitness through aerobics are great ways to increase your energy. Increasing muscle mass also increases your resting metabolic rate, leading to higher caloric usage and more overall energy for the body.

### **Sleep**

Increasing energy begins with sound sleep. Try to establish a routine, such as trying to go to bed the same time every night. If you are having trouble sleeping, keep your work out of your bedroom by eliminating activities other than sleeping from your bedroom.

### **Water**

Chronic dehydration can also lead to fatigue. Increased exercise, dry heat indoor air in the winter, excess caffeine and stress can lead to dehydration. Stay hydrated by drinking a minimum of 10 eight-ounce glasses of water every day.

### **Emotional Health**

Unacknowledged emotional issues and states of depression can deplete energy. Consulting with a licensed professional in the psychological sciences such as a psychiatrist or psychologist may help you address such issues and alleviate their enervating attributes.

### **Supplementation**

There are situations in which supplementation might positively affect energy production. Cases of mitochondrial myopathy, a disorder of this energy producing organelle, have responded to Coenzyme Q10 therapy (Rev Neurol 1999 Jul 1-15; 29(1): 59-63 and Eur Neurol 1996; 36(4): 191-6). The result of oral supplementation of Coenzyme Q10 on detected skeletal muscle energy metabolism in middle-aged post-polio subjects, revealed the energy enhancing benefits of replenishing this

coenzyme (Mol Aspects Med 1997; 18 Suppl: S291-8). Further, the subjective perception of enhanced vigor occurred in middle-aged, untrained men, supplementing with Coenzyme Q10 (Int J Sports Med 1995 Oct; 16(7): 421-7).

Another supplement increasing in popularity is ENADH, the absorbable form of the aforementioned NADH coenzyme. This supplement has been studied in cases of chronic fatigue syndrome at the dose of 10 mg with significant energy enhancing results (Ann Allergy Asthma Immunol 1999 Feb; 82(2): 185-91). Higher doses, such as 20 mg per day may offer greater results. Future studies are planned at the writing of this article.

The amino acid L-Carnitine may also benefit those with chronic fatigue syndrome. A study of 28 patients with this condition at Mercy Hospital and Medical Center in Chicago found that carnitine benefited almost all of the patients in eight weeks. Researchers suggest that this is due to carnitine assisting fats into the tricarboxylic acid cycle, in which they are burned for energy (Neuropsychobiology 1997, 35:16-23).

D-ribose is a naturally occurring five-carbon sugar found in all living cells. Some of the most important biological molecules contain D-ribose, including ATP (adenosine triphosphate), all the nucleotides and nucleotide coenzymes and all forms of RNA (ribonucleic acid). D-ribose, in the form of ribonucleoside diphosphates, is converted to deoxyribonucleoside diphosphates, precursor molecules for DNA. D-ribose in RNA and D-deoxyribose in DNA may be considered genetic sugars. D-ribose seems to increase energy production. It has been used in clinical research for cardiac ischemia (*Lancet*. 1992; 340:507-510). I'm using it in clinical practice along with carnitine, coenzyme Q10 and magnesium taurate.

Magnesium must also be considered. Adenosine triphosphate (ATP) exists in cells primarily as magnesium ATP (MgATP). Magnesium deficiencies can induce fatigue (*The Lancet*, 337:75760, 1991).

## **LOOKING FORWARD**

There is some interesting research on a compound called NT factor. NT factor has been studied in chronic fatigue syndrome and fatigue associated with major medical care such as chemotherapy and radiation therapy. The scientific evidence seems to show that NT factor reduces fatigue by enhancing the integrity of the mitochondrion, thus increasing the formation of ATP (Anti-Aging Medical News 2001; Winter: 5,16,32,44).

If you are suffering with constant fatigue, first seek medical assistance. If you are given a clean bill of health, the information provided in this article may help you find and keep your "get up and go".