Meet your mitochondria

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In paying attention to our health it is important to not overlook the little things — like our mitochondria. Our subject is tiny but complex, so consider this a brief introduction.

Each cell in our body manufactures its own energy. Cellular energy is made in tiny cellular structures called mitochondria. Different cells have differing number of mitochondria. Cells in organs that need a lot of energy (think skeletal muscle, brain, heart and liver cells) contain larger numbers of mitochondria. In the last few decades, medicine has advanced its understanding of the part mitochondria play in health, disease and aging.

Mitochondria are powerful energy producers, but they also are vulnerable. To create energy, they use oxygen. In the process of generating energy, they also generate reactive oxygen species. These are capable of damaging and even destroying the mitochondria. Since our bodies are wise, our mitochondria have been given an array of substances, called antioxidants, to mop up these damaging compounds. Sometimes, however, this balance is disrupted.

When we look at conditions where mitochondrial dysfunction is a part of the problem, we see a wide array of issues. In the brain we see conditions like Alzheimer's, Parkinson's and depression. Issues affecting the heart include coronary artery disease. In skeletal muscle, chronic fatigue syndrome and fibromyalgia have mitochondrial changes. At the cellular levels these conditions have similarities, initially a buildup of the damaging reactive oxygen species, then an accumulation of mitochondrial DNA damage resulting in disruption of production of energy, and eventual mitochondrial death and cell death. If the process reaches this stage we finally see changes in the tissues of the organs.

Although the underlying mechanism in the cell can look similar, the pathways by which this damage can occur can be different in different tissues and different patients. Mitochondria need oxygen to make energy, so poor delivery of oxygen to the cell may be an issue. This could be caused by poor circulation or low iron. Iron-deficiency anemia is common, and results in a lowered ability of the blood to carry oxygen. Without enough oxygen, the mitochondria can't keep up with energy demand. Besides having basic iron status evaluated, exercise is a great way to increase circulation and oxygenation of our cells.

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Besides oxygen, mitochondria need nutrients like iron, B vitamins and magnesium so poor nutritional status or poor assimilation or utilization of nutrients may be a problem. Possible genetic or gastrointestinal issues may need addressing.

An increase in what is called oxidative stress — greater exposure to damaging reactive oxygen species can also contribute. Chemicals that can increase oxidative stress include drugs, agriculture chemicals, food additives, household cleaners, water and air pollutants and contaminants.

Our ever-increasing exposure to chemicals calls for an increase in our intake of protective foods. Sadly, our intake of dietary antioxidants is decreasing. Fruits and vegetables contain colorful compounds that have antioxidant properties. However, only about eight percent of Americans reach the daily recommended intake of fruit and vegetables (5-13 servings). Most of our intake hovers around 2-3 servings and the quality is poor. Potatoes are Americans' most consumed vegetable in the form of French fries and potato chips. Adding colorful fruits and vegetables in greater amounts to one's diet is a sure way to provide mitochondria with protective nutrients. In some cases, a doctor who knows how to support detoxification may be needed.

Though the processes are complex, much of the advice is simple. Go for a walk. Eat a salad. Your millions of mitochondria will cheer you on.