Mitochondria give cells over 90% of their energy. Without proper energy cells cannot carry out their functions.

**Mitochondrial Dysfunction vs Mitochondrial Disease**
Mitochondrial dysfunction simply means that the mitochondria are not working correctly. Mitochondrial disease is the term used when the primary cause of mitochondrial dysfunction resides in the mitochondria. Mitochondrial disease is generally genetic. It can be inherited from either or both parents. A special type of mitochondrial disease is caused by mutations on the mitochondrial DNA, and is inherited only from the mother. When the primary cause of mitochondrial dysfunction resides outside the mitochondria, mitochondrial dysfunction is called “secondary” (to something else).

**Symptoms of Mitochondrial Dysfunction**
Cellular energy is necessary for the function of all cells, but is particularly critical for nerve and muscle. Both nerve and muscle are important in GI function, thus cyclic vomiting, constipation, diarrhea, poor GI mobility, and other digestive disorders are common. Additional potential complications of mitochondrial dysfunction include chronic fatigue, neuropathic pain, depression, autistic regression, seizures, hypoglycemia, visual and hearing difficulty, depression, anxiety, panic disorder, intellectual disability, and dysautonomia.

**Mitochondrial Triggers**
Mitochondrial dysfunction can be genetic, but even then, the disease is often triggered by the environment. Viral infections are among the most common triggers of mitochondrial dysfunction. Additional potential triggers are other infections (e.g. lyme bacteria), vaccinations, toxins, anesthesia, and any other significant stressor. In order situations, mitochondrial dysfunction can be acquired. In fact, stroke and heart attack involve mitochondrial dysfunction, whereas cells are receiving insufficient oxygen for required energy metabolism. Many environmental toxins can poison mitochondria as well, including some pesticides.

**Treating Mitochondrial Dysfunction**
The good news is that mitochondrial dysfunction in general can be treated. In Dr. Boles' experience, about 80% of people with mitochondrial dysfunction improve on proper treatment, including people with autism. Of course, this requires a broad-based
treatment approach with strong foundational aspects including good diet, supplements, exercise, adequate sleep, avoidance of environmental triggers, and more. Of particular importance is the combination and dosages of specific supplements including the bioavailable form of coenzyme Q10 (ubiquinol), L-carnitine, riboflavin (vitamin B2), vitamin C, alpha lipoic acid, vitamin D, and others.

Interview
In my radio show interview with mitochondrial expert, Dr. Richard Boles, we discuss all of these topics in detail and he shares his supplement formula created to address the specific needs of mitochondrial dysfunction. Please listen. It’s show #51.

Dr. Richard G. Boles biography
Dr. Richard G. Boles is a medical geneticist and a pediatrician who specializes in mitochondrial medicine, functional disease (including cyclic vomiting syndrome, other atypical forms of migraine, and chronic fatigue syndrome) and autism spectrum disorders. His expertise stems from decades of both clinical work and research at a major academic center as well as from his most recent experience in cutting edge biotechnology and genomics. He uses an innovative and integrative approach in both diagnosis and treatment to best serve his patients. He treats children and young adults (up to age 25) with a variety of conditions, but his main focuses are on:

- Mitochondrial disease and dysfunction
- Autistic spectrum disorders
- Complicated migraine including cyclic vomiting syndrome
- Other chronic pain disorders
- Chronic fatigue syndrome