



The Health Nugget

Powerhouse Preservation II

Sigmund Shuckert is known for building the world's first powerhouse in Bavaria in 1878. It generated energy to light up the magnificent gardens of Linderhof Palace. Shortly after, Edison took energy production to the next level. Energy exists in different forms but is generally defined as liveliness, the ability or power to work, a supply, or a source of power. The human body has an amazing capacity in itself to experience energy: liveliness, ability, and power. We don't have to look far to see what man is capable of. It requires energy to move, think and live. To be or feel energetic is a desirable quality.

Last month we introduced what has been referred to as the powerhouse of the human body: the mitochondria. Within a human cell we find, at times, hundreds of these miniature organs. Mitochondria are about the size of bacteria. At a microscopic level, mitochondria are responsible for the conversion of ingested energy sources into a substance called ATP. This process of splitting glucose molecules and producing ATP involves about ten different chemical reactions. In the first half of the production, energy is used. But by the end of the process, the lost energy is replaced and doubled. Most of these chemical reactions occur in our little powerhouses, the mitochondria.

Mitochondria are extremely complex, and just like most power-plants, they produce a lot of waste. They also require certain components to make them work effectively and efficiently. When mitochondrial function decays, as a result of aging or deficiency of vital components, eventual physical and mental decline can be expected.

In his 80s, when most are taking it easy, Dr. Bruce Ames, whom we introduced last month, is still spry and spunky in his lab. Cancer research,

studying DNA damage and degenerative disease led Ames to understand how mitochondrial decay drives a lot of aging and disease. The leaking of free oxygen radicals, DNA damage and diminished production of ATP are some of the signs and symptoms of mitochondrial decay.

Ames and his team discovered two substances that take care of these decay problems in rats. Acetyl carnitine and lipoic acid given at high levels for a few weeks restored the declining mitochondrial function of aged rats to a young rat level. When rat diets were supplemented with acetyl carnitine and lipoic acid, a good part of the lost function from the heart and immune system and diminished ambulatory activity and cognition was restored. Together these two substances complemented each other. In some cases, synergistically accomplishing what neither of them could do on their own. Ames explains that these substances do more than mop up the toxic mess that the aged mitochondria are producing, as important as that is. Ames states, "It turns out that lipoic acid is a fantastic inducer of all the body's antioxidant defenses. It is better to turn on the body's defenses than to just give an antioxidant."¹

Both these substances are naturally found in youthful, healthy mitochondria. But apparently supplementation can serve a good purpose as we age.* "Acetyl carnitine, a mitochondrial transporter for fatty acids, when fed to old rats for several weeks, reverses three aspects of mitochondrial decay...; lipoic acid, a mitochondrial coenzyme, when fed to old rats for several weeks reverses the increase in oxidant by-products; and the combination of acetyl carnitine and lipoic acid, when fed to old rats improves mitochondrial function in the liver and brain and increases activity levels and scores on cognition tests."²

There are more nutritional components to the mitochondria story though. Ames believes that mitochondria, and thus the human body, are aging faster as the result of nutritional deficiencies related to our bad diets. There are 40 micronutrients that power our biochemistry. These include vitamins and minerals. When short on micronutrients in the diet, Ames explains that nature selects short term in place of long term metabolism. In other words, one can look healthy and feel good, the body is taking care of itself for today. But in the meantime, he says, you are knocking out DNA repair enzymes, adaptive immunity, then the mitochondria start pouring out radical oxygen—all the things that come with age.

DNA damage and free radicals on the loose are seen, for example, with magnesium and zinc deficiency. Biotin, selenium and phosphate deficiency have been found to produce the same results. “Biotin inadequacy from food is present in 40% of pregnant women; biotin deficiency in human cells in culture leads to oxidant release, DNA damage, accelerated mitochondrial decay, and premature senescence (aging).”³ We think of deficiency diseases as a thing of the past here in America. According to the EAR, this is not the case. The EAR stands for the estimated average requirement of nutrients used by nutrition researchers to assess the nutrient adequacy of groups of people. Fifty-six percent of the American population is below the EAR for magnesium. Why? Where do we get magnesium? Magnesium is found in the center of the chlorophyll molecule, which is found in green leafy vegetables. Need I say more? Magnesium can also be consumed in whole grain breads.

One frustrated scientist found broken chromosomes in all his rats prior to being irradiated. Chromosomes are DNA strands that carry the blueprint for cell production. Ames explains that strand

breaks, or chromosomal lesions, are found in those who have been exposed to radiation. When these lesions are near each other, chromosomes end up falling apart. Upon investigation, the scientist found that folic acid deficient rat chow was the cause of the mimicked effects of radiation. Are deficiencies that serious? After replicating these results in human cells in culture Ames clarifies, “Very simply, if you don’t eat whole grains, or your greens, or take a supplement, it’s like getting irradiated.”⁴

Undernourishment is on one side, but over nourishment can be just as harmful when it comes to what can go wrong with the mitochondria. Both too little and too much iron have been found to have the same effect: mitochondria pouring out radical oxygen and massive DNA damage. Overnutrition in general compromises mitochondrial performance having far reaching results, including cancer and neurological decline.

It amazes me to see the Cross of Christ stamped upon the microscopic of our physiology. In spite of the effects of our neglect and abuse, “the gospel of Christ,” “the preaching of the Cross: which “is the power of God” (Romans 1:16; 1 Corinthians 1:18) is offered for all. Jesus says, “All power is given unto Me in heaven and in earth” (Matthew 28:18). What is this power given to Him for? For us. The measureless power given Him has been placed at our disposal. Jesus Christ Himself is the inexhaustible source of “the power that works in us” (Ephesians 3:20, NKJV). Whatever the demand, whatever the task, temptation or trial, His divine power has provided for us “all things that pertain to life and godliness through the knowledge of Him” (2 Peter 1:3, NKJV). Through “the word of His power” (Hebrews 1:3) you will be kept and sustained by the Powerhouse of the universe.

¹Ames, Bruce N. “Aging: The Disease, The Cure, The Implications.” June 27, 2008. UCLA. <http://video.google.com/videoplay?docid=6279555376505271736> (November 7, 2011).

²Ames, Bruce N. Research Interests. Department of Molecular & Cell Biology. 5/27/2008. http://mcb.berkeley.edu/index.php?option=com_mcbfaculty&name=amesb (November 7, 2011).

³<http://www.bruceames.org>.

⁴Smith, Philip. “Life Extension Interview with Dr. Bruce Ames.” Life Extension. August 2011, p. 34.

***Please discuss supplementation with a health professional.**

