Ubiquinol Reduced CoQ10: The Other Half Of The CoQ10 Story

Ubiquinol, which is the reduced from of Coenzyme Q10 (CoQ10), has been recently added to the supplement offerings of many companies and has generated a lot of confusion along with its excitement. As a supplement, ubiquinol is somewhat new, but as a critical part of human metabolism, our knowledge of ubiquinol goes back to the discovery of CoQ10. Although CoQ10 is often thought of as a “static” nutrient in the context of nutrition, it actually interchanges between two useful states: the oxidized ubiquinone, and the reduced ubiquinol.

Coenzyme Q10 is a member of a family of important biological compounds which are referred to as ubiquinones. It is a lipophilic, water-insoluble substance, which takes part in a large array of biochemical oxidation and reduction reactions. It was first identified in 1957 as an essential component of the energy production system in cells. CoQ10 and other members of the ubiquinone family have, since then, been identified as critical metabolic compounds in a range of aerobic organisms. Because of its crucial role in metabolism, humans have the ability to make their own CoQ10, although small amounts can be obtained through diet and as supplements.

In humans, CoQ10 is found in each cell in the body, but is particularly abundant in tissues which have large energy requirements such as the heart, liver, kidneys, and skeletal muscles. Smaller amounts can be found in the brain, lungs, and intestines. There are also substantial amounts that can be found in circulation, which are most often associated with lipoprotein particles. In total, CoQ10 in a normal adult has been estimated to be between 0.5 and 1.5 grams. Inside cells, about half of the CoQ10 is found within the mitochondria, where the final steps of CoQ10 production occur.

CoQ10 which is not located in areas of the cell and are not charge with producing cellular energy can amount to about 50-60 percent of the total CoQ10 pool. CoQ10 can be found throughout cell membranes and in other cellular structures such as the nucleus, cytoplasm, and endoplasmic reticulum. Some experimentation has also concluded that, while the final steps of CoQ10 production occur in the mitochondria, it can be exported to other sub-cellular locations.

While participating in various oxidation and reduction reactions, CoQ10 is cycled between two stable states: a fully oxidized form referred to as ubiquinone, and a fully reduced form called ubiquinol. CoQ10 cycles through these oxidated/reduced forms in order to achieve its metabolic goals. The cycle of CoQ10 is simple. Ubiquinone picks up electrons and then becomes ubiquinol. Ubiquinol then release its electrons and becomes ubiquinone again. Therefore, it would seem that CoQ10 has a very simple function of moving electrons, as the transfer of electrons is a fundamental step in the production of energy, the regeneration of antioxidants in cell membranes, and the construction of other important biological molecules. Each cell that is in the body needs a source of energy in order to survive. Therefore, sugars, fats, and amino acids are broken down in order to make energy.

In the mitochondria, CoQ10 is abundant, as it carries electrons to aid in the chemical reactions that burn cellular fuel and produce chemical energy to form ATP. Since substantial amounts of ATP are needed to power our cells, the importance of CoQ10 in human metabolism is easily understood. Both forms of CoQ10 are needed to transfer electrons between energy-producing reactions. Outside of the mitochondria, CoQ10 performs a slightly different role as a membrane and antioxidant. About half of the human body’s total CoQ10 pool may be functioning in this capacity. CoQ10 is one of the major antioxidant elements of the LDL particles and is also one of the first to be depleted when LDL is subjected to oxidation.

A discussion of CoQ10 would not be complete without mentioning its documented health benefits. Supplemental CoQ10 has been the subject of a lot of studies over the last half century, especially in applications for cardiovascular health. Many studies have shown benefits of CoQ10 in patients who are diagnosed with chronic heart failure, exercise-induced angina, hypertension, or those who have recently experienced infarction. There is also early evidence showing that CoQ10 may protect the heart from damage during chemotherapy, bypass surgery, or in diabetes. Aside from its cardiovascular uses, CoQ10 has been studied for its benefits in other conditions involving dysfunctions in cellular energetics, neurological degeneration, or oxidative stress damage. Although the clinical evidence for the potential benefit of CoQ10 in many of these applications shows promise, the variability in study outcomes proves it necessary to further research these areas for a more definite answer.

As we have previously seen, CoQ10 functions by cycling between two stable forms, ubiquinol and ubiquinone. This cycle results in the generation of cellular energy and the protection of membranes and lipids from oxidation. Dietary or supplemental CoQ10 also takes part in this cycle. Supplemental ubiquinol may have a distinct advantage over ubiquinone in its facility of absorption. Like many fats and lipophilic nutrients, CoQ10 is usually taken up by the intestinal electrolytes, packaged into lipid particles, and then released into the lymphatic system. From there, these particles are transferred into circulation where they are free to be transported throughout the body as needed.

The absorption of dietary CoQ10 is actually quite poor since it has limited solubility in lipids and depends on other contents of the gut. Some studies have measured that absorption is as low as 2-3 percent of the total dosage. One of the most thrilling consequences of the development of a stabilized dosage form of ubiquinol is its ability to be absorbed more efficiently than ubiquinone. There is evidence that CoQ10 must be reduced in intestinal enterocytes before the release into the lymphatic system. This, paired with absorption/reduction, may be a rate-limiting step of CoQ10 assimilation.

Dietary ubiquinol avoids this reduction reaction, and is directly available for absorption, which explains why ubiquinol-based CoQ10 supplements exhibit enhanced bioavailability over ubiquinone supplements. Preliminary studies in humans have shown that absorption of ubiquinol is at least double the absorption of ubiquinone. Comparisons of blood levels between trials also estimate the improvement in absorption to be significantly higher. Future studies are necessary to more accurately determine ubiquinol's enhanced absorption, and what effect the patient age or medical condition may have on these results.

About the Author

More information on Ubiquinol Reduced CoQ10 is available at VitaNet ®, LLC Health Food Store. http://vitanetonline.com/

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