

## The Straight Scoop on CoQ10

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Everything you've ever wanted to know – and would probably like to forget!

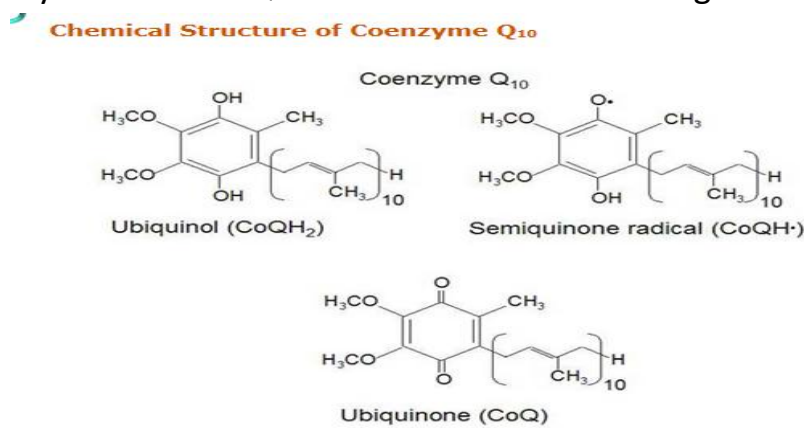
Most of you have known me as the Nurse who promotes the use of CoQ10 for healthy body supplementation. My statements make the complicated structures of CoQ10 seem simple. When in reality there's a whole lot of shaking and moving going on to produce the end result.

When I state that the oxygen component of CoQ10 is the basis for your formation of ATP (energy) within the cell, it is just a way to simplify the chemical process that results in that energy. I will attempt to add more detail to the CoQ10 story, without adding confusion at the same time.

To justify simplification of this process I will start with the molecule that is already broken down and absorbed into the body. The natural body formation of CoQ10 comes from the breakdown of proteins to amino acid chains that form CoA- reductinase enzymes, which then reduce down, twenty steps later, to Coenzyme Q10. When fully reduced it appears in most human tissues and in the highest concentrations in the circulating blood, as Ubiquinol (CoQH<sub>2</sub>). This is a stable antioxidant with an (OH bond or oxygen – hydrogen bond)) on both sides of its tail. This molecule can also be introduced into the body in liquid form and bypass most of the biosynthesis process which requires the presence of sufficient quantities of fat and vitamin B6 to occur.

### Are you still with me? OK, so let's add to your confusion.

At any one time CoQ10 can exist in the circulating blood stream and tissues in



one \_\_\_\_\_ of three forms.

Each form is vitally important to cellular health and each plays a different and unique roll.

First, **Ubiquinol**, with its double OH bond, is a highly stable antioxidant which prevents lipid peroxidation (permanent lipid damage), thus preventing your healthy LDL's (low density lipoproteins) from free radical oxidation and deterioration. This deterioration can result in heart disease, otherwise known as hardening of the arteries. Ubiquinol also prevents damage to cellular proteins and DNA as well as excessive consumption of vitamin E. Vitamin E (alpha-tocopherol) which is the main ingredient necessary for progressive oxidation of Ubiquinol into **Ubisemiquinone** (CoQH\*) an unstable molecule with only one OH bond which has the unique capability of gaining or losing a hydrogen bond thus becoming a stable **Ubiquinone** a less oxidizing radical, or the fully oxidized form of CoQ10 known also as **Ubiquinone**.

**Lost? Ok! Simply stated;**

**Ubiquinol** plus stable vitamin E (alpha tocopherol) = Ubisemiquinone

Ubiquinol, a **highly effective and powerful antioxidant**, protects the structure and function of cellular proteins, vitamin E and DNA.

**Ubisemiquinone** plus O<sub>2</sub> (oxygen) = Ubiquinone + super oxide O<sub>2</sub>

**Ubisemiquinone** **protects cell wall integrity**, including cholesterol structure and function (healthy cholesterol).

Or Ubisemiquinone plus vitamin E (radical) = fully oxidized **Ubiquinone** + stable vitamin E

Fully oxidized **Ubiquinone**, (CoQ) is the molecule with a single oxygen bond on each side of its tail. The molecule has lost its hydrogen bonds. And with only oxygen left it can attract and form chains of Ubiquinone. These chains cross the cell wall and bond with the CoQ10 found within the mitochondria inside every cell. The Mitochondria is the central 'power plant' of each and every cell, containing RNA and DNA. This formation is called the **electron transport chain**. This all important chain of molecules has resulted in my simplified definition of 'oxygen to the cells'. Across this chain, the electrons that form fatty acid and glucose metabolism are moved, which; **enhances cell growth and proper function**. Also across that same chain flows **protons**, these enter the

mitochondria and result in ATP otherwise known as energy production. A steady supply of protons insures the proper PH (acid – base balance) within the cell to maintain its function. Without this oxygen bond chain, energy cannot be produced and the PH balance of the cell would be lost, resulting in eventual cell death. Now you have a chain of fully oxidized CoQ10 crossing the cell wall into the cell. While enzymes within that same cell wall are capable of reducing that chain back down to its reduced state of Ubiquinol, then the cycle starts over. Problems occur when that cell wall becomes damaged or diseased.

Hopefully you're not too confused. If not, then you have just completed your first mini course in bio-chemistry. Now let's take this one step further, what can CoQ10 do for me?

If you understood the mini course, then some of the benefits are obvious. There are no set values for normal levels of CoQ10 in the body, whether it is tested in the blood or tissues. No one knows how much your body needs, and to make it more difficult, levels of CoQ10 vary throughout the body, with different levels found in blood, bones, soft tissue, the liver and heart.

The need for increased cholesterol in the body is triggered by the inflammatory response and regulated by the liver and this response may also serve as a CoQ10 regulator, increasing levels in areas of the body when needed, since the two appear to work together. There are no known deficiencies of CoQ10 but decrease levels have been noted in areas affected by illness. Cardiac studies have shown that with increased cardiac disease such as congestive heart failure, significant decreases in levels of CO Q-10 have been found, this indicates there is an increased demand for CO Q-10 during illness.

In several small clinical trials supplementation with CO Q-10 did in fact demonstrate significant improvement in cardiac function during cardiac illness, but only in patients who did not take HMG–CO- A reductase inhibitors otherwise known as 'statin' drugs. These patients required increasing doses to affect response from supplementation. It appears that almost all conventional medical therapy of patients with heart disease in any form includes the use of statin drug therapy. Since statin drugs, including Red Yeast Rice block the formation of CO Q-10 within the body and also reduces the flow of lipoproteins in the blood, which CO Q-10 is dependent upon for intracellular transport, then it can be assumed

that the tissue demand for energy frequently outweighs the supply in the presence of these drugs, which results in the progressive formation and increase of disease, not only in the heart but in all tissues of the body.

For this reason both conventional and integrative medicine recommends the use of supplementation with CO Q-10 for all patients who choose to continue statin or cholesterol lowering drug therapy. According to Dr. Joseph Mercola, nationally recognized natural health advocate, physician and family practitioner of thirty years; “In my view it is medical malpractice to prescribe a statin drug without recommending that one take CoQ10, or better yet ubiquinol. Unfortunately many doctors fail to inform their patients of this fact”. According to Dr. Duane Graveline, a former Astronaut and physician of 23 years, “Once mitochondrial damage and mutations are formed they cannot be reversed, no matter how much CoQ10 you take.” He recommends that if you have symptoms of statin damage, such as muscle pain, take anywhere from 200 to 500mg of CoQ10 daily. And if you just want to use it preventatively, then 200mg or less would be sufficient. At this point I must interject one small comment; most people take CoQ10 in a tablet or jell-cap form, according to research this form absorbs at about 10%. This would turn that 500mg dose into 50mg’s absorbed. The average dietary intake of less than 10mg/d of CoQ10 per day has been documented. The recommended minimum daily dose of absorbable CoQ10 for average adult is 50mg, or 100mg for those on cholesterol lowering therapy, preferably in the Ubiquinol or liquid form which is readily usable by the body. Keep in mind these are estimates that were derived by clinical testing. But since there are no true known required levels in the body, and all levels vary widely throughout the body, with the highest levels of Ubiquinol in the blood and the highest levels of Ubiquinone in the heart and brain, then the only way an individual will know if he or she is getting enough is by how their own body reacts.

Food sources of CO Q-10 are beef, fish, chicken, nuts, vegetables and eggs. Levels in food sources decrease with frying during preparation. Some strict vegetarian diets should consider supplementation at any age, but especially over the age of thirty.

It is assumed that the healthy child and young adult obtains sufficient quantities of CO Q-10 via food and by bio-synthesis (made by the body) and does not require

supplementation. There are no set guidelines for the level of Coenzyme Q-10 within the body. Clinical trials have shown that the use of CoQ10 does improve muscle performance in children with Duchenne Muscular dystrophy (DMD) it also improves stamina or tolerance (energy levels) that provide for that performance. There have been no reports of significant adverse effects of oral CO Q-10 supplementation at doses as high as 1200mg per day for as long as one year. Large doses, especially in tablet form, do cause mild gastro - intestinal irritation, and it is recommended to take divided doses throughout the day and tablets should be taken with meals that contain fats, since this is a fat – soluble molecule. None of the studies published on Coenzyme Q10 indicated the effects of supplementation with vitamin E during CoQ10 use. But several studies did implement its use in their clinical trials. Since this vitamin is vitally important in the progressive formation of fully oxidized CoQ10 (Ubiquinone) the use of 400mg daily (recommended daily dose) would be appropriate. There are liquid forms on the market today that have vitamin E already in the product (check your product labels).

The healthy human body absorbs, breaks down and creates CO Q-10 by bio-synthesis from birth to age twenty, at which point natural bio-synthesis begins to decrease. For this reason healthy adults over the age of thirty and those people of any age (including children) who are ill should supplement depending on the severity of the illness.

Healthy maintenance over 30	Adult age recovery from illness	Adult age during illness	Any age high dose Rx
100mg/day or 50mg absorbed	200mg/day or 100mg absorbed Child by wt.	200 - 800mg/day ^200mg absorbed Child/physician	200 – 1200mg/day Adult /Child Per physician

It is recommended that high dose treatment be under the supervision of your integrative medicine physician. High dose supplementation has been found to be successful in the treatment of Parkinson’s disease, Huntington’s disease, mitochondrial encephalomyopathies (inherited neurological anomaly), Fredrick’s

ataxia (inherited neurodegenerative disease), cardio vascular disease including hypertension, and cancer (as an adjunct to conventional therapy).

Drug interactions have only been noted in people on wafarin or Coumadin therapy, this is seen as decreased Coumadin activity. If CoQ10 is to be used then blood tests to monitor clotting time should be done by your doctor frequently, especially in the first two weeks, so he may adjust your Coumadin levels.

**Are you ready to forget it all? AH, but wait, one more note;**

Coenzyme Q10 research is still an ongoing process. Its functions, actions, and antioxidant properties, as well as responses during treatments for a wide variety of health problems are still being debated in the medical community. Case in point; much discussion has been made in the area involving the use of the radical oxygen ion, formed during Coenzyme Q10 oxidation, and its function in conjunction with research into various treatments for cancer. But definitive studies in this area are still ongoing. Even with the limited results we have at present, a large percentage of that community now believes that the use of CoQ10 by anyone with illness or over the age of thirty is still beneficial for a wide variety of reasons. Most important are the heart health benefits, but added to this is the improvement of cellular energy production throughout the body, with improved cholesterol metabolism and the reduction of oxidative stress (cellular burnout). New recent studies show that CoQ10 may be influential in the prevention of premature aging, by preventing telomere shortening (decreasing length of DNA strands), which slows and may even reverse the aging process.

I found many studies that utilized only the fully oxidized Ubiquinone to study disease pathways that were created by oxidative damage and feel that these studies need to be more enhanced, using reduced CoQ10 or Ubiquinol, the true antioxidant, and show the differences so that human supplementation can be more effective. Until then, I agree with Doctor Joseph Mercola and others who support the use of Ubiquinol as a form of supplementation that provides greater benefits for overall health including a wide variety of diseases. Recent studies suggest that neurological dysfunction including, but not limited to attention defect, ASHD, acute depression, migraine headaches, muscular dystrophy, autism and Alzheimer's disease, can benefit from supplementation with CoQ10.

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