

# CoQ10 — A Nutritional Powerhouse for Mitochondrial Health

## STORY AT-A-GLANCE

- › CoQ10 and the reduced version, ubiquinol, are among the most popular supplements for mitochondrial health. Between 2000 and 2016, the number of Americans using CoQ10 increased from 2 million to 24 million
- › Taking this supplement helps protect your mitochondria from oxidative damage, which is helpful for a number of health conditions and chronic diseases, including heart and brain diseases
- › Ubiquinol is particularly important if you're taking a statin, as these cholesterol-lowering drugs block your body's ability to produce CoQ10, which can have serious consequences for your heart

## By Dr. Mercola

According to the industry publication *New Hope*,<sup>1</sup> coenzyme Q10 (CoQ10) and the reduced version, ubiquinol, are among the most popular supplements for mitochondrial health.

Between 2000 and 2016, the number of Americans using CoQ10 increased from an estimated 2 million to 24 million, and the number of brands featuring CoQ10 has increased from 18 brands to 125.

This rapid growth suggests people are becoming increasingly aware of the importance of mitochondrial health, which is really great news.

Ubiquinol plays an important role in the electron transport chain of your mitochondria, where it facilitates the conversion of energy substrates and oxygen into the biological energy needed by your cells for life, repair and regeneration.

It's a fat-soluble antioxidant, meaning it works in the fat portions of your body, such as your cell membranes, where it mops up potentially harmful byproducts of metabolism known as reactive oxygen species (ROS).

Taking this supplement helps protect your mitochondrial membranes from oxidative damage, and this in turn has been shown to be helpful for a number of health conditions and chronic diseases.

This is to be expected, since many conditions, including heart disease and migraines — for which **CoQ10** has been found beneficial — appear to be rooted in mitochondrial dysfunction.

Low CoQ10 levels have even been detected in people with certain types of cancer,<sup>2</sup> including lung, breast and pancreatic cancer, as well as melanoma metastasis, further strengthening the metabolic theory of cancer.

## **CoQ10 Versus Ubiquinol**

Ubiquinol is the fully reduced version of CoQ10. It's the same molecule, but when CoQ10 is reduced it takes on two electrons, which turns it into what we call ubiquinol.

In your body, this conversion occurs thousands of times every second inside your mitochondria — the "engine" of nearly every cell. The conversion of CoQ10 to ubiquinol is part of the process that allows your body to convert food into energy.

Ubiquinol is the only fat-soluble antioxidant that is actually generated within your body and does not need to be obtained from food. The downside is that by the time you hit your 30s, your body starts to produce less and less of it.

With age, many also start to lose their ability to convert CoQ10 to ubiquinol, and this is why ubiquinol is typically recommended for older people while younger folk can do quite well by taking CoQ10.

## **Many Health Conditions Stand to Benefit From CoQ10**

Researchers have identified a number of conditions and health concerns where CoQ10 or ubiquinol can be of great benefit, including the following:

Heart disease (ideally in combination with selenium)

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Migraines

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**Diabetes**

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Amyotrophic lateral sclerosis (ALS)

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Chronic fatigue

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Autism spectrum disorder

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Hypertension

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Heart transplant or chronic heart failure

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Mitral valve prolapse (ideally in combination with magnesium)

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Arrhythmia

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Ubiquinol is particularly important if you're taking a statin, as these cholesterol-lowering drugs deplete your body of CoQ10, which can have serious consequences for your heart and other muscles.

Research has also shown CoQ10 can improve exercise performance, improving your overall energy status, peak power production and muscle recovery when taken in doses of 200 to 300 milligrams (mg) per day.<sup>3</sup> World class athletes who need extra ATP turnover may go as high as 300 to 600 mg per day.

## **Heart-Healthy Benefits of CoQ10**

CoQ10 is perhaps most well-known for supporting heart and cardiovascular health, as your heart is one of the most energy-hungry muscles in your body. Without sufficient energy, your heart will not be able to function properly.

Chronic nutrient deficiencies can lead to a number of heart problems, such as cardiomyopathy (a condition characterized by inflammation, loss of elasticity and enlargement of your heart), diastolic dysfunction, heart valve diseases, arrhythmia (irregular heartbeat) and heart failure.

Besides CoQ10, other examples of nutrients that are important for heart health include (but are not limited to) B vitamins (including **folate or B9** and **B12**), carnitine, **taurine**, **magnesium**, **vitamin K2** and **animal-based omega-3**. All of these play important roles in keeping your **mitochondria** working properly.

Since ubiquinol also acts as an antioxidant, part of its benefits can be attributed to its ability to quench inflammation. Two markers for inflammation are gamma-glutamyl transferase (GGT) — which is an early marker of heart failure — and NT-proBNP.

There is in fact an association between the levels of these two markers and ubiquinol. When ubiquinol is supplemented, both these markers go down and genes associated with them are downregulated, thereby lowering your risk for heart problems and other conditions rooted in chronic inflammation.

## **Beware, Statins Compromise Your Heart and Health in Many Ways**

At present, at least 1 in 4 American adults over the age of 40 are taking a statin — ostensibly to protect their heart health.

Unfortunately, these drugs deplete, inhibit or interfere with a number of really important heart nutrients, including CoQ10,<sup>4</sup> vitamin K2 and glutathione peroxidase (a selenium-containing protein), which helps explain why statins may actually increase your risk of heart failure.

If you're on a statin, it's really important to make sure you're supplementing with ubiquinol and keeping an eye on your vitamin K2 and selenium intake.

Moreover, statin drugs also diminish your liver's ability to produce ketones, because the enzyme that produces ketones is the same enzyme that produces cholesterol, namely HMG-CoA reductase.

This is the enzyme inhibited by statin drugs. This means that, in addition to lowering your cholesterol, the drug also compromises your body's ability to benefit from a healthy and cleaner-burning fuel (fat).

As a result, your ability to optimally metabolize fat can become severely compromised and this too will have cardiovascular consequences, since depriving your cardiac tissue of fuel will impair your heart health.

So, if you're on a statin, even if you're taking vitamin K2 and ubiquinol you still have to address the fact that you cannot make ketones.

## **CoQ10 + Selenium = A Winning Combo for Heart Health**

Recent research found that taking CoQ10 in combination with selenium improves heart function and cuts cardiovascular mortality by nearly 50 percent in elderly people. The study in question used 200 mg of CoQ10 and 200 micrograms (mcg) of selenium per day.<sup>5</sup>

CoQ10 and selenium work in tandem to reduce oxidative stress, minimize mitochondrial damage and increase the generation of new mitochondria. While CoQ10 is known to do all of those things by itself, selenium helps your body produce and accumulate CoQ10, so it's an important "booster" in that regard.

Animal studies have shown that selenium-deficiency reduces the animals' ability to generate CoQ10 by as much as 33 percent.<sup>6</sup> As noted by Life Extension:<sup>7</sup>

*"It has now been shown that a vital selenocysteine-containing enzyme called thioredoxin reductase actively recycles exhausted CoQ10 (ubiquinone) molecules and turns them into active, oxidative stress-fighting ubiquinol molecules. In other words, selenium improves the efficacy of CoQ10."<sup>8</sup>*

*But just as we need ample selenium to produce and accumulate CoQ10, we also need ample CoQ10 to make the selenocysteine-containing enzymes.<sup>9</sup> Thus, there appears to be an important reciprocal relationship between CoQ10 and selenium."*

# CoQ10 May Be Important for Migraine and Dementia Prevention and Treatment

CoQ10 also shows significant promise in the treatment of **migraines** — a debilitating kind of head pain that strikes approximately 38 million Americans<sup>10</sup> and 1 billion people worldwide.<sup>11</sup> While migraines are the third most prevalent illness in the world,<sup>12</sup> researchers have long struggled to identify their cause.

In more recent years, scientists have started leaning toward migraines being a mitochondrial disorder, and studies suggest certain nutritional deficiencies may play a significant role. CoQ10 is on this list. In one recent study, a high percentage of children, teens and young adults who struggled with migraines were found to have mild CoQ10 and riboflavin (vitamin B2) deficiencies.<sup>13,14</sup>

Interestingly, girls were more likely to be deficient in CoQ10, whereas boys were more deficient in vitamin D. These and similar findings lend support to the theory that migraines are in fact a mitochondrial disorder.<sup>15</sup> Other studies showing the link between CoQ10 and migraines include the following:

- In 2005, a double-blind, placebo-controlled and randomized clinical trial found that those who took 100 mg of CoQ10 three times a day (for a total of 300 mg per day) had 48 percent fewer migraines after three months. The placebo group only had 14 percent fewer migraines.<sup>16</sup>
- Another early study found that pediatric and adolescent patients with low CoQ10 levels who received 1 to 3 mg of CoQ10 per kilo (2.2 pounds) of body weight had a nearly 50 percent reduction in migraines.<sup>17</sup>
- A 2011 study found that taking 100 mg of CoQ10 for about seven months reduced migraine frequency, severity and duration compared to placebo. Beneficial effects were noticeable after the first month of supplementation.<sup>18</sup>
- More recently, a 2015 study using a commercial formula containing 150 mg of CoQ10 in combination with 400 mg of **riboflavin** (B2), 600 mg of magnesium and other nutrients, found it decreased migraine frequency by about 50 percent and significantly reduced intensity, compared to placebo.<sup>19</sup>

Studies also suggest CoQ10 can be helpful for other brain-related disorders beyond the treatment of migraines. For example, research published in 2014 found that people with the highest CoQ10 levels had a 77 percent lower risk of dementia than those with the lowest levels.<sup>20,21</sup>

## How to Regenerate CoQ10 Naturally

Recent research shows you can improve your body's conversion of CoQ10 to ubiquinol by eating lots of chlorophyll-rich vegetables in combination with sun exposure. Once **chlorophyll** is consumed it gets transported into your blood. Then, when you expose significant amounts of skin to sunshine, that chlorophyll absorbs the solar radiation and facilitates the conversion of CoQ10 to ubiquinol.

You can also improve absorption of CoQ10 from food or supplements by taking it with a small amount of healthy fat, such as some olive oil, coconut oil, MCT oil or avocado. Foods particularly rich in CoQ10 include:<sup>22</sup>

Grass-fed beef
Herring
<b>Organic pastured chicken</b>
Sesame seeds
Broccoli
<b>Cauliflower</b>

## Suggested Dosing Recommendations

General dosing recommendations vary from 100 to 600 mg per day, and as a general rule, the sicker you are, the more you need. A good place to start is to begin by taking 200 to 300 mg of

CoQ10 or ubiquinol per day. Within three weeks your plasma levels will typically plateau to its optimum level.

After that, you can go down to a 100 mg/day maintenance dose. This is typically sufficient for healthy people. Splitting your dose up so that you take it two or three times a day (rather than taking it all at once) will result in higher blood levels.

If you have an active lifestyle, exercise a lot, struggle with a chronic health condition or are under a lot of stress, you may want to increase your dose to 200 to 300 mg/day. Remember, if you're on a statin drug you MUST take at least 100 to 200 mg of ubiquinol or CoQ10 per day, or more. To address heart failure and/or other significant heart problems you may need around 350 mg per day or more.

Ideally, you'll want to work with your physician to determine your ideal dose. Your doctor can do a blood test to measure your CoQ10 levels, which would tell you whether your dose is high enough to keep you within a healthy range. Also keep in mind that CoQ10 supplements can interact with certain drugs, including beta-blockers, certain antidepressants and chemotherapy drugs, so be sure to consult with your doctor if you're on medication.