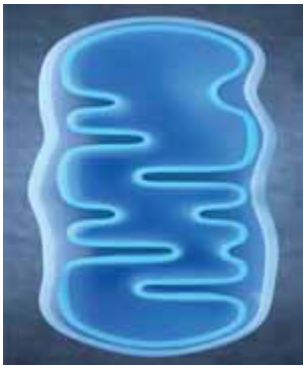
Life Extension Magazine January 2013

Report

CoQ10: The Longevity Factor

By Lina Buchanan


Mitochondria

Would you like to potentially add 9 years to your life expectancy? That's what research on the nutrient **coenzyme Q10** (CoQ10) implies is possible.1

CoQ10 is well known for its heart and vascular health benefits.2 By helping the cellular powerhouses known as ***mitochondria*** burn fuel more effectively, CoQ10 is able to protect not only the heart but ***every*** cell in your body.3

That's why scientists are growing increasingly fascinated with the role of CoQ10 in tissues beyond the cardiovascular system.2 There is evidence for CoQ10's protective effects in the brain and nervous system, in asthma and chronic lung disease, in diabetes and the metabolic syndrome, on ocular health, and even on the aging immune system.

Most excitingly, there's early support for the idea that CoQ10 supplementation can extend the life span of both primitive animals and mammals, laying the groundwork for a similar pro-longevity effect in humans.

CoQ10 Extends Life Span

According to the **mitochondrial theory of aging**, oxidant damage to the mitochondria is at the root of aging itself.4 Simply put, the more oxidative damage to mitochondria, the shorter the life span of the individual.5,6

Therefore, if we can make mitochondria burn energy more cleanly and efficiently, we can decelerate the aging process. That would mean not only longer life, but a healthier one.

CoQ10 is an essential component of the mitochondrial energy transfer system. When CoQ10 levels fall, mitochondrial dysfunction skyrockets, and aging is accelerated.5

However, when CoQ10 is added back to ailing or aging mitochondria, their function rebounds. Studies show that when supplemented with CoQ10, older worms in the species *C. elegans* experience a slowing down of the aging process and an extended life span.7

Even studies that don't show life span extension demonstrate a return to youthful behaviors and functions in response to CoQ10 supplementation.8

These benefits aren't restricted to primitive invertebrates, however. Research demonstrates that mice supplemented with CoQ10 live longer. In one case, supplemented animals experienced an **11.7%** increase in mean life span, and a **24%** increase in maximum life span.1 That increase translates into the equivalent of humans gaining over **9** years, based on today's life expectancy of **78.5** years.9

The benefits of CoQ10 supplementation in mice aren't restricted solely to extending the quantity of life, however. Lifelong dietary supplementation with CoQ10 decreased objective measures of aging even in middle-aged animals.10

CoQ10 appears to achieve these exceptional effects through a multi-targeted set of mechanisms.

It is now evident that CoQ10 directly influences the expression of multiple genes involved in aging, especially those regulating inflammation.11-13 This so-called "epigenetic" effect is at the very forefront of scientific attempts to understand how environmental factors such as nutrition influence our genetic load.

Taken all together, CoQ10's antioxidant, anti-inflammatory, and epigenetic mechanisms combine to offer remarkable protection for a host of body systems, especially those hit hardest by mitochondrial aging.

CoQ10 Preserves Brain Structure, Slows Neurodegeneration

Mitochondrial dysfunction from chronic oxidation and the resulting chronic inflammation are a root cause of neurodegenerative conditions like Alzheimer's, Parkinson's, Huntington's, and ALS (Lou Gehrig's disease).6,14-18

CoQ10 is attracting ever-increasing attention as scientists look for a way to prevent these diseases and treat their causes, rather than simply treating symptoms, which is the best that current medicine can offer.17,19

Alzheimer's disease is the largest cause of dementia among Americans, estimated to affect more than **5 million** people; it is the sixth leading cause of death.20 While many factors contribute to risk for Alzheimer's, age and oxidant stress in the brain are major contributors to this disease.15,16,21 Accumulated oxidant stress leads to production and deposition of an abnormal protein called ***amyloid*** β-***peptide***, which is itself a trigger for more oxidation and inflammation.21

Eventually, brain cells overwhelmed by ***amyloid*** β-***peptide*** lose their function and die, producing the loss of memory, cognition, and physical function we associate with the disease.

CoQ10 shows great promise in laboratory and animal studies of Alzheimer's disease. By slowing oxidant damage, CoQ10 is proven to reduce deposition of destructive ***amyloid*** β-***peptide*** proteins in brain cells.22 It reduces the ***amyloid*** β-***peptide***-induced oxidation that contributes to the vicious cycle of oxidation-inflammation-oxidation that accelerates the disease process.23 Finally, and perhaps most importantly, CoQ10 added to ***amyloid*** β-***peptide***-afflicted brain cells causes the destructive protein to become destabilized and weakened even after it is formed.24 This unique CoQ10 mechanism has the potential for reversing Alzheimer's disease at the molecular level.

Animal studies demonstrate reduced oxidative stress and ***amyloid*** β-***peptide*** deposition when CoQ10 is added to feed.22,25-27 CoQ10 supplementation in such animals improves cognitive performance and memory both with CoQ10 alone and when vitamin E is added.28,29 These studies provide a useful model of what recovery from Alzheimer's disease might look like in humans.

Human patients with Alzheimer's disease are known to have lower levels of reduced CoQ10 in their spinal fluid, an indication of the intense oxidant stress in their brains.30

CoQ10 and Parkinson's Disease

Parkinson's disease is the second most common aging-related disorder in the world.31 Like Alzheimer's, it is the result of oxidant stress triggering production of an abnormal, inflammatory protein.32-34 In Parkinson's the protein is called ***alpha-synuclein***, which damages neurons in regions of the brain that control motor function as well as cognition.33,34 Symptoms include slowed movements, weakness, cognitive impairment, and eventually dementia.31

CoQ10 is showing real promise in human studies of Parkinson's disease.18 Unlike current treatments, which improve symptoms without changing disease progression, CoQ10 may fundamentally alter and slow the otherwise inevitable decline of patients with Parkinson's.33

For example, animal studies have shown that CoQ10 significantly reduces damage to neurons in the brain areas affected by Parkinson's disease after the animals were exposed to a pesticide that has been associated with Parkinson's development in humans.33,35

CoQ10 at doses of **300** to **1,200 mg/day** have been used in clinical research, though up to **2,400 mg/day** is well tolerated.36 In studies using the higher doses, improvements on several Parkinson's disease rating scales have been observed.32,37 In one important study, **1,200 mg/day** produced substantial slowing of disease progression compared with placebo.37

A 2011 meta-analysis (a large study combining data from smaller trials) concluded that **1,200 mg/day** of CoQ10 was well-tolerated by Parkinson's disease patients, and provided significant improvement on numerous measures of disease severity and progression.38

WHAT YOU NEED TO KNOW

Combat Mitochondrial Decline with CoQ10

- Your mitochondria need to burn fuel cleanly and efficiently to assure their own integrity and your own longevity.
- CoQ10 is an essential coenzyme that, when added to the diet, acts as a fuel additive to optimize mitochondrial performance, extracting the most energy with the least damage.
- Animals from primitive worms to laboratory mice enjoy dramatic extension of their life spans when supplemented with mitochondrial-protecting CoQ10.
- Additional benefits from CoQ10's mitochondrial energy-boosting effects include protection from neurodegenerative diseases and mental health disorders, enhanced lung function, and protection from the effects of elevated glucose in diabetes and metabolic syndrome.
- New findings are adding to the already impressive list of cardiovascular benefits ascribed to CoQ10 supplementation.

CoQ10 Preserves Brain Function, Fights Migraine, Mental Illness

CoQ10 is essential not only in preventing brain structural deterioration, but in maintaining normal function at all ages. Studies are revealing some startling associations in two areas of brain function in particular: migraine headaches and common mental health problems such as depression and schizophrenia.

Migraine headaches occur in an estimated **8.7 million** women and **2.6 million** men in the United States producing moderate to severe disability. More than **3 million** women and **1 million** men are estimated to suffer 1 or more attacks/month.39,40

The exact chain of events leading up to a migraine is unclear, but it may be related to brain energy levels, as indicated by low CoQ10 levels in people with migraines (almost **33%** of a population with migraine had levels below the standard in one study).41 Studies of CoQ10 supplementation in children, adolescents, and adults show substantial decreases in the frequency of migraine episodes, number of days with migraine symptoms, headache disability, and frequency of nausea, a common feature of migraines.41-43

CoQ10 is so effective in managing migraine headaches that it is now listed among the 11 most effective "***drugs***" for preventing migraines by the Canadian Headache Society.44

Major depression, bipolar disorder, and schizophrenia, long considered separate entities, are now recognized as having common roots in ***mitochondrial dysfunction*** and elevated brain oxidative stress levels.45,46 People with these conditions have higher markers of oxidant damage and lower cellular antioxidant levels than do healthy controls, and CoQ10 is typically lower than normal.45,47 In one study, **51.4%** of depressed patients' CoQ10 levels fell below the lowest values in control subjects.48

CoQ10 deficiency is particularly marked in people whose depression responds poorly to medication, a possible indication that the deficiency needs to be corrected in order for prescription meds to work.48

A major breakthrough in our understanding of the causes of mental illness came in 2011 and 2012, when researchers discovered that oxidative and other related stresses in the brain were capable of creating new molecular configurations that triggered an autoimmune response in the brains of people with depression and schizophrenia.45,49,50

Restoring natural levels of antioxidants such as CoQ10 is therefore an attractive approach in these conditions. One study of depression in older adults with bipolar disorder found a significant reduction in symptom severity during treatment with CoQ10 at **1,200 mg/day**.51

The **ubiquinol** form of CoQ10 is far better ***absorbed***, so a much lower dose, perhaps around **400 mg/day** of **ubiquinol** should provide benefits seen when much higher doses of the more common **ubiquinone** form of CoQ10 is used.

Finally, some medications in common use against depression, such as amitryptiline, are capable of lowering CoQ10 levels in the blood, further reducing available energy in the brain. Thus, people taking such drugs are especially likely to benefit from CoQ10 supplementation.52

CoQ10 Protects Lung Function

Your lungs face the most immediate threat of oxidant damage because they interact directly with the **21%** oxygen in air you breathe.53 It's not surprising, therefore, that the major diseases of the lung, asthma and chronic obstructive pulmonary disease (COPD), involve a severe imbalance of oxidation and the body's natural preventive measures, including CoQ10.54

Levels of CoQ10 are markedly lower in both asthmatics and patients with COPD.55-57 Conversely, supplementing with CoQ10 offers substantial benefits. In one study, asthmatic patients on chronic steroid treatment to reduce inflammation were able to significantly reduce the amount of steroids they had to give themselves each day.58 And a study of COPD patients showed improvements in exercise performance, tissue oxygenation, and heart rate on CoQ10 supplementation at **90 mg/day**.59

CoQ10 Fights Metabolic Syndrome and Diabetes

In both metabolic syndrome and diabetes, tissue levels of oxidant stress are markedly elevated.60,61 Not surprisingly, levels of the antioxidant CoQ10 are reduced in humans and lab animals with these conditions.60,62,63

Low CoQ10 levels are now recognized as being closely correlated with problematic long-term blood sugar control and many of the complications of diabetes, including diabetic neuropathy (nerve damage), nephropathy (kidney damage), and of course ***endothelial dysfunction*** and the resulting cardiovascular damage.61,64

Fortunately, supplementation with CoQ10 is a remarkably simple way to restore deficient levels and get better long-term control of blood sugar. Human studies show that adding CoQ10 to the already healthful Mediterranean diet further reduces oxidant stress and fat oxidation in the period immediately following a meal, when your body is especially vulnerable to

damage.65

STATIN DRUGS DRASTICALLY DEPLETE COQ10

Drugs in the so-called "statin" category are an effective pharmaceutical means of lowering blood lipids, and they may play a role in protecting against Alzheimer's disease.79

But statins, like all prescription medicines, have concerning side effects. One important effect of statin treatment is a reduction in blood levels of CoQ10, which may account for some of the muscle pain and other side effects experienced by many people on these drugs.2

New evidence suggests that low CoQ10 levels in the brain may be related to cognitive dysfunction in animals treated with the statin drug atorvastatin (Lipitor®).79

Those taking a statin drug are strongly urged to ensure adequate supplementation with CoQ10.

This has beneficial effects on long-term blood sugar control. Supplementation with **200 mg/day** of CoQ10 (in the ubiquinol form) reduced levels of hemoglobin A1c, a marker of blood sugar control over time, to less than **7%**, the upper limit of normal.66,67 In both human and animal studies, the supplemented groups had significant decreases in elevated blood pressure and improvements in ***endothelial function***.61,68,69

Animal studies demonstrate improved nerve conduction velocity, a measure of nerve function, in diabetic animals supplemented with CoQ10.64 Human studies show improvement in endothelial function in diabetics taking **200 mg/day** of CoQ10.70 CoQ10 supplements mitigate glucose and oxidant stress-induced damage to kidney tissue in diabetic animal models, restoring kidney function to near-normal levels.71,72

New Developments in CoQ10 and Cardiovascular Health

It's not only people with the metabolic syndrome and diabetes, however, who can benefit from CoQ10 supplementation with regard to cardiovascular disease. The heart and blood vessels are rich with mitochondria, and that requires highly effective and efficient use of energy in those tissues. That's what led the earliest researchers to study CoQ10 as a way of improving heart and blood vessel health.

In less than a decade, we've seen the emergence of remarkable new findings about CoQ10 and its cardiovascular benefits. Here are some highlights:

CoQ10 supplements improve the function of the heart's dominant left ventricle during the vital diastolic, or relaxation phase. This is critical because the diastolic phase is when the heart receives its own surge of blood flow, and statin drugs impair diastolic function.73

Eight weeks of CoQ10 supplementation at **300 mg/day** improved heart muscle function during the systolic, or pumping phase, by enhancing mitochondrial performance and endothelial function.74

The addition of CoQ10 to enalapril, a blood pressure drug, promoted normalization of endothelial function and enhanced blood pressure control in patients with "essential hypertension."75

The combination of CoQ10 with selenium, another important coenzyme with antioxidant powers, cut the death rate from

cardiovascular disease by more than half (to **5.9%** from **12.6%**) in a group of older adults.76

CoQ10 plus aged garlic extract, another supplement known to improve endothelial function and slow atherosclerosis, reduced blood vessel stiffness and slowed arterial calcium accumulation in a group of firefighters.77,78

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Summary

The enzyme cofactor CoQ10 can help your **mitochondria** burn more cleanly and efficiently. That reduces the amount of oxidant stress and damage to mitochondria, helping to slow pathologic aging processes.

Reducing mitochondrial damage and enhancing performance with CoQ10 supplementation are well known to support cardiovascular function. Scientists are now discovering that CoQ10 contributes to a longer life, the result of the supplement's augmentation of mitochondrial function in brain structure and function, lung defense mechanisms, and disorders related to poor glycemic control and the metabolic syndrome.

Total body health depends heavily on maintaining mitochondrial integrity. CoQ10 represents an efficient way to optimize mitochondrial output by maintaining coenzyme Q10 blood levels in ***youthful*** ranges.

If you have any questions on the scientific content of this article, please call a Life Extension® Health Advisor at 1-866-864-3027.

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