Previously, I wrote an article called "Coenzyme Q10 as Ubiquinone & Ubiquinol: For Cardiovascular Health & More" for the February 2014 issue of Vitamin Retailer. That article reviewed some of the vital cellular functions and health/wellness applications for coenzyme Q10 (CoQ10). This article will focus strictly on new human research that has been published in 2014 on CoQ10 (ubiquinone) and ubiquinol. It will not review studies on animals or in-vitro studies (i.e. research done on cell lines in a laboratory, not on a live organism).

The Difference Between Ubiquinone and Ubiquinol

Before jumping into the research, let’s do a quick review on the difference between ubiquinone and ubiquinol. Chemically, ubiquinol is the fully reduced form of CoQ10 known as CoQ10H2. This means that it has two additional hydrogens than standard, oxidized ubiquinone, which is also known as CoQ10. Most CoQ10 products on the market today provide ubiquinone, although it is ubiquinol that provides virtually all of the benefits associated with CoQ10. This does not necessarily mean that supplementation with ubiquinol is necessary, however, since the human body can easily convert ubiquinone into ubiquinol. The fact is that supplementation with either ubiquinone or ubiquinol has value.

CoQ10 and Semen

Previous research from 2004 showed that infertile men with idiopathic asthenozoospermia (the medical term for reduced sperm motility) who take 200 mg/day of CoQ10 had increased sperm motility after six months of treatment. Since low-seminal plasma concentrations of CoQ10 have been associated with some parameters of impaired sperm, researchers decided to further explore the relationship between semen and CoQ10.

A recent randomized, placebo-controlled study examined the effect of CoQ10 on catalase, superoxide dismutase (SOD) and F2-isoprostanes (prostaglandin-like compounds formed in the body from the free radical-catalyzed peroxidation of essential fatty acids) in seminal plasma of infertile men. Forty-seven infertile men with idiopathic oligoasthenoteratozoospermia (the medical term for semen with a low concentration of sperm) received 200 mg/day of CoQ10 or placebo for three months. Not surprisingly, the results showed that CoQ10 levels increased significantly following supplementation in CoQ10 (P < 0.001). In addition, the CoQ10 group had higher catalase and SOD activity than the placebo group. There was also a significant positive correlation between CoQ10 concentration and normal sperm form and structure (P = 0.037), catalase (P = 0.041) and SOD (P < 0.001).

Furthermore, after supplementation there was a significant reduction in seminal plasma 8-isoprostane in the CoQ10 group compared to the placebo group (P = 0.003). The authors concluded that three-month supplementation with CoQ10 in oligoasthenoteratozoospermia infertile men can reduce oxidative stress in seminal plasma and improve semen parameters and antioxidant enzymes activity.

CoQ10 and Fibromyalgia

In 2002, an open, pilot study found that supplementation with 200 mg/day of CoQ10 in conjunction with 200 mg/day of Ginkgo biloba extract for 84 days improved quality of life parameters in
fibromyalgia patients, including physical fitness levels, emotional feelings, social activities, overall health and pain. The 2002 study did not, however, investigate the mechanism of action behind these beneficial effects. One possibility is that the mechanism had to do with the neurotransmitter, known as serotonin. The reason is that the relationship between serotonin in the pathophysiology of fibromyalgia has previously been explored, and medications that modulate serotonin levels are currently used in the treatment of fibromyalgia. Since serotonin is an important modulator of pain perception, sleep, fatigue, cognition and mood in normal subjects, this supports the positions that disturbances in these functions in fibromyalgia (e.g. fibromyalgia patients have higher levels of depression) can result of abnormalities in the content, metabolism or transmission serotonin. Recent research set out to determine if CoQ10 had an impact on serotonin in fibromyalgia patients.

A randomized, double-blind, placebo-controlled study examined the effects of 300 mg/day of CoQ10 (divided into three daily doses) on serotonin and depression in 20 fibromyalgia patients for 40 days. Ten patients received CoQ10 and 10 patients received a matching placebo. CoQ10 and serotonin levels were assessed using blood and blood platelet samples, and depression was evaluated the Beck Depression Inventory (BDI) scale. Results showed that CoQ10 and serotonin levels in platelets from fibromyalgia patients were restored in the CoQ10-treated group compared to placebo group. A significant improvement in depressive symptoms was also observed in the CoQ10-treated group compared to the placebo group (P < 0.001). In fact, the authors of the study stated, “Our findings also support the hypothesis that CoQ10 supplementation can be used as an alternative therapy for controlling depression.”

**CoQ10, the Mediterranean Diet and Aging**

Past research has shown that CoQ10 plays a role as a powerful antioxidant in cells, inhibiting lipid peroxidation in cell membranes and DNA, and is involved in helping to protect against different types of oxidative damage. A study in 2012 found that CoQ10 supplementation in combination with the Mediterranean diet in an elderly population reduces the inflammatory response and stress to those parts of the cell responsible for manufacturing proteins—which is important to help prevent aging-related disease such as diabetes, inflammation and neurodegenerative disorders, including Alzheimer’s disease. The question is, would CoQ10 and the Mediterranean diet help also help reduce DNA damage, which would be a boon to the aging population? This was explored in recent research.

In July of 2014, a new study was published in which 20 participants were randomly assigned to one of three groups for four weeks: 1) a Mediterranean diet supplemented with coenzyme Q10, 2) a Mediterranean diet alone, and 3) a saturated fatty acid-rich diet. Volunteers were then tested to determine if certain genes expressed themselves (the process by which information from a gene is used in the synthesis of a protein or RNA), which in this case would be an indicator of DNA damage. The results showed that those in the Mediterranean diet group, and especially those in Mediterranean diet supplemented with coenzyme Q10 group, experienced a reduction in the expression of the genes associated with increased DNA damage. The researched concluded that these results indicated a triggering of DNA repair machinery.

**Ubiquinol and Autism**

Since autistic spectrum disorders can be associated with mitochondrial dysfunction and oxidative stress, and since CoQ10 is beneficial for treating both of these issues, this raised the question as to whether supplementation with CoQ10 would be helpful with autism. A case study published in 2006 did report a variety of improvements in an autistic girl treated with a program of vitamin supplements, L-carnitine and CoQ10, but this was insufficient for drawing conclusions for a larger population of autistic patients. However, a recent study took another look at this question. Twenty-four children, aged 3-6 years, with autism were given 50 mg of ubiquinol twice daily for a total daily dose of 100 mg. Data on behavior of the children were collected from parents. The results were that supplementation with ubiquinol improved symptoms in children with autism, including:

- communication with parents (in 12 percent)
- verbal communication (in 21 percent)
- playing games of children (in 42 percent)
- sleeping (in 34 percent)
- food rejection (in 17 percent)

This is the first study in which beneficial effects of ubiquinol in children with autism has been demonstrated.

**Conclusion**

Supplementation with ubiquinone and ubiquinol has been shown in research to continue offering a range of benefits. Based upon research published in 2014, this includes reduction oxidative stress semen, a reduction of depression in fibromyalgia patients, reduction in the expression of the genes associated with...
Tinnitus is not the only condition linked to low vitamin B12 levels associated with aging. Several studies have found the level of vitamin B12 declines with age and that vitamin B12 deficiency is found in as high as 40 percent of persons aged 65 and over. The deficiency may be the result of reduced dietary intake, but a more likely explanation is as we age there is reduced secretion of a compound known as intrinsic factor that facilitates B12 absorption. Low vitamin B12 levels can be devastating at any age, but in the elderly it can lead to significant impairment in nerve function and mental capacity. Tinnitus for many elderly folks may be the tip of the iceberg if it is related to low vitamin B12 levels.

One study looked at blood levels of vitamin B12 in 100 consecutive geriatric outpatients who were seen for various acute and chronic medical illnesses. They found that 11 patients had serum B12 levels at 148 pmol/L or below—the cut off for vitamin B12 deficiency; 30 patients had levels between 148 to 295 pmol/L; and 59 patients had levels above 296 pmol/L. After the initial determination, the patients were followed for up to three years. The patients with B12 levels below 148 pmol/L were treated and were not included in the analysis of declining cobalamin levels. The average annual decline was 18 pmol/L for patients who had higher initial B12 levels, but for patients with lower initial B12 levels, the average annual serum decline was much higher at 28 pmol/L.

These results indicate that measuring the level of vitamin B12 in the blood (serum cobalamin) or measuring the urinary excretion of methylmalonic acid as screening tests for vitamin B12 deficiency appears to be indicated in the elderly. Alternatively, I would recommend anyone over the age of 65, or a vegetarian at any age, to take the active form of vitamin B12, methylcobalamin, at a dosage of 1,000 to 3,000 mcg daily. Note: this high dosage bypasses the need for intrinsic factor to aid absorption.

Vitamin B12 is available in several forms. The most common forms are cyanocobalamin and hydroxocobalamin, however, these two forms must be converted to methylcobalamin by the body and may not be the best for older people as many may have a reduced ability to convert cyanocobalamin and hydroxocobalamin to methylcobalamin. In animal models of aging, while methylcobalamin led to significant increases in lifespan, cyanocobalamin had no effect. Methylcobalamin has also produced better results in clinical trials than cyanocobalamin and should, therefore, be considered the best available form whenever specific benefits of vitamin B12 are desired.

**Final Comments**

There is little research on dietary factors in tinnitus—there just isn’t any money in it. That said, a new study examining data from the UK Biobank resource, a very large cross-sectional study of adults aged 40-69 living in the UK provides some interesting clues. After controlling for lifestyle, noise exposure, hearing, personality and other factors; a relationship between persistent tinnitus, defined as present at least a lot of the time, was reduced with fish consumption indicating another possible benefit from fish oil supplementation.

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**SUPPLEMENTS**

(Continued from page 74) Increased DNA damage and improved symptoms in children with autism. VR

**References:**


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