Coenzyme Q10 (CoQ10) and Male Fertility Overview with Reference Publications

The information offered here represents a brief and selective overview of the published medical literature in regards to coenzyme Q10 (CoQ10) supplementation and male fertility*. This review has been prepared by the Center for Human Reproduction (CHR), a leading fertility center in New York City, and is being distributed by Fertility Nutraceuticals, LLC, with permission from CHR.

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Age-related decline in male fertility and role of oxidative stress
Male age has not been conclusively shown to influence fertility rates1. However, one recent study suggested that, independent of their partners’ age, men might experience a precipitous decline in fertility between ages 35 and 392. Advancing male age is, indeed, associated with declines in various sperm parameters, including semen volume, motility and morphology3,4,5. Older men have also been shown to demonstrate a higher rate of DNA fragmentation and more early markers of apoptosis6,7,8.

Oxidative damage and sperm functions
Oxidative damage has been suggested as one possible cause of observed declines in sperm parameters1. Environmental factors, like chemicals, heat and radiation, as well as lifestyle factors including smoking, alcohol consumption and chronic stress have been implicated9. Due to their high concentration of polyunsaturated fatty acids, sperm cells are considered particularly vulnerable to oxidative stress10,11.

Oxidative stress damages sperm membranes and sperm DNA. Compromised sperm membranes reduce sperm motility and its ability to fuse with the oocyte for fertilization. DNA damage inhibits paternal contribution of DNA to the embryo1. Studies have also suggested that such DNA damage may increase germ cell apoptosis, lowering sperm count12.

Oxidative damage to mitochondrial DNA
Oxidative stress can also cause DNA damage in mitochondria, indirectly hampering spermatogenesis. Damage in mitochondrial DNA (mtDNA) can compromise mitochondrial energy metabolism13, which then reduces energy availability for sperm cells during meiosis. This suboptimal energy metabolism has been suggested as one of the causes of abnormalities in sperm morphology13 and for sperm DNA abnormalities1.

Antioxidants: Natural defense mechanisms within the testes
Healthy testicular environment is equipped with antioxidant enzymes, including coenzyme Q10 (CoQ10). CoQ10 and other antioxidants are thought to protect sperm membrane, sperm DNA and mtDNA from oxidative damage. In such a healthy testicular environment, normally functioning mitochondria with full

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membrane potential provide energy to “fuel” spermatogenesis, thereby preventing meiotic arrest and abnormal sperm morphology\textsuperscript{13}.

Recently, age-related decline in serum antioxidant levels have attracted attention as a possible explanation for the observed decline in male fertility with advancing age\textsuperscript{1}. Supplementation with vitamin C, vitamin E, glutathione and other antioxidants has, therefore, been suggested as a potential approach toward addressing male infertility.

**Supplementation with CoQ10 for male fertility**

One such antioxidant, coenzyme Q10 (CoQ10), is naturally synthesized within mitochondria, but its levels decline with age\textsuperscript{14}. After Mancinini et al demonstrated that CoQ10 concentrations in the seminal fluid correlated with sperm count and motility\textsuperscript{15}, a number of studies investigated whether oral supplementation with CoQ10 would improve sperm parameters, partner pregnancy rates and other fertility-related metrics. Some studies have found CoQ10 supplementation to significantly improve sperm parameters, leading to the suggestion by Mancinini et al that CoQ10 may lead to new insights into unexplained infertility\textsuperscript{16}.

**Randomized controlled trials**

Safarinejad reported significant improvements in sperm density and motility after supplementation with CoQ10 for 26 weeks\textsuperscript{17}. The study, investigating infertile men with idiopathic oligoasthenoteratospermia (low semen count, motility and morphology), found a positive correlation between duration of CoQ10 treatment and sperm count, motility and morphology\textsuperscript{17}. The study also reported that FSH and LH levels declined with CoQ10 supplementation\textsuperscript{17}. The same authors later replicated most of those findings, using a reduced form of CoQ10\textsuperscript{18}. In another trial, Balercia et al reported significantly increased levels of CoQ10 in seminal plasma and sperm cells, and also noted improved sperm motility\textsuperscript{19}. The lower baseline values were before supplementation, the more likely was there a respond to CoQ10 supplementation\textsuperscript{19}. The most recently reported study by Nardiarzadeh et al demonstrated that men who received CoQ10 supplementation for 3 months demonstrated higher CoQ10 concentrations, higher antioxidant enzyme activity markers in the seminal plasma and significantly better sperm morphology than men who received placebo\textsuperscript{20}.

**References**


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