Supporting Male Fertility

Crucial Clinical Considerations

Supporting sperm production, motility and overall sperm health

Carnitine is present in the highest concentrations in human sperm and seminal fluid, with levels ten times higher in the epididymis than any other part of the body. Levels increase during sperm maturation in the epididymis, playing a role in stimulating sperm motility. This stimulatory effect appears to require the conversion of L-carnitine (LC) to acetyl-l-carnitine (ALC).[1] In clinical trials, supplementation with LC or LC plus ALC led to improvements in sperm motility in those with low motility, and increased sperm counts in men with low sperm count, poor motility and abnormal morphology.[1]

Sperm rely on β-oxidation for energy, and it is proposed that the high concentration of LC in the epididymis is to ensure the supply of ATP. Human trials have found carnitine therapy **(2-3g daily) to be effective in increasing semen quality, sperm concentration and total and forward sperm motility especially in groups with lower baseline levels**.[2] One trial reported that improvements in sperm motility were only observed in the presence of normal mitochondrial function, determined by phospholipid hydroperoxide glutathione peroxidase levels.[2]

A review of **clinical trials found the combination of LC and ALC to be more effective than either nutrient on its own**. Supplementing LC (2 grams daily) combined with ALC (1g daily) in men with poor sperm parameters, over **three to six months of treatment** improved sperm motility, sperm concentrations, and sperm volume. The results were best in men with lower values at baseline.[3]

The benefits of LC may also be related to reduced inflammatory cytokines and improved antioxidant effects. Male germ line cells have a low number of antioxidant molecules and enzymes due to their lack of cytoplasm and have a special polyunsaturated fatty acid (PUFA) structure in the membrane.[3] This makes them particularly susceptible to peroxidation and damage. Since the concentration of carnitine in the epididymis is high, carnitine may act as a scavenger for reactive oxygen species (ROS), reducing free radical induced oxidative stress, and minimising pathological disorders of sperm, such as ATP depletion leading to insufficient axonemal phosphorylation (required for motility), lipid peroxidation as well as loss of viability.[4]

Carnitine studies have found benefits for female reproductive health – LC specifically for aiding β-oxidation in oocytes, thus improving energy supplies and enhancing oocyte quality. ALC is more involved in preventing free radical-induced DNA damage.[4]

Stress plays a fundamental role in reproductive health in men as its presence has been found to reduce luteinizing hormone and testosterone pulsing, leading to reduced spermatogenesis and sperm quality.[5]

Vitamin C is present in the testes, providing protection from oxidative damage. In its active (reduced) state, it also plays a role in spermatogenesis.[5] Vitamin C can remain in its reduced form due to the presence of the GSH-dependent dehydroascorbate reductase which is abundant in the testes.[5]

Several randomised double-blind placebo controlled trials in males with idiopathic low sperm count, low motility and morphology taking 2**00-300mg CoQ10 for 3-6 months showed improvement in sperm health parameters, antioxidant levels and seminal levels of CoQ10.** The greatest response was seen in those with the lowest baseline CoQ10 and sperm motility levels.[2]

Selenium is required for testosterone synthesis, normal sperm maturation and sperm motility. Human clinical studies have confirmed the association and identified selenium as able to increase sperm motility. **Zinc is required for the maturation of sperm.**[2]

Supports healthy mood balance

A large systematic review including **12 randomised controlled trials with almost 800 participants found ALC to be as effective as conventional medical therapy to aid mood balance at 2g daily.** It was also **more effective than placebo with significantly reduced side effects** compared to conventional therapy.[6] Many human clinical trials also show a link between zinc deficiency and altered mood, with supplementation resulting in mood balance.[7] Zinc's role is linked to its action on brain-derived neurotropic factor (BDNF). Zinc interacts with BDNF levels and its deficiency can lead to reduced neurogenesis and altered mood.[7]

References:

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