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Review Article

Neutraceuticals in Male Infertility

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Abstract

In about 50% of infertility issues, males are responsible. Quality of semen has deteriorated by 50% to 60% over the last 40 years [1].

Neutraceuticals are food ingredients that provide health benefits including prevention and treatment of disease [2]. Most neutraceuticals have antioxidant properties which can help to increase sperm count and improve sperm function.

Keywords: Male Infertility; Semen Quality; Neutraceuticals; Antioxidants

Introduction

Oxidative stress is reported in 30% to 80% of male infertility cases [3,4]. Oxidative stress in testis can be attributed to infection, inflammation, saturated fatty acids, meat, smoking, alcohol, caffeine, contaminants, industrial exposure, chemotherapy, exogenous heat (hot tub, sauna, laptop etc.) and endogenous factors (cryptorchidism, varicocoele, febrile illness etc.) [5].

Oxidative stress

- Decreased sperm membrane integrity [6]
- Sperm DNA damage [6]
- Decreased ability to repair sperm DNA damage [7]
- Decreased sperm motility [8]

Antioxidants function to protect against oxidative stress and damage. Physiological antioxidants are enzymatic and non enzymatic. Enzymatic oxidants are catalase, superoxide dismutase and glutathione peroxidase. Non enzymatic antioxidants include carnitine, carotenoids, glutathione, hypotaurine, taurine and Vitamin C and E. [9].

Antioxidants for male infertility

Efficiency of antioxidant therapy is still to be established. Antioxidant supplements do improve semen quality and are associ-

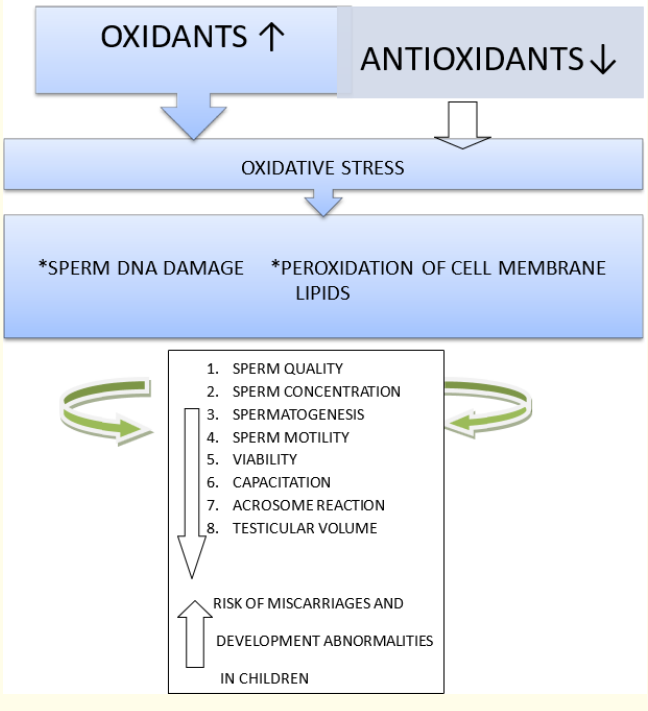

Figure 1

ated with decreased DNA damage. No reliable studies are available to access the outcome of antioxidant supplementation and positive pregnancy outcome and live births [10].

Arginine

Arginine is responsible for sperm motility, metabolism, capacitation and acrosome reaction. Some studies have reported daily arginine supplementation improves sperm concentration and motility [11-13]. Conversely some other studies have failed to demonstrate any improvement [14,15].

Zinc

Zinc is involved in testicular development and steroidogenesis. Zinc is found in high concentrations in male genitor-urinary tract, especially in prostate. Zinc deficiency can be associated with oligospermia, decreased testosterone levels and compromised immune system [16].

Appropriate zinc concentration in semen is associated with higher concentration of spermatozoa in ejaculate, higher motility and viability. Due to strong antioxidant properties, adequate amount of zinc in semen plasma shows protective effects [17,18].

Coenzyme-Q10

Coenzyme-Q10 transports electrons in mitochondrial respiratory chain and promotes energy in sperm mid-piece [19,20]. It also stabilizes and protects the cell membrane.

Selenium

It has an important role in testicular development, spermatogenesis and sperm function [21,22]. Vitamin E plays a role in selenium metabolism and works in synergy with selenium antioxidant properties [23].

Folic acid

Folic acid is involved in purine and pyrimidine production, hence it plays a role in DNA synthesis and cell function [24].

Glutathione

It is produced in the liver. It helps in maintaining exogenous Vitamin C and Vitamin E in their active reduced roles. It has been shown to improve sperm motility [25,26].

Omega-3 fatty acids

It has an important part to play in the structural component of cell membrane. Intake of PUFAs can improve sperm antioxidant activity helping to improve sperm count, motility and morphology [27,28].

Lycopene

Lycopene is a powerful antioxidant. It reduces lipid peroxidation and DNA damage and increases number and survival of sperms [29]. Intake of Lycopene 2000ucg twice a day has been shown to improve sperm concentration , morphology and motility [30].

Vitamin A, C & E

Deficiency of vitamin A can result in decreased spermatogenesis [31]. It is a fat soluble vitamin, which may have antioxidant properties , though the exact mechanism is unknown [32].

Vitamin C is a water soluble vitamin found in high concentration in seminal plasma [33]. Adequate concentration reduces sperm DNA fragmentation and damage [34].

Vitamin E is a potent antioxidant that inhibits free radical induced damage to the cell membrane, prevents lipid peroxidation and also helps to improve the activity of other antioxidants [35]. Vitamin e supplementations have demonstrated decrease in lipid peroxidation, leading to increased sperm motility and pregnancy rate [36].

Summary

Neutraceuticals are heavily marketed in infertile couples. Despite an abundance of studies on the effect of neutraceuticals on semen parameters and pregnancy outcomes, there is a lack of uniformity between the studies. This makes interpretation of results difficult.

Infertile couples are however likely to try many neutraceuticals with a hope for improvement in their infertility with minimal risk factors.

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