



Editorial

Vitamin C's Role in Prostate and Male Fertility

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Vitamin C (VC) is an essential component of numerous enzymes, including TET (ten-eleven translocation) proteins involved in DNA demethylation. Moreover, VC is an effective free radicals/Reactive Oxygen Species (ROS) scavenger; therefore, it can protect cellular biomolecules such as DNA from degradation/modifications. Thus, these properties make VC essential for the proper functioning of our bodies. Furthermore, it has been widely recognized that VC has a beneficial effect on the process of spermatogenesis to attain fertility. Seminal plasma composition is affected by the physiological state of the different organs/glands associated with fertility, and the prostate is the major male reproductive gland. [1] The prostate may be the main supplier of VC in seminal plasma. Results suggest that prostatic vitamin C and DNA modifications play an important role in maintaining prostate health and as such may be potential factors linked with male fertility and reproduction. It was shown that Vitamin C maintained testicular structure and enhanced testicular function. Consequently, vitamin C could be a potential fertility enhancer in opposition to lifestyle stresses [2].

Further studies did not find evidence to support that high circulating vitamin C concentration at the physiological level has a large protective effect on the five most common cancers (lung, breast, prostate, colon, and rectal cancer) in European populations. The reported associations between dietary vitamin C and cancer risk in observational studies might be confused by other components of vitamin C-rich foods [3] The effect of vitamin C on prostate cancer cell lines contains the proliferation and movement of those cell lines. However, the experimental data from in vivo studies are controversial, and there is no general agreement about the effects of ascorbic acid on prostate tumors. The parenteral administration of vitamin C to rats with prostate cancer yielded promising results. The ascorbic acid contributed to tumor suppression and the inhibition of metastasis. Favorable results were also achieved in a meta-analysis comprising over 18 prostate cancer studies, indicating the association between vitamin C and a reduction in prostate cancer incidence. Since its conception, the possibility of treating cancer with vitamin C has been a controversial and much-disputed subject. Some published data have indicated promising findings for vitamin C's role in cancer therapy, as well

as its bioavailability in cancers. Its clinical anticancer potential is reflected in the number of clinical trials involving vitamin C. The level of vitamin C in cells may be related to vitamin C transporter expression and its polymorphism in cells [4].

In another study, It was found that pharmacological doses of ascorbic acid suppress tumor growth and metastases in hormone-refractory prostate cancer. [5] In the Montreal PROtEuS Study, the findings document the absence of an association between recent dietary vitamin C intake, or supplementation, and prostate cancer incidence overall or prostate cancer grade at diagnosis. Based on this, and other available evidence, vitamin C intake does not seem to hold promises regarding prostate cancer prevention. [6] Researchers found that after adjusting for covariates, ascorbic acid was inversely associated with LH ($P = 0.01$). Ascorbic acid was positively associated with total testosterone only among males over the age of 41.6 years ($P = 0.01$). These findings show that ascorbic acid is associated with higher testosterone levels and improved androgenic status in infertile males, and some of the effects appear to be age dependent [7].

It was also found in the dose-response analysis, that an inverse linear relationship between dietary vitamin C intake and prostate cancer risk was established. With a 150 mg/day dietary vitamin C intake in cohort studies, and in case-control studies the intake of vitamin C from food was inversely associated with prostate cancer risk. A 150 mg/day increment of dietary vitamin C intake reduced prostate cancer risk by 5% [8].

Further findings document the absence of an association between recent dietary vitamin C intake, or supplementation, and prostate cancer incidence overall or prostate cancer grade at diagnosis. Based on this, and other available evidence, vitamin C intake does not seem to hold promises with regard to prostate cancer prevention. Vitamin C, or ascorbic acid, has various physiological functions including aiding in tissue and hormone development, acting as a co-factor for enzymes and reducing oxidative damage via its role as a powerful antioxidant. Vitamin C intake has been positively associated with healthy semen parameters, as dietary intake influences seminal ascorbic acid concentrations. Seminal ascorbic acid concentrations can measure up to 10 times that of

serum ascorbic acid. [8] Vitamin C may account for 65% of seminal antioxidant activity and affects the integrity and structure of sperm by promoting an environment where sperm can thrive, develop, and reproduce, minimizing structural and functional flaws. Despite some studies showing no benefit of vitamin C to sperm quality other studies have supported a positive association between vitamin C intake, serum and semen ascorbic acid concentrations, and healthy semen parameters including semen volume, and sperm concentration, number, motility and morphology, and overall fertility. Higher dietary vitamin C intake has been linked to reduced sperm DNA damage and low levels of seminal vitamin C have been associated with higher sperm DNA fragmentation in infertile men. Despite the evidence for beneficial effects of vitamin C on male fertility, consuming an excess amount of vitamin C poses the risk of promoting oxidative stress by acting as a pro-oxidant. Further research is needed to determine concentrations at which this effect occurs [8].

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