



Lifestyle Changes

Recommendations for
Managing Oxidative Stress and Improving Fertility



Male Factor Infertility and Oxidative Stress

Male factor infertility is solely and partially implicated in up to 70% of cases of infertility.

There is a significant proportion of infertile men who have normal semen analysis and are classified as unexplained male infertility.

It is well known that conventional semen parameters (sperm concentration, motility, and morphology) does not guarantee normal functions of sperm.

Elevated levels of ROS (Oxidative Stress) is believed to be a major contributing factor to male infertility.

Up to 80% of the causes behind male infertility are associated with oxidative stress.

Oxidative stress is a condition caused by an imbalance between the production of reactive oxygen species (ROS) and the body's antioxidant system responsible for their neutralisation and removal.

Oxidative Stress is a major contributing factor for male infertility and can be managed by lifestyle changes and targeted antioxidant use.^{1, 2, 3, 4, 5, 25}

Antioxidant supplementation

„Antioxidant supplementation in subfertile men may increase pregnancy rate and number of live births“ Cochrane Systematic Review.²²

It has been proven that subfertile men, when compared with fertile men, have higher levels of ROS and lower levels of antioxidants in their semen.²⁴

In order to maintain normal spermatogenesis and reproductive function, the body needs to be supplied with various essential microelements and antioxidants. Especially important are those which support key oxidative stress defence mechanisms and contribute to DNA synthesis and spermatogenesis.^{5,25}

Antioxidants that are commonly used clinically and investigated scientifically as either an individual application or in combination include vitamin C, vitamin E, carnitine, N-acetyl cysteine, coenzyme Q10, glutathione, l-carnitine and lycopene, along with important antioxidant co-factors zinc, selenium, and folic acid, as these compounds are significantly involved in essential sperm functions.²³

It is important to stress that excessive use of antioxidants could also lead to disbalance in body's redox status and in turn negatively affect sperm functional parameters. Achieving and maintaining redox balance is recommended.²³

Please always consult with your treating physician on testing for oxidative stress and on choosing the right antioxidants for you.

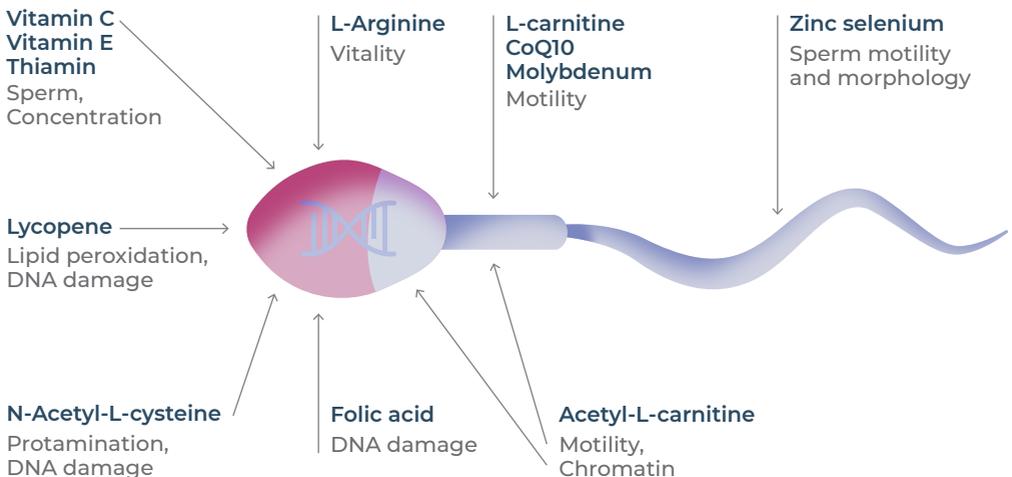


Figure 1: Individual antioxidant compounds that have significant effects on sperm functions.²³

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Minimize Alcohol Consumption

Heavy alcohol intake has been associated with a systemic prooxidant state and a reduction in semen quality.

Infertile patients who drink two to three units of alcohol every day have significantly decreased sperm density, percent normal forms, and percent motile forms.

Alcohol intake should be kept to a minimum, preferably below two standard drinks per day.⁵



Stop Smoking

Cigarette smoking has been associated with an increase in seminal Oxidative Stress and impaired spermatogenesis, plus an increase in sperm DNA damage, which has been linked with serious health consequences for the next generation.

Smoking results in a 48% increase in seminal leukocyte concentrations and a 107% increase in seminal levels of ROS, along with decreased levels of seminal plasma antioxidants such as vitamin C and vitamin E.

Smoking should be totally avoided.

Several studies have also shown that other nicotine containing products like chewing tobacco/snus can negatively affect sperm quality.⁵



Eat Better

An unhealthy diet is an increasing problem in the developed world because of increased consumption of packaged food high in sugar and fat content, but low in beneficial micronutrients such as antioxidants. Large epidemiological studies have linked frequent consumption of red and processed meat, known triggers for OS, with a decline in sperm quality.

Furthermore, a high consumption of fruit and vegetables, especially those containing b-carotene, lutein, and lycopene antioxidants, has been linked with improved sperm quality.

Studies have shown that the Mediterranean dietary patterns, which are characterized by high intakes of fruits and vegetables, fish, and whole grains, are associated with higher semen quality.

Overall optimal sperm quality is best supported by eating a minimum amount of red and processed meats, plus plenty of fruit, vegetables, legumes, whole grains, and nuts.⁵



Avoid being Overweight

Obesity is associated with a decline in sperm quality and an increase in sperm oxidative damage.

Obese men have significantly higher seminal ROS and sperm DNA fragmentation when compared with fertile normal weight men.

Weight loss through diet, exercise, is known to improve sperm quality.⁵



Avoid Psychological Stress

About 31% of adult men in the United States reported feeling increasingly stressed in 2015, with younger adults reporting higher stress levels.

Psychological stress is linked to increased levels of seminal ROS along with reduced levels of antioxidants such as glutathione.

Minimization of stress through stress reducing activities like yoga or meditation can reduce sperm oxidative stress and improve general well-being.⁵



Manage Heat Stress

When the testicles are exposed to excessive heat through high environmental temperatures (e.g., working in a smelter or hot kitchen, prolonged use of a laptop computer on the lap, or frequent use of saunas and baths), there is a decline in sperm quality mediated by OS.

Management of heat stress obviously involves avoidance of heat related recreational activity (baths, saunas, and exercise in extreme heat), wearing loose-fitting clothing, and avoiding prolonged direct contact between the testicles and heat sources (laptop computers, electric blankets).⁵



Avoid/Limit Environmental Toxins

Exposure to air pollution, pesticides, plasticizers, heavy metals, and non-ionizing radiation can affect sperm quality.⁵

References

- 1 Hamada A, Esteves SC, Agarwal A. Unexplained male infertility: potential causes and management. *Hum Androl* 2011;1(1):2e16.
- 2 Lewis SEM, Boyle PM, McKinney KA, Young IS, Thompson W. Total antioxidant capacity of seminal plasma is different in fertile and infertile men. *Fertil Steril* 1995;64:868e70.
- 3 Van der Steeg JW, Steures P, Eijkemans MJ, Habbema JDF, Hompes PG, Kremer JA, van der Leeuw-Harmsen L, Bossuyt PM, Repping Silber SJ, Mol BW, van der Veen F, Collaborative Effort for Clinical Evaluation in Reproductive Medicine Study Group. Role of semen analysis in subfertile couples. *Fertil Steril* 2011;95:1013e9.
- 4 Agarwal A, Perekh N, Panner Selvam MK, et al. Male Oxidative Stress Infertility (MOSI): Proposed Terminology and Clinical Practice Guidelines for Management of Idiopathic Male Infertility. *World J Mens Health*. 2019;37(3):296-312. doi:10.5534/wjmh.190055
- 5 Henkel R, Samanta L, Agarwal A, editors. Oxidants, antioxidants, and impact of the oxidative status in male reproduction. London: Elsevier/Academic Press; 2018.
- 6 Gaskins AJ, Colaci DS, Mendiola J, Swan SH, Chavarro JE. Dietary patterns and semen quality in young men. *Hum Reprod* October 2012;27(10):2899e907.
- 7 Zareba P, Colaci DS, Afeiche M, Gaskins AJ, Jørgensen N, Mendiola J, et al. Semen quality in relation to antioxidant intake in a healthy male population. *Fertil Steril* December 2013;100(6):1572e9.
- 8 Chiu YH, Gaskins AJ, Williams PL, Mendiola J, Jørgensen N, Levine H, et al. Intake of fruits and vegetables with low-to-moderate pesticide residues is positively associated with semen-quality parameters among young healthy men. *J Nutr* May 2016;146(5):1084e92
- 9 La Vignera S, Condorelli RA, Balercia G, Vicari E, Calogero AE. Does alcohol have any effect on male reproductive function? A review of literature. *Asian J Androl* March 2013;15(2):221e5.
- 10 Esakky P, Moley KH. Paternal smoking and germ cell death: a mechanistic link to the effects of cigarette smoke on spermatogenesis and possible long-term sequelae in offspring. *Mol Cell Endocrinol* November 5, 2016;435:85e93.
- 11 Silva JV, Cruz D, Gomes M, Correia BR, Freitas MJ, Sousa L, et al. Study on the short-term effects of increased alcohol and cigarette consumption in healthy young men's seminal quality. *Sci Rep* April 3, 2017;7:45457.
- 12 Tunc O, Bakos HW, Tremellen K. Impact of body mass index on seminal oxidative stress. *Andrologia* April 2011;43(2):121e8.
- 13 Oliveira PF, Sousa M, Silva BM, Monteiro MP, Alves MG. Obesity, energy balance and spermatogenesis. *Reproduction* June 2017
- 14 Saleh RA, Agarwal A, Sharma RK, Nelson DR, Thomas Jr AJ. Effect of cigarette smoking on levels of seminal oxidative stress in infertile men: a prospective study. *Fertil Steril* 2002;78(3):491e9
- 15 Taha EA, Sayed SK, Gaber HD, Abdel Hafez HK, Ghandour N, Zahran A, et al. Does being overweight affect seminal variables in fertile men? *Reprod Biomed Online* 2016;33(6):703e8
- 16 Association AP. Stress in America: the impact of discrimination. *Stress in America Survey*. 2016.
- 17 Eskiciok S, Gozen AS, Taskiran A, Kilic AS, Eskiciok M, Gulen S. Effect of psychological stress on the L-arginine-nitric oxide pathway and semen quality. *Braz J Med Biol Res* 2006
- 18 Rubes J, Selevan SG, Evenson DP, Zudova D, Vozdova M, Zudova Z, et al. Episodic air pollution is associated with increased DNA fragmentation in human sperm without other changes in semen quality. *Hum Reprod (Oxf)* 2005;
- 19 Jung A, Schuppe HC. Influence of genital heat stress on semen quality in humans. *Andrologia* December 2007;39(6):203e15.
- 20 Sheynkin Y, Jung M, Yoo P, Schulsinger D, Komaroff E. Increase in scrotal temperature in laptop computer users. *Hum Reprod* February 2005;20(2):452e5.
- 21 Ahmad G, Agarwal A, Esteves SC, Sharma R, Almasry M, Al-Gonaim A, et al. Ascorbic acid reduces redox potential in human spermatozoa subjected to heat-induced oxidative stress. *Andrologia* March 1, 2017
- 22 Showell MG, Mackenzie-Proctor R, Brown J, Yazdani A, Stankiewicz MT, Hart RJ. Antioxidants for male subfertility. *Cochrane Database Syst Rev* 2014;12:CD007411
- 23 Agarwal A, Leisegang K, Majzoub A, et al. Utility of Antioxidants in the Treatment of Male Infertility: Clinical Guidelines Based on a Systematic Review and Analysis of Evidence. *World J Mens Health*. 2021;39(2):233-290. doi:10.5534/wjmh.200196
- 24 Smits RM, Mackenzie-Proctor R, Fleischer K, Showell MG. Antioxidants in fertility: impact on male and female reproductive outcomes. *Fertil Steril*. 2018 Sep;110(4):578-580. doi: 10.1016/j.fertnstert.2018.05.028. PMID: 30196940.
- 25 Agarwal A, Virk G, Ong C, du Plessis SS. Effect of oxidative stress on male reproduction. *World J Mens Health*. 2014;32(1):1-17. doi:10.5534/wjmh.2014.32.11