

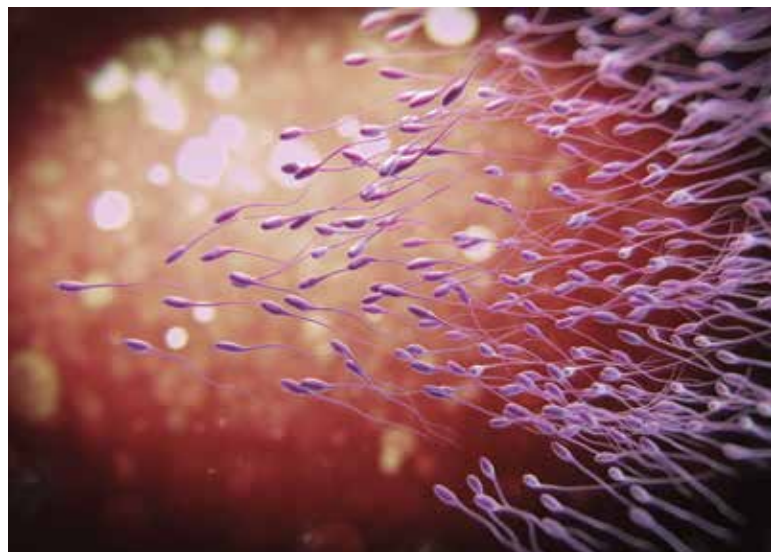
Male fertility

Improving sperm health and chance of pregnancy

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Male factor infertility is common. There is insufficient knowledge in the general population of how to optimise fertility in men, and preconception counselling often focuses on female factors. This article provides advice on preconception care for men and discusses strategies that may be implemented to optimise male fertility based on the existing evidence base.

About one in six couples experience infertility and 50% of cases are due to male factors, either as a sole cause or as a contributing factor.¹ Although there is increasing awareness about optimisation of general and reproductive health before pregnancy, preconception counselling primarily targets women. Male partners often receive less attention and less is known about preconception care for men.²



Preconception care aims to improve general and reproductive health and should be offered to both partners. Preconception counselling is recommended for all couples who are aiming to conceive. Preconception advice can be divided into four domains:

- advice based on the person's medical history and a fertility assessment
- educating couples about coital practices
- recognising and eliminating modifiable risk behaviours and exposures
- recommending treatments that may improve fertility.

History and fertility assessment

Early and appropriate recognition of reproductive risks is important and helps to identify people who would benefit from early assessment and targeted interventions. In addition to taking a general medical history, basic fertility assessment of a male partner should cover the following:

- coital frequency and timing and any difficulty with erections or ejaculations
- previous fertility
- childhood conditions (e.g. mumps orchitis, undescended testes or testicular torsion)
- previous genitourinary tract infections
- adverse lifestyle exposures, including past or current use of anabolic steroids.

Early semen analysis and referral to a specialist in male reproduction or urology are warranted if the history is abnormal.

Education about coital practices

Education about the basics of reproduction helps to increase fertility awareness, alleviates anxiety and corrects widely held misconceptions. It is important for couples to be reassured that frequent ejaculations do not decrease male fertility. An abstinence interval greater than five to 10 days may adversely impact sperm parameters; however, daily or second-daily ejaculations can improve sperm quality.^{3,4} Recommendations for daily sexual intercourse may lead to stress and decrease sexual satisfaction.

MedicineToday 2019; 20(1): 55-57

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Couples should be aware that frequent intercourse may improve their chance of pregnancy, but the optimal frequency should be defined by their own preferences.

Sperm are present in the cervical canal seconds after ejaculation and migrate to the fallopian tube within several minutes. Remaining supine after intercourse does not influence fecundity (the ability to conceive). Sperm transport may be facilitated by female orgasm, although there is no clear correlation between orgasm and fertility.³

Evidence from in vitro and in vivo experiments regarding the effect of vaginal lubricants on fertility is not conclusive. Lubricants that were shown to adversely affect sperm motility, DNA fragmentation and survival include water-based lubricants, olive oil, sesame oil, baby oil and saliva. On the contrary, canola oil, some mineral oils and hydroxyethylcellulose-based lubricants have not been observed to have such adverse effects and should be recommended for couples trying for pregnancy.³

Recognition and elimination of modifiable risk behaviours and exposures

Multiple lifestyle, environmental and behavioural factors have been recognised as being associated with impaired fertility; however, the evidence is based on small, low-quality studies. Interventions for most adverse modifiable factors have not been assessed in the context of male infertility and no strong recommendations can be made based on the currently available evidence base.

Cigarette smoking

Smoking has been shown to be associated with a deterioration in sperm quality, increased sperm DNA damage and decreased sperm fertilising capacity. A meta-analysis of 20 studies including 5865 men showed that smokers had a reduced sperm count and motility in a dose-dependent manner, with a more

significant negative effect in moderate-to-heavy smokers.⁵ A comprehensive narrative review showed that fertility in smokers can be impaired in the presence of normal semen parameters and that smoking can substantially increase the risk of erectile dysfunction.⁶ Several studies have reported marked improvement in physiological and sexual health in male smokers who stop smoking, although overall the data on the effect of smoking cessation on male fertility are scant.⁶ Successful smoking cessation in both partners should be considered as a component of the management plan for infertility and should be encouraged.

Interventions for most adverse modifiable factors have not been assessed in the context of male infertility

Alcohol

Alcohol consumption can affect reproductive potential in men and women. The level of consumption associated with reproductive risk is unclear.^{7,8} Chronic alcohol consumption has been associated with testicular atrophy, decreased male libido, erectile dysfunction and deranged male reproductive hormones.⁹ Most international guidelines recommend a cautious approach to alcohol consumption for couples planning pregnancy. Complete abstinence is the safest recommendation for couples desiring optimal fertility, although a more realistic approach would be to not consume more than one to two standard drinks per day and to avoid binge drinking, as recommended by the NHMRC.¹⁰

Caffeine

Limited observational studies indicate a negative association between high-dose caffeine consumption and fertility.^{11,12} Most fertility societies recommend limiting preconception caffeine consumption to one to two cups of coffee per day in

women. There are no specific recommendations for men.

Obesity

A high body mass index in men has been associated with decreased production of androgens, an increase in oestradiol due to aromatisation of testosterone in adipose tissue, abnormal semen parameters and impaired sperm DNA integrity.¹³⁻¹⁵ A systematic review of 30 studies with a total of 115,158 participants concluded that paternal obesity negatively affects fertility and is associated with a reduced live-birth rate after fertility treatments.¹³ The degree of weight loss that improves reproductive performance is not clear, neither is the optimal timing and type of weight-loss intervention.¹⁶ Considering the evidence for the multiple health risks of obesity, weight loss strategies should be recommended for obese men as part of preconception counselling.

Diet

A systematic review of 35 observational studies highlighted that dietary modifications in a male partner may have an important effect on semen quality and/or fecundability (the monthly chance to achieve pregnancy).¹⁷ Diets rich in omega-3 fatty acids, antioxidants and vitamins and low in saturated and trans-unsaturated fatty acids are associated with better semen parameters. Consumption of fish, shellfish, seafood, poultry, cereals, whole grains, vegetables, fruits and low-fat dairy products has been positively related to sperm quality. On the contrary, diets rich in red or processed meat, soy foods, potatoes, full-fat dairy products, coffee, alcohol, sugar-sweetened beverages and sweets have been associated with poorer sperm quality and a lower likelihood of achieving pregnancy.

Anabolic steroids

Anabolic steroids can be found in multiple 'gym supplements' and appear to be present in 15 to 25% of 'steroid-free' dietary supplements worldwide.¹⁸ Serious health

risks are associated with their prolonged use and include cardiovascular effects, hepatic dysfunction, renal failure, mood changes and aggressive behaviour. Adverse reproductive effects of anabolic steroid use in men include testicular atrophy and abnormal spermatogenesis, resulting from negative feedback of exogenous androgens on the hypothalamic-pituitary-testicular axis.¹⁸ Sperm production usually recovers spontaneously at about four to 12 months after discontinuation of anabolic steroids but may take up to several years in those with a history of prolonged or high-dose exposure.^{19,20} About 4 to 10% of men may remain azoospermic, especially if they had abnormal semen analysis results before androgen supplementation.²¹ Any form of androgen supplementation should be strongly discouraged in men of reproductive age, unless clearly indicated. Exogenous testosterone acts as a male contraceptive and should not be prescribed for managing infertility. Targeted education, motivational counselling and suitable urological support should be provided to people who use anabolic steroids.

Heat

Exposure of the genitals to heat is being recognised as a potential cause of reduced testicular function and impaired spermatogenesis. Elevated temperature leads to molecular dysfunction within Leydig, Sertoli and germ cells with subsequently impaired sperm production. Febrile illness can adversely influence semen concentration and progressive motility. This effect may occur within a few weeks after a fever episode and can last for one to three months.²²

There is no convincing evidence linking scrotal heat exposure due to sedentary posture, professional driving, tight-fitting underwear or frequent saunas to semen quality. It is unclear whether frequent use of a computer on the lap or using heated car seats have any effect on semen quality.²² In small uncontrolled studies, interventions that reduce genital exposure to heat

or that cool the scrotum have been shown to improve semen parameters but these interventions have not been assessed in high-quality trials.²²

Treatments that may improve fertility

Nutritional supplements

The market for male fertility supplements is growing rapidly, although the safety of many has not been tested. A limited number of dietary supplements have been evaluated in randomised trials. Antioxidants are the most investigated. Several systematic reviews concluded that supplementation of vitamins E and C, coenzyme Q10, zinc, selenium, N-acetyl-cysteine, L-carnitine or a combined preparation containing vitamin E, vitamin C, zinc, selenium, lycopene, folate and garlic may improve sperm parameters as well as clinical pregnancy and live-birth rates.²³⁻²⁵ Patients should be informed of the possible reproductive benefits of antioxidants. Caution should be advised in purchasing these preparations through international websites, which are not regulated by the TGA.

Varicocele repair results in recovered sperm counts and improved sperm quality

Varicocele

Varicocele, defined as a dilation of the pampiniform venous plexus of the spermatic cord, is considered the most common and correctable cause of male factor infertility.²⁶ It is present in 20% of adult men and is two to three times more common in men presenting to infertility clinics.²⁷ It is widely accepted that varicoceles affect fertility by raising intratesticular temperature, which has a deleterious effect on sperm health. In addition, testicular hypoxia and accumulation of reactive oxygen species in men with varicocele are thought to amplify abnormal spermatogenesis and to promote sperm DNA damage.^{26,28}

Varicocele repair results in recovered sperm counts and improved sperm quality, which increases the likelihood of natural pregnancy and may improve the outcomes of fertility treatments.²⁹⁻³³ Recent meta-analyses showed that pregnancy and live-birth rates were higher with in vitro fertilisation or intracytoplasmic sperm injection after varicocelectomy compared with assisted reproductive cycles when men with varicocele did not undergo repair.^{32,33} Subclinical varicocele repair, however, has not been associated with improved pregnancy rates.³⁴ Men with known varicoceles or abnormal semen parameters should be referred to a urologist to facilitate early assessment, treatment and directed counselling.

Conclusion

Early recognition of risks to fertility along with timely referral for management of correctable causes of infertility in men may improve a couple's chance of conceiving and may reduce the need for complex fertility treatments. The extent to which fertility-related outcomes are amenable to risk-reduction interventions is as yet unclear; however, as the results of larger, well-designed prospective trials are published more specific advice on helping patients to improve fertility should become available.

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A list of references is included in the online version of this article (www.medicinetoday.com.au).

COMPETING INTERESTS: None.



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