Current evidence-based and best advice to improve sperm

TRUTH FERTILITY

March 2019

Male Infertility

I'd just like to begin by sharing a few statistics with you:

- 1 in 20 men are infertile.
- 1 in 5 men have a sperm count below the World Health Organisation range.
- Males are found to be solely responsible for 20-30% of infertility cases but contribute to 50% of cases overall.

Isn't that incredible? I'm not sure men perhaps realise these statistics, but they are very real and more worryingly, sperm health is declining at a rapid rate.

Lead researcher, Dr Ashley Tiegs, found that the proportion of men needing fertility treatment has risen from 12.4% in 2004 to 21.3% in 2017. The conclusion of her report showed that 1 in 5 (20%) men in the UK can expect to encounter fertility problems. (Tiegs et al, 2019) Furthermore, male fertility seems to be declining at a rapid rate with no signs of 'levelling off'.

Further research shows that among Western countries, sperm concentration has declined more than 50% in less than 40 years. (Levine et al, 2017) This means that in our lifetimes we could see total infertility in men.

I really do feel that with all the attention focused on female infertility we're somewhat missing the point! Fertility clinics, GPs and the population in general need to wake up to this growing problem and fast! Especially as the decline in sperm health also has further implications beyond reproduction with evidence linking poor semen quality with a higher risk of hospitalisation and death. (Levine et al, 2017)

So, what are the causes of male infertility? There are many of course, but below is a list of known causes that you might find useful when thinking about yourselves or your partners and whether male factor infertility could be contributing to your case.

Conventional Reasons	Additional Reasons
A hormone imbalance or genetic problem	Obesity
Having had undescended testicles as a baby	Stress (high cortisol, low testosterone, etc)
A structural problem such as the tubes that carry the sperm being damaged	Excess oxidative stress
A genital infection, such as chlamydia, gonorrhoea, or prostatitis	Toxins (smoking, plastics, pesticides, heavy metals, etc)
Varicoceles (enlarged veins in the testicles)	Radiations, radioactivity, EMFs
Previous surgery to the testicles or hernia repairs	Other hidden infections such as CMV (HHV-5)
The testicles becoming overheated	Mumps as an adult
Excessive alcohol consumption, smoking and use of drugs such as marijuana or cocaine	Poor Diet
Certain medications, including testosterone replacement therapy, long-term anabolic steroid use, cancer medications, and some antibiotics and antidepressants.	Lack of zinc, selenium, vitamins A, D and E
	Lack of antioxidants
	Excess processed meats, trans fats

(Haynes, 2020)

Now let's look at a few of the known causes individually…

Obesity
Obesity is a worldwide epidemic and causes infertility in many different ways. Adipose tissues (fat), causes an increase in Oestradiol and a decrease in Testosterone.

Testosterone directly effects fertility by causing a decrease in sperm production but also indirectly effects fertility through a low sex drive. Excess Oestradiol directly effects fertility through the development of the sperm and indirectly causes infertility through erectile dysfunction. So obesity, in itself, causes a hormonal imbalance. Also, being overweight causes chronic inflammation which not only increases Cortisol levels but also increases the scrotal temperature.

Sperm likes to be at a cool 4 degrees below body temperature for proper development, so with excess fat around the testes causing unnecessary insulation, coupled with internal heat from inflammation, makes it very tricky to keep the sperm cool.

It is also likely an obese person might not be eating an appropriate diet when it comes to foods rich in zinc and selenium and favouring more processed meats and trans fats, thereby exacerbating the problem. It is important that attention is paid to maintaining a healthier lifestyle and losing weight if necessary before paying for expensive IVF treatments. Again, women are always turned away from fertility treatment if they are obese but in all my career I've never known this be the case for a man. I believe there should be equal standards for both men and women when it comes to discerning who is eligible and that appropriate advice be given to everyone

concerned. Especially as research shows there is a decrease of pregnancy rate in assisted reproduction when there is obesity in the male partner. (Keltz et al, 2010)

Stress

Stress is a huge problem and sadly is one that is quite overlooked when it comes to men. This is an area where I do think women are able to gain more support and men are left not able to find others to talk to as the stigma in male infertility in particular is still a very big problem. Therefore men are often the silent, stressed-out partner!

In a group of men who scored high during an inventory test to determine how stressed they were, they all had these hormonal imbalances in common:

- significantly decreased testosterone levels
- increased prolactin
- increased cortisol
- decreased sex hormone binding globulin (SHBG)
- significantly decreased DHEA

The conclusion of the study was that depression and anxiety in male participants causes decreased semen volume and sperm density. (Wdowiak et al, 2017)

I really do feel that on both sides, male or female, stress is a major problem when it comes to fertility. Unfortunately, again, it is not something that is readily addressed in the fertility clinics and I feel that it's time that patients were made aware of the impact this has so that they might work on making changes here before shelling out on expensive fertility treatment. It's something I certainly make sure I talk about at length with all my patients.

I know some of you have found it beneficial to have their levels of cortisol and DHEA tested to see what impact this may be having and so if you feel that this test would benefit you then please let me know and I can arrange it for you.

Oxidative Stress

Reactive Oxidative Stress (OS) occurs when there is an imbalance between free radicals and antioxidants. OS commonly effects the integrity of the DNA strands of the sperm causing DNA Fragmentation. It is a common problem and one which often goes undiagnosed but can cause many problems with fertility. Oxidative stress in sperm has an impact not only on DNA integrity but also on the dynamics of epigenetic reprogramming, which may harm the paternal genetic and epigenetic contribution to the developing embryo and affect embryo development and embryo quality. (Wyck et al, 2018) Thereby causing problems after fertilisation such as miscarriage or genetic defects in the child.

Men with OS were also found to have higher levels of follicle stimulating hormone (FSH) and luteinising hormone (LH). They also had lower testosterone levels and with every increase of 7 units in cortisol it increased the prevalence of infertility by 3%. It found that stress together with a decrease in antioxidants was found to play a significant role in reducing the fertilising potential of male infertile subjects. (Rehman et al, 2020)

It's a topic I talk at length with my patients because it is undetectable in a standard semen test. So many of my female patients come in saying that their partners are "fine" because their sperm test said so, however I'm finding in my clinic that about 80% of the men I'm sending for DNA Fragmentation testing are coming back with male factor infertility. I won't say too much on this particular subject as my blog post, "Could it be Sperm DNA Fragmentation?" takes a more in-depth look. Please give it a read if you think this might be contributing to your case.

Overheated sperm
If sperm are exposed to elevated temperatures, they begin to die. This will show up on a semen analysis as reduced motility. If the exposure to heat is prolonged, it can affect sperm production processes, causing the body to produce fewer sperm, many of which may be abnormally shaped. On a semen analysis, this will show up as reduced sperm count and abnormal morphology (often accompanied by reduced motility). (Haynes, 2020)

A lot of the studies into this have been with men who occupationally are subjected to high heat levels, such as chefs, welders, etc. However I've found in my clinic that men who generally run hot and feel overheated or sweaty are often prone to abnormal semen parameters. Acupuncture can be hugely beneficial in reducing body temperature so it's worth exploring that if you feel it might be affecting you.

Toxin Exposure
This is a massive subject and one that I won't be exploring in great depth here but if you're interested in knowing more then please do let me know and I'll write more on subject. But by way of a brief overview:

- Glyphosate, which is a common pesticide, often found in British bread was administered in high doses to a research group. The study found that exposure exerted toxic effects on sperm progressive motility but not on sperm DNA integrity, meaning that the toxic effect is limited only to motility, at least in the first hour of exposure. (Anifandis et al, 2018)

- Pthalates, a plastic derivative used to make plastics more flexible, is a known endocrine disruptor. Meaning that they can affect the release of hormones, or bind to existing hormones so that they can no longer be metabolised, or speed up the metabolisation of hormones thereby making them less active. Pthalates, in particular, are capable of compromising male infertility by having the ability to impair spermatogenic process by inducing oxidative stress and apoptosis in germ cells or target sertoli cells and thereby hamper spermatogenesis. (Sedha, Kumar, Shukla, 2014)

- Bisphenol A (BPA), a by-product in the plastics industry, is a known endocrine disruptor. The study found that total BPA levels were negatively associated with semen quality and antioxidant levels, and positively correlated with DNA damage. (Omran et al, 2018)

- Surfynol, an adhesive used in multilayer plastics and often used to contain semen for artificial insemination, was found to seriously damage the sperm in terms of motility,

acrosome integrity, mitochondrial activity and penetration capacity in the cells, thus affecting male fertility. (Nerin et al, 2018) I'm utterly speechless! So the very vessel used to transport semen is the very thing that will negatively effect it. How can anyone with a poor semen sample even stand a chance?! It begs the question, why are we using plastics in IVF?

- Triclosan, a synthetic chemical used in personal care products, textiles, and plastic kitchenware, was found to negatively effect semen quality. (Jurewicz, 2018)

- Tobacco smoking. Most studies have reported reduced semen quality, reproductive hormone system dysfunction and impaired spermatogenesis, sperm maturation, and spermatozoa function in smokers compared with non-smokers. (Dai, Wang & Qiao, 2015)

- Heavy metals. In a study, there were significant associations between low sperm viability and higher blood levels of Cadmium and Barium, as well as higher seminal doses of Lead and Uranium. Furthermore, Uranium concentrations in the seminal fluid were associated with increased odds ratios for below-reference progressive sperm motility and normal morphology. Therefore, environmental exposures to Cd, Ba, Pb and U appear to adversely influence sperm development in men. (Sukhn C, Awwad J, Ghantous A, Zaatari G, 2018)

EMF Exposure

There is a growing body of evidence showing that exposure to Electromagnetic Fields is damaging to the body as a whole, but particularly to sperm. It is therefore considered that prolonged use of cell phones may have negative effects on the sperm motility characteristics. Radio frequency electromagnetic waves emitted from cell phones may lead to oxidative stress in human semen and so for this reason it is recommended that mobile phones are kept out of trouser pockets and, where possible, left in flight mode. (Agarwal et al, 2008)

Laptops are doubly harmful as not only do they emit the same radio frequency waves, but when using on laps will heat up the testicles causing damage to the sperm as discussed earlier. In the first study of its kind, ex vivo exposure of human spermatozoa to a wireless internet-connected laptop decreased motility and induced DNA fragmentation by a non-thermal effect. (Avendano et al, 2012)

STD's

Sexually transmitted diseases are caused by several pathogens, including bacteria, viruses, and protozoa and can induce male infertility through multiple pathophysiological mechanisms. Additionally, horizontal transmission of STD pathogens to sexual partners or vertical transmission to foetuses and neonates is possible. Chlamydia trachomatis, Ureaplasma spp., human papillomavirus, hepatitis B and hepatitis C viruses, HIV-1 and human cytomegalovirus have all been detected in semen from symptomatic and

asymptomatic men with testicular, accessory gland and urethral infections. (Gimenes, et al, 2014)

Hidden Infections
Infections known to impact male infertility are:

H. Pylori (HP)
Mycoplasma pneumoniae (MP)
Chlamydia pneumoniae (CM)
Epstein-Barr virus (EBV)
Herpes Simplex virus 1 (HSV-1)
Cytomegalovirus (CMV)

Cytomegalovirus, sometimes know as HHV5 has shown to significantly effect male fertility. (Mohseni, 2018) However it goes undetected in any tests that might be conducted at the fertility clinics. It's certainly one I need to pay closer attention to in my clinic, especially as symptoms are extremely vague. You may not know you've contracted the illness whilst others might have flu-like symptoms or a rash. If you think this may be affecting you, ask me about testing for this virus and I can organise this for you.

Diet

Foods known to have a positive effect on male fertility	**Foods known to have an adverse effect on male fertility**
Foods rich in Omega 3 fatty acids (fish, shellfish, seafood)	Processed meats
Foods low in saturated fatty acids and trans-fatty acids	Soy foods
Poultry	Potatoes
Cereals (grains, not Kellogg's Frosties!)	A diet rich in full fat dairy products
Vegetables, fruits	Coffee
Low fat dairy and skimmed milk	Alcohol
Selenium, Zinc, Iodine	Sugar-sweetened beverages
β-carotene, cryptoxanthin, lycopene, Astaxanthin	Sweets
CoQ10	
Carnitine	

(Salas-Huetos et al, 2017)

Vitamin D

Vitamin D does not effect male fertility except when there is a deficiency. Deficiencies in men have been shown to significantly effect fertility. (Gaskins & Chavarro, 2018) This is an interesting one, given that most of the UK population struggles with Vitamin D deficiency. I would recommend my patients have theirs checked as it's an easy one to rule out before we delve into further testing.

Antioxidants

Antioxidant supplementation is strongly advised for men. Even if there is no pre-existing condition or concern. This is in order to counteract the imbalance between antioxidants and free radicals that can occur, culminating in oxidative stress to the sperm. Patients already diagnosed with Sperm DNA Fragmentation must take a high dosage to manage the effects and then retest the sperm after 3 months to be clear that the quality of the sperm is improving.

Zinc

Zinc is an incredibly important mineral for men particularly. Not only does it have antioxidant properties it is also a hormone balancer, helping hormones such as testosterone, prostate and sexual health and functions as an antibacterial agent in men's urea system. Zinc deficiency impedes spermatogenesis and is a reason for sperm abnormalities. (Fallah, Mohammad-Hassani, Colagar, 2018)

This is another easy one to test for and can be done at home using a Medichecks finger-prick test.

Selenium

Selenium is another essential mineral for male reproductive functions. In a study, it found that DNA Fragmentation was significantly decreased after supplementing with Selenium after 6 hours incubation. It has also been shown to improve sperm motility. (Ghafarizadeh et al, 2018)

Folate

If there is a C677T polymorphism in the MTHFR gene, then male fertility could be affected and sufficient folate is required. (Hong, 2017) This basically means that some people (about 40% to 60%), have a genetic polymorphism that impairs the conversion of supplemental folic acid to its active form, l-methylfolate. (Greenberg & Bell, 2011)Therefore, I always recommend my male and female patients take Methylfolate over Folic Acid.

Iodine

Iodine is essential in the production of thyroid hormone. Both Iodine deficiency and excess were associated with decreased semen parameters. (Sun, 2020)

Omega 3 Fatty Acids

A meta-analysis showed that supplementing infertile men with Omega 3 fatty acids resulted in a significant improvement in sperm motility and concentration of DHA (docosahexaenoic acid) in seminal plasma. (Hosseini, 2019)

Magnesium & Calcium

Calcium concentration and higher calcium/magnesium ratios are negatively associated with sperm concentrations. Magnesium alone is associated with increased sperm concentration. (Liang, 2016)

Vitamin A

Vitamin A is essential for sperm production with a deficiency affecting testosterone secretion, a hormone vital in male fertility. (Yang, 2018)

Supplements

A study group found that taking Vitamin E, CoQ10 and an amino acid called Carnitine having dramatic effects on fertility. Here are the details:

- 40 infertile men were supplemented daily with two or three of the supplements providing these nutrients.
- After 3 and 6 months of treatment, sperm density was improved by 48.9% and 80.9% respectively, and after 3 months of treatment the sperm pathology decreased by 25.8%.
- Concentrations of $CoQ(_{10\text{-TOTAL}})$ (ubiquinone + ubiquinol) and α-tocopherol were significantly increased and the oxidative stress was decreased.
- In conclusion, the effect of supplementary therapy with these supplements showed benefits on sperm function in men, resulting in 45% pregnancies of their partners.

(Gvozdjáková A et al, 2015)

What an incredible result! It's worthwhile investing some money in supplements as they can have dramatic effects. We know that sperm regenerates every 3 months so a poor sperm test result doesn't necessarily mean disaster, it can be fixable.

If you wish to purchase any of the discussed supplements please talk to me first so we can ensure that they do not have any contra-indications with anything you might already be taking. It is also important you buy your supplements through a reputable source. I would be more than happy to give you my account details to the supplement companies I use so you can order them yourselves. With the current Coronavirus restrictions I am unable to order supplements and distribute them from my clinic, as I would have done in the past.

If you or your partner feel that you would benefit from testing or supplementation please arrange with me for an online consultation so we can discuss your individual needs and once I am able to open the clinic I will be on hand for acupuncture treatments to further improve the sperm.