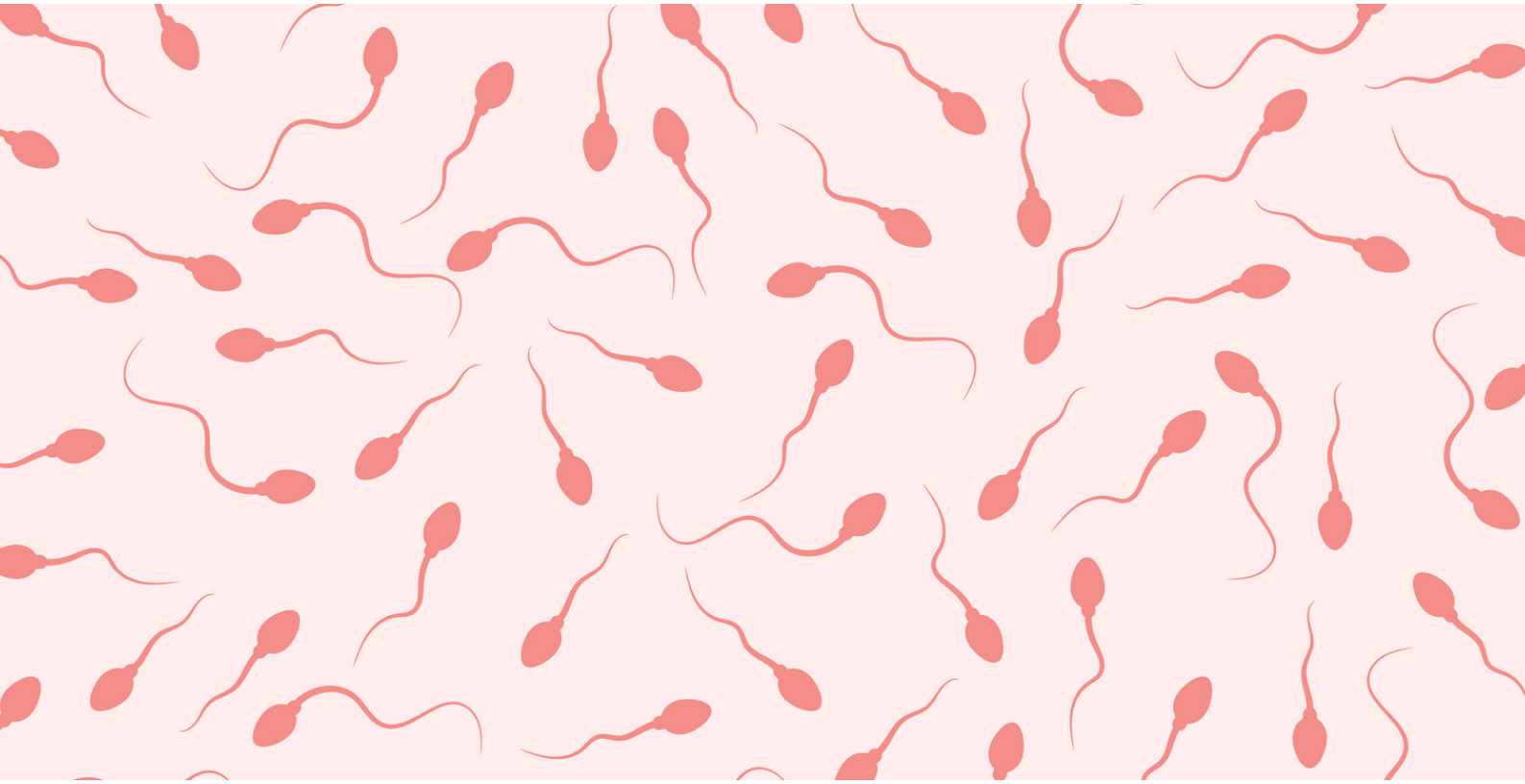
NATMED INTEGRATED MEDICINE

SEMEN ANALYSIS & DNA FRAGMENTATION EXPLAINED



WHY UNDERTAKE SPECIALISED SEMEN ANALYSIS?

Sperm concentrations have declined in the Western world by 50% over the last 40 years.
Factors include:

Advancing age
Lifestyle
Diet choices
Environmental factors
Psychological factors

90% of first trimester miscarriages are caused by chromosomal problems.
Optimising sperm quality is not only for the male's general health even into the future but also the healthy conception and the future of the baby.
Unfortunately, there have been several studies comparing the semen analysis you may be referred to by your G.P compared to a specialist lab with professional andrologists.

The referral from your GP goes to a standard lab where hundreds of tests are performed, and they are not specialists in fertility. This test is also very basic and only tests for a few parameters.

We refer to a specialist lab with scientists qualified in andrology to give you the best sperm testing available. We highly recommend doing a Sperm Chromatin Structure assay (SCSA) as this is assessing the DNA of the sperm and testing the level of DNA fragmentation.
The DNA in sperm is vulnerable to conditions of 'oxidative stress'. Under these conditions, the DNA can be damaged causing the DNA to fragment. Where there is a high degree of DNA fragmentation, there may be an increased risk of infertility, failed assisted reproduction e.g., IUI or IVF, and recurrent miscarriage.

OXIDATIVE STRESS

Oxidative stress can be caused by several conditions such as:

Infection	inflammation can cause a significant increase in oxidative stress. Inflammation elsewhere in the body can also contribute to sperm damage and deplete critical antioxidants.
Varicocele	like a varicose vein in or near the testes, can increase damage to sperm.
Obesity	Excess body fat, especially that which accumulates around the middle.
Smoking	Markedly increases oxidative stress.
Testicular heat	Increased local heat can damage sperm and sperm DNA.
Chemicals	Exposure to certain pesticides and other chemicals.
Poor diet	A diet low in protective antioxidants, deficiencies in vitamins or minerals
Age	DNA fragmentation may increase with age.

Genetics	Issues with the folate cycle.
Medical conditions	Some conditions such as undiagnosed or poorly managed type II diabetes.
Medications	Certain medications can interfere with sperm production and health.
Alcohol	Reduces gonadotropin release, testicular atrophy and decreased testosterone and sperm production. (Sperm count, size , shape and motility).

Specialise semen analysis is an exceptional tool that allows your practitioner to identify issues and determine a specific, targeted, evidence-based plan to support healthy pregnancy outcomes.

UNDERSTANDING SEMEN ANALYSIS

The below explanations will assist you to understand your test results.

Total sperm count

This one marker can be misleading but is a good starting point. While having higher numbers doesn't necessarily equate with higher fertility, if the QUALITY of that sperm is poor, you can have as many as you like – it still won't get the job done.

Viscosity:

Measures the seminal fluid's resistance to flow. High viscosity may interfere with determination of sperm motility, concentration, and antibody coating of spermatozoa. Normally, semen coagulates upon ejaculation and usually liquefies within 15-20 min. In other words if viscosity is too high or too low it can impairs the sperms movement making it difficult for them to reach the egg and fertilize it.

Semen Ejaculate Volume

What Is It: Semen is made up of more than just sperm. In fact, less than 5% of semen is made up of sperm. Healthy semen includes fluid from the testes (which is where the sperm come from), from the seminal vesicles (which includes important nutrients for the sperm), from the prostate gland (which includes zinc-rich fluid to maintain DNA stability of the sperm), and from the bulbourethral glands (which contains a mucus to help the semen swim).

What Is Considered Normal: Normal semen ejaculate is between 1.5 millilitres to 6 millilitres of fluid. This is about one-third of a teaspoon to a little over a teaspoon.

What Might Be Wrong if Results Are Abnormal: Low semen volume may be caused by an obstruction of the vas deferens (the duct that carries sperm from the testicles to the urethra), absence or blockage of the seminal vesicle, partial retrograde ejaculation, or a hormonal imbalance. Low volume may also be caused by stress over the test. (Speak to your doctor if this is true for you.) An abnormally high volume may be caused by inflammation of the reproductive glands.

Total Sperm Number

What Is It: This is the total number of sperm found in provided semen sample.
What Is Considered Normal: About 39,000,000 (or 39 x 10^6) sperm per ejaculate is considered the lower acceptable limit. Having a lower than normal count of sperm is https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8751073/ sometimes called oligospermia. If no sperm cells are found, this is called azoospermia.

What Might Be Wrong if Results Are Abnormal: Having a lower sperm count may indicate a number of problems, including varicocele, (a hemorrhoid within the testes) an infection, chronic or undiagnosed health problems like diabetes or celiac disease, problems with ejaculation like retrograde ejaculation, duct problems, hormonal imbalances, and exposure to toxic substances.

Abnormally low sperm counts can also be caused by certain medications, recent illness accompanied by high fever, and exposure of the scrotum to heat (as in a hot tub). Smoking, obesity, and excess alcohol intake has been linked to low sperm count. Often, the cause for low sperm count is never found.

Azoospermia may be caused by a duct problem, a hormonal imbalance, or a problem with the testes.

Sperm count: The total number of sperm in entire ejaculate - This is more important than Sperm Concentration, since most of the ejaculate is composed of secretions of the seminal vesicle and prostate glands.

Sperm Concentration

What Is It: Sperm concentration is the number of sperm found in one milliliter of semen.
What Is Considered Normal: There should be at least 15,000,000 (or 15 x 10^6) sperm per millimeter.

What Might Be Wrong if Results Are Abnormal: Low sperm concentration may be part of an overall low sperm count, or it could be related to an abnormally high ejaculate volume. See above for more on these two issues.

Motility

What Is It: Motility is the percentage of sperm who move. For fertilization to occur, sperm must swim up the female reproductive tract to meet the egg. Being able to swim to their destination is essential. Total motility refers to any movement, while progressive motility refers to forward movement in either a line or in a large circle.

What Is Considered Normal: At least 40% of the sperm should be moving, and at least 32% should swim in a forward movement or in large circles.

What Might Be Wrong if Results Are Abnormal: Asthenozoospermia is the term used for poor sperm motility. Poor sperm motility may be caused by illness, certain medications, nutritional deficiencies, or poor health habits like smoking. Many of the causes of low sperm count can also cause poor motility. (See above.) Often the cause is never found.

Viability or Vitality

What Is It: Sperm viability refers to the percentage of live sperm in the semen sample. This is especially important to measure if sperm motility is low, so differentiate between live non-motile sperm and dead sperm.

What Is Considered Normal: At least 58% of the sperm cells should be viable.

What Might Be Wrong if Results Are Abnormal: Necrozoospermia is the term used when all sperm in the semen sample are dead. There are a variety of causes for necrozoospermia, including many of the same things that can cause low sperm count. (See above.)
Using a non-fertility-safe lubricant or regular condom can kill sperm, even if they don't contain spermicide. Be sure to disclose to your doctor if you used lubricant or a regular condom to produce your semen sample. There are fertility-approved lubricants and specialty condoms available for the collection of semen samples. Ask your doctor for more information.

Morphology

What Is It: Sperm morphology refers to the shape of the sperm cells. The lab technician closely examines a sample of sperm, checking to see approximately what percentage have a normal shape. The head, mid-section and tail are evaluated, as well as the measurements and proportions between each.

Before 2010, the World Health Organization had different requirements for sperm to be considered "normal" in shape. Labs may have evaluated sperm morphology according to the WHO criteria, or what is known as Kruger's Strict criteria. However, the 2010 WHO guidelines encourage the use of Kruger's Strict criteria, based on the research of Dr. T.F. Kruger and Dr. R. Menkeveld. Speak to your doctor to find out if they are using the outdated WHO criteria or Kruger's criteria.

What Is Considered Normal: At least 4% should have a normal shape.

What Might Be Wrong if Results Are Abnormal: Teratozoospermia is the term used for poor sperm morphology. Poor sperm morphology may be cause by the same things that can cause low sperm counts. (See above.)

Sperm morphology is poorly understood, and because the evaluation is somewhat subjective, scores can vary on the same semen sample, in the same lab, using the same scoring techniques. If sperm morphology alone is abnormal, but all the other semen parameters fall within normal limits, then male fertility may still be considered normal. Your lab will test for a breakdown of sperm morphology as a percentage.

Normal
Head defects
Mid piece defects
Amorphous forms
Cytoplasmic droplets

Tapered head sperm are sperm with “cigar-shaped” heads that may indicate the presence ofvaricocele in the male or constant exposure of the scrotum to high temperature locations such as sitting down all day , tight underwear, hot sauna.

Liquefaction

What Is It: When semen is ejaculated, it is thick and gelatinous. This is to help it adhere to the cervix. The semen eventually liquefies to enable the sperm to swim better.

What Is Considered Normal: Semen should liquefy within 20 to 30 minutes of ejaculation.

What Might Be Wrong if Results Are Abnormal: Delayed liquefaction may indicate a problem with the prostate, the seminal vesicles, or the bulbourethral glands, which are also known as the male accessory glands.

If delayed liquefaction occurs, your doctor may follow up with a post-coital test (PCT). This fertility test evaluates the woman's cervical mucus after sexual intercourse. If sperm are found and moving normally, the delayed liquefaction is not consider a problem.

White Blood Cells (WBC)

What Is It: White blood cells are the cells that fight infection in the body. All semen includes white blood cells.

What Is Considered Normal: The white blood cell count should be less than 1,000,000 per milliliter of semen, or 1.0 x 10^6 per ml.

What Might Be Wrong if Results Are Abnormal: A higher than normal white blood cell count is known as leukocytospermia, and it may indicate infection. However, some men may have leukocytospermia and not have any active infection or male fertility impairment. In fact, anywhere from 5 to 20% of men tested may be found to have leukocytospermia.

DNA FRAGMENTATION

Investigating the integrity of sperm behind the standard Semen analysis.
It is estimated that about 10-15% of males have alterations in the genetic material of the sperm they produce, whilst common parameters like count, motility, and morphology are normal.

DNA fragmentation refers to the presence of sperm with damaged (broken) DNA, which affects male fertility. Alterations of any kind in sperm DNA are likely to cause infertility in the man affected, as integrity of sperm DNA is key to obtaining viable embryos and subsequently a healthy baby.

Sperm DNA Fragmentation – Causes & Effect on Fertility
The higher the sperm DNA damage index, the lesser the chances of achieving an ongoing pregnancy.

For fertilization to result in viable embryos with implantation potential, it is necessary that the DNA of both egg and sperm are free from damage and other lesions.
High DNA fragmentation rates can translate into:

- Reduced fertilization rates
- Poor embryo quality
- Reduced implantation rates
- Increased miscarriage rates
- Poor-quality embryos
- Varicocele
- Recurrent pregnancy loss
- Men who are 45 or older
- Chronic diseases like diabetes

Causes

Over the past few years, evidence has shown that about 25% of infertile men have high levels of sperm DNA fragmentation after doing a sperm DNA fragmentation test. Many factors can cause sperm DNA to be damaged, including:

Heat: high scrotal temperature (due to episodes of high fever, presence of a varicocele, hot working environments, cycling, or wearing too tight clothes)
Seminal infections.

Alcohol: consumption of two or more drinks per day has a damaging effect on sperm DNA
Smoking: men who smoke have a decreased sperm quality. In fact, smoking can increase the concentration of sperm with damaged DNA.

Advanced age: DNA fragmentation increases dramatically with age, especially from age 45 onwards.

Caffeine: Studies have shown that consuming three or more cups of coffee per day (approximately 300mg caffeine) can damage sperm DNA. This is because caffeine is an effective inhibitor of the cell to repair DNA.

Recreational Drugs and Medications: Several illicit drugs have been linked with infertility, including marijuana, cocaine, methamphetamines, opioid narcotics, and anabolic steroids. Short term use can lead to a reduction in sperm quality and libido. Chronic use increases the chance that permanent damage will result. In the case of cocaine, residual effects can be seen for up to two years from last use. Medications such as chemotherapy drugs, those used to treat high blood pressure, an overproduction of stomach acid, gout, urinary tract infections, inflammation, certain types of antibiotics, seizures, fluid retention and methadone all lead to a decrease in sperm quality.

Pollution, Toxins and Radiation: Environmental exposure to pollutants such as dioxin, as well as pesticides and herbicides has been shown to cause sperm DNA damage. Occupational exposures to metals, paints, solvents, degreasers, non-water-based glues can also have a detrimental effect on DNA quality.

Treatment

Not all causes of sperm DNA fragmentation are treatable or can be cured. In all other cases, treatment based on antioxidants is typically enough to improve sperm quality.

Oxidative stress caused by an increased number of free radicals in the man's organism causes damage to sperm DNA. For this reason, lifestyle/dietary changes and the use of antioxidants for 2-3 months can help reduce the levels of sperm DNA fragmentation.

On the other hand, seminal infections should be treated with antibiotics to reduce the levels of sperm DNA fragmentation. Surgery to treat varicocele also improves sperm DNA integrity and subsequently boost male fertility.

Effect on pregnancy

The fact that a man has elevated levels of sperm DNA fragmentation does not mean that conceiving naturally is impossible. However, the chances of success decrease due to all the reasons explained above.

If the fragmentation index is rather low, it is possible that the egg fixes the damage by itself after fertilization. Although this mechanism of action is still to be studied, it depends highly on the type of damage and egg quality.

In spite of all this, patients with a percent of sperm DNA fragmentation above 30% should go directly for IVF with ICSI treatment, also known as IVF-ICSI.

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