

# InfoSheet : POOR SPERM QUALITY

## INTRODUCTION

A semen analysis will report the volume of the ejaculate and the concentration of sperm (in millions per millilitre) as well as observations on the motility, vitality and morphology of the sperm. Motility will refer to proportions that are motile (i.e. moving) and progressive (i.e. are swimming well), and might sometimes use classifications into grades *a* through *d*. *a* and *b* rapid and slow are progressive respectively, and these are the sperm that stand a chance of getting into the cervical mucus. The vitality assessment identifies those sperm that are alive, regardless of whether they are motile (an important piece of information is some cases of severe male subfertility). Morphology relates to the shape and structure of the sperm, and will report the "percent normal forms", i.e. the proportion of sperm that have the shape and structure typically associated with sperm that are able to penetrate cervical mucus and fertilize eggs. The prevalence of particular types of abnormal sperm, or other indices might also be reported; interpretation of these values requires expert knowledge, especially since the cut-offs used vary greatly between labs since the methods and standards used to examine the sperm can be quite different.

Oligozoospermia is used to describe a semen analysis where the sperm concentration is below 20 million/ml. Asthenozoospermia is used to describe poor sperm motility (below 50% progressively motile sperm or below 25% rapidly progressive sperm). Teratozoospermia describes samples with poor sperm morphology, although interpretation of these results requires specialized knowledge.

These conditions often occur in combination, so oligoasthenozoospermia means low count and poor motility, while oligoasthenoteratozoospermia (sometimes called the "OAT syndrome") means that the count is low and that both the sperm motility and morphology are abnormal.

These jargon terms are used to describe what is seen in the semen analysis, but in many cases no specific cause of the problem(s) can be found. This means that a description like this is not, in fact, a diagnosis. Some

causes that are commonly associated with abnormal semen analysis findings include:

- Endocrine (hormonal) disorders
- Varicocele
- Cryptorchidism
- Genetic disorders
- Infections of the male genital tract
- Antibodies against sperm and other problems of auto-immunity
- Certain drugs
- Heat
- Toxins
- Partial obstructions of the ducts that carry the sperm to the outside
- Prolonged periods of sexual abstinence
- Injury to the testes
- Structural defects of the sperm

Each of these problems is explained briefly below, including some discussions of the more common conditions.

## Endocrine (hormonal) abnormalities

Normal sperm production depends on an intact hypothalamo-pituitary gonadal axis (the system of linkages between the brain, pituitary gland and testes).

- Testicular failure can be caused by a number of problems, including cryptorchidism, Klinefelter syndrome, chemotherapy, radiotherapy or toxins and is typically associated with elevated levels of follicle stimulating hormone (FSH).
- Congenital or acquired absence of gonadotrophins can also cause subfertility. For example in the case of Kallman syndrome, head injury, pituitary tumours or inappropriate use of anabolic steroids).
- High levels of prolactin can also interfere with this axis and lead to subfertility.
- Hypothyroidism (i.e. low thyroid activity) can also be associated with subfertility.

- In hypogonadotropic hypogonadism the FSH, LH and testosterone levels are all decreased, and the man is essentially the same as a boy before he goes through puberty.

## Varicocele

Although somewhat controversial, varicoceles can be associated with oligoasthenozoospermia (see explanation on the previous page). In the general population about 15% of adult men have a varicocele, whereas 40% of infertile men have one.

Several mechanisms have been proposed for the effects of varicocele on subfertility and the efficacy of many treatments has been questioned by many authorities. Varicoceles can lead to significant increases in the generation of free radicals and reductions in antioxidant activities, and these effects might be reversed by treatment of a varicocele.

## Cryptorchidism (undescended testis)

This condition is present in approximately 4% of full term male infants. If left alone, this condition may lead to testicular defect and subfertility.

## Genetic disorders

Genetic disorders commonly associated with severe oligozoospermia include:

- Abnormal karyotypes (the number and structure of your chromosomes);
- Micro-deletions of the Y chromosome; and
- Abnormalities in the cystic fibrosis gene.

## Infections and Pyospermia

The presence of more than 1 million/ml white blood cells (leukocytes) in semen is called "pyospermia" and is indicative of an infection in the male genital tract. Pyospermia is often associated with disorders of sperm function. Besides the well-known sexually transmissible diseases (STDs or venereal diseases) common infections include *Streptococcus fecalis*, *E. coli*, *Chlamydia* and *Ureaplasma*.

## Auto-immunity and anti-sperm antibodies

Risk factors for the development of antibodies against sperm include conditions that may disrupt the blood testis barrier, such as mumps orchitis (i.e. damage to the testes occurring after mumps), epididymitis

(inflammation of the epididymis), cryptorchidism (failure of the testes to descend into the scrotum at puberty) and injury. These problems can lead to sterility.

In addition, antibodies might be produced against sperm and these can be detected in the blood or seminal plasma (the liquid part of the semen) or on the sperm themselves. Diagnostically speaking, the most important place to find them is actually bound to the sperm in the ejaculate. Anti-sperm antibodies may be detected in as many as 10% of infertile men.

Lastly, women can also produce antibodies against sperm, either secreted in the cervical mucus (where they will block sperm migration) or in the fluids of the uterus and fallopian tubes (where they can attach to the sperm and hinder fertilization).

## Fever

It has been shown that fever episodes can lead to a 7% decline in sperm counts and up to a 23% decline in motility 2 to 6 weeks after the episode. It takes up to 3 months for sperm tests to return to normal.

Recent studies have also shown that a single bout of fever can cause dramatic damage to the DNA inside the sperm heads: this will not cause the production of abnormal babies, but will likely cause poor embryo quality or block embryo development so there will be fewer, or no, embryos to transfer

## Chemotherapy, radiation and toxins

Risks here include radiation, smoking, drugs (both recreational and some medications) and exposure to other toxic substances that affect the testes ("gonadotoxins"). Common gonadotoxins include cocaine, marijuana, excessive hot tubs, excessive intake of alcohol and anabolic steroids.

## Obstructive oligozoospermia

Obstruction of the ducts that carry the sperm from the testes to the outside is a common cause of azoospermia (where there are no sperm at all in the ejaculate) and partial obstruction is found in 7–12% of all infertile men. Obstructions can occur at different, and even multiple locations.

These obstructions can be present since birth ("congenital" defects) or might be acquired subsequent to infection. Typically there will be a low volume ejaculate, which is also fructose negative.

Diagnosis of obstructions is confirmed by vasography or seminal vesiculography. Trans-rectal ultrasound can also be useful in diagnosing the cause. Dilatation of the ejaculatory ducts, the presence of prostatic cyst and calcification and dilatation of seminal vesicles can also be associated with this problem.

## HISTORY TAKING

The following factors can be important and should be discussed at your first interview:

- Lubricants are often associated with subfertility. Products that do not interfere with sperm function include vegetable oil, peanut oil, saliva and raw egg. A new product called Pre-Seed is the first "sperm-friendly" lubricant and was designed specifically for couples trying to conceive ([www.drugstore.com](http://www.drugstore.com)).
- Prolonged abstinence decreases sperm motility.
- High grade fever can produce oligozoospermia and damaged sperm DNA for up to 3 months.
- History of sexually transmitted infections.
- Childhood illnesses such as mumps.
- Testicular trauma and torsion because they can lead to decreased sperm production.
- Occupational history, especially any jobs where you might have been exposed to gonadotoxins.

## PHYSICAL EXAMINATION

Patients should be examined for signs of androgen deficiency, and the testes and prostate examined.

## LABORATORY INVESTIGATIONS

- **Semen analysis:** While a semen analysis by a standard pathology laboratory can give some clues as to the risk of a male factor in a couple's subfertility, more comprehensive testing is usually required. At VFC we perform a more detailed sperm functional assessment that includes looking for anti-sperm antibodies. If there are signs of infection then semen cultures will be required as well.
- **Endocrinological evaluation:** Serum testosterone and FSH levels. If the testosterone level is low then measurements of LH, prolactin and estradiol as well.
- **Transrectal ultrasound:** This will be needed if the ejaculate has a low volume and the man has palpable vasa deferentia.

## MANAGEMENT

### Surgery

This might include:

- Varicocelectomy
- Microsurgery for genital duct obstruction
- Possible surgery for brain tumours, etc.

### Medications (pharmacological therapy)

This will obviously depend on the identified problem. The most successful treatment of this type is pulsatile GnRH analogue or gonadotrophins for hypogonadotropic hypogonadism, a very specific problem that affects a very small number of men.

### Empirical therapy

Some men with idiopathic oligozoospermia might benefit from a variety of empirical medical treatments, although these are not generally considered to be reliable forms of treatment for the majority of patients. The following might be tried for a minimum of 3 to 6 months:

- Clomiphene or Tamoxifen might be effective, but are very controversial.
- Gonadotropins are also very controversial.
- Testosterone rebound therapy. This involves giving high doses of testosterone in an attempt to suppress the hypothalamic-pituitary gonadal axis, and then stopping the therapy in the hope that the system will rebound and improve the production of sperm. Another highly controversial and suspect form of treatment.

### Miscellaneous treatments

Attempts to correct dietary imbalances include taking vitamins and antioxidants.

### Assisted Reproduction Technology or "ART"

This includes intrauterine insemination of washed sperm (IUI) and IVF/ICSI. For men with severe oligozoospermia or azoospermia, sperm might be obtained surgically from the epididymis ("MESA" or "PESA") or directly from the testes ("TESE").

See separate VFC InfoSheets on these subjects.

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