

# Male Infertility

updated May 2011

About 15 per cent of couples do not achieve a pregnancy within 12 months of trying to have a child. In up to 50 per cent of these couples the man may have a disorder which accounts for, or contributes to, the low fertility. Thus medical investigation of infertility should, from the outset, involve both the man and the woman.

## Requirements for normal conception

- Production of sufficient numbers of normal sperm – normal in both structure and motility (ability to swim)
- Transport of the sperm through the male genital tract and deposition in the female genital tract, usually near the cervix of the uterus during sexual intercourse
- Normal oocyte (egg) production – ovulation – by the ovaries
- Transport of sperm within the female genital tract to the site of fertilisation in one fallopian tube
- Transport of the oocyte from the ovary to the site of fertilisation in one fallopian tube
- Penetration of sperm into the oocyte – fertilisation – and development of a pre-embryo
- Transport of the embryo to, and implantation in, the uterus.

## Infertility tests

Infertility is a disorder of a couple, and so both partners must be investigated. For the man, medical history, clinical examination and semen tests are usually all that is necessary. Several semen tests are performed because the results may vary considerably from day to day. Blood tests may be needed to check for sperm antibodies, hormonal abnormalities, and genetic or chromosomal disorders. Ultrasound examination of the testes and prostate, testicular biopsies and exploratory operations are sometimes performed to check sperm production and look for blockages.

## Emotional reactions to infertility

People have many different emotional reactions when their fertility is questioned. Common reactions to a diagnosis of infertility include: surprise, disbelief and denial of the problem, anger with the partner and medical attendants, resentment of the

need to participate in infertility tests, feelings of depression, loss of self-esteem, marital disharmony, and temporary sexual problems, such as loss of interest and poor erections. These feelings and reactions are essentially normal initial psychological aspects of grief. These problems decrease with time as an understanding of the infertility is achieved.

Some couples may be helped by discussions with their doctor or other infertile couples in self-help groups. Specialist infertility counsellors are also available to assist couples in adjusting to the diagnosis of infertility and to explore the medical and social options.

## Male genital tract

The male genital tract consists of the testes, a system of ducts and some other glands opening into the ducts. The testes produce sperm and the male sex hormone, testosterone. Sperm are produced by repeated division of cells in small coiled tubules within the testes at an average rate of approximately 100 million per day in healthy young men.

Sperm production is a lengthy process – from the beginning of division of the stem cell to the appearance of mature sperm in the semen takes about three months.

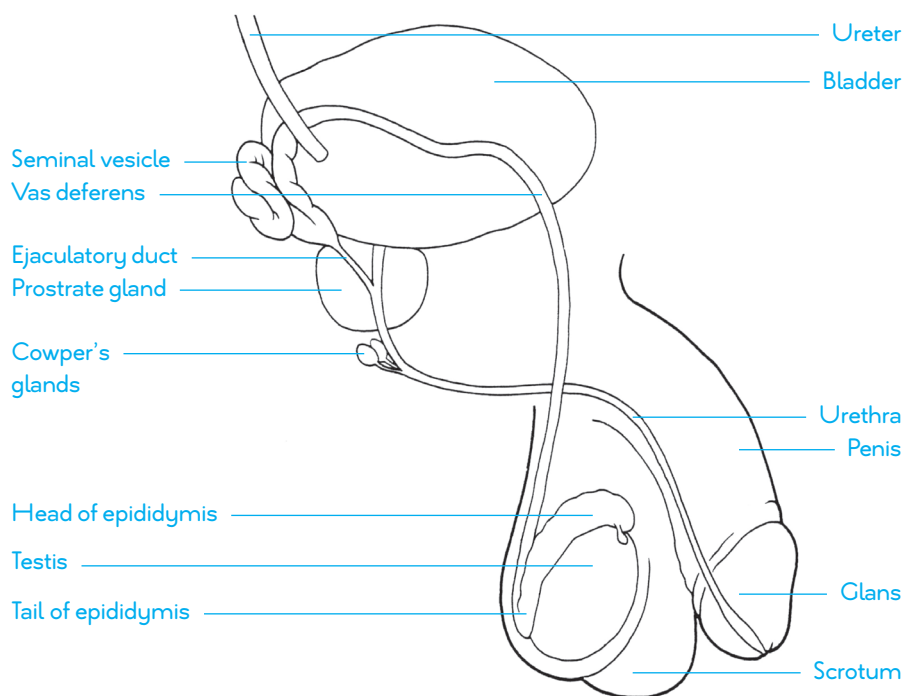
Leading from each testis is a long highly coiled tube called an epididymis. The sperm spend two to ten days passing through the epididymis, during which time they mature and become capable of swimming and penetrating oocytes. At the beginning of ejaculation sperm are transported from the tail of the epididymis via the vas deferens to the urethra.

The seminal vesicles, prostate gland and Cowper's glands secrete most of the volume of semen – these secretions help deliver the sperm during ejaculation. The volume of liquid coming from the two epididymides is less than five per cent of the total semen volume. About 60 per cent of the semen volume comes from the seminal vesicles and 30 per cent from the prostate gland.

The average semen volume for healthy men ejaculating every two days is three millilitres, and the sperm concentration 85 million per ml. During ejaculation, usually the sperm and the prostatic fluid come out first and the seminal vesicle fluid follows. The seminal vesicle fluid coagulates giving the semen a lumpy gel-like appearance. Liquefaction occurs after 20 minutes or so and the gel disappears.

Under usual conditions with sexual intercourse during the fertile phase of the woman's menstrual cycle, sperm quickly enter cervical mucus and ascend the uterus and fallopian tubes to the site of fertilisation in the outer third of the tube. Sperm require motility (swimming ability) to get into cervical mucus and to penetrate the outer coverings of the oocyte. They also require normally shaped heads to bind to the surface of the oocyte.

In addition, release of enzymes from the acrosome on the head of the sperm and vigorous motility are needed to penetrate into the oocyte.



The function of the testes is dependant upon hormones from the pituitary gland, follicle stimulating hormone (FSH) and luteinizing hormone (LH). The blood levels of these hormones rise during the early stages of puberty and stimulate testicular development. LH controls production of the male sex hormone testosterone which in turn is responsible for the growth that occurs at puberty: development of the genitals, beard and body hair, prostate and seminal vesicles, and also development of bone and muscle and other aspects of masculine physique.

If LH and FSH are deficient, the testes do not develop or function properly. In contrast, if the testes are damaged directly, the levels of these hormones in the blood rise. Thus the measurement of FSH, LH and testosterone in blood may help in the diagnosis of testicular disorders.

## Types of male infertility and treatment

The results of a physical examination and tests help determine whether or not a treatable condition exists. In Melbourne infertility clinics, approximately 12 per cent of men have untreatable sterility, 13 per cent have treatable conditions, and 75 per cent have disorders of sperm production or function which do not usually have clearly defined effective treatments.

### Untreatable Male Sterility: 12%

- Primary seminiferous tubal failure 12%

The 12 per cent of men with untreatable sterility have no sperm in their semen (azoospermia) or in the testes, because the sperm producing cells in the testes either did not develop or have been irreversibly destroyed (primary seminiferous tubal failure). This may be caused by chromosomal or genetic defects, inflammation of the testes and treatment with certain drugs, or associated with

failure of the testes to descend into the scrotum during childhood. Adoption or donor insemination are the only possibilities for couples in this category to have a family.

Some men with failure of sperm production do not produce normal amounts of the male sex hormone, and their general health and sexual performance is improved by treatment with testosterone.

## Treatable Conditions: 13%

### ••• Gonadotrophin deficiency 0.5%

Deficiency of the two hormones from the pituitary gland which control testicular function; luteinizing hormone (LH) and follicle stimulating hormone (FSH), can be treated by injections of hormone preparations. Usually the testes increase in size and produce testosterone in normal amounts. Sperm may appear in the semen after several months of treatment. At least 50 per cent of the partners of such men conceive during treatment, but the treatment often needs to be given for many months. Also it must be repeated for each pregnancy unless adequate sperm can be collected during the first course of treatment and stored frozen for later use. This hormone deficiency affects less than one per cent of infertile men. Other treatable hormone deficiencies are even more rare.

### ••• Obstructive azoospermia 6%

Approximately six per cent of men have blockages in the genital tract that prevent the passage of sperm between the testes to the penis and result in absence of sperm in the semen.

There are three major groups of causes of male genital tract blockages:

- Disorders of development of the epididymis, vas and seminal vesicles
- Scarring from inflammation (especially gonorrhoea), and
- Vasectomy

Rarely other blockages may occur in the vas and ejaculatory ducts.

Some patients can be treated with bypass surgery, joining the tube in the epididymis above the blockage to the vas deferens. The results depend on the level of the blockage, being poor with blockages close to the testis. This is partly because the sperm are immature, having not passed through parts of the epididymis in which maturation usually occurs. With blocks in the tail of the epididymis or vas, sperm appear in the semen of up to 80 per cent of men after surgery, although only about half of these produce pregnancies within one year.

It is possible to obtain sperm by a surgical operation from the tubes above the obstruction, by sucking liquid out of the epididymis or epididymal cysts through a needle or from a testicular biopsy. These sperm can be used for intracytoplasmic sperm injection (ICSI) with in vitro fertilisation (IVF, see below). This approach is particularly useful for: absence of the vasa deferentia, high epididymal obstructions for which the results of surgery are predicted to be poor, and failures of vasectomy reversal or other operations.

### ••• Sperm autoimmunity 6%

Sperm antibodies are normally produced in response to introduction of foreign material, such as bacteria, into the body and are protective. However, antibodies to sperm develop in many men after vasectomy and may interfere with fertility after vasectomy reversal operations. Antibodies are also found in about six per cent of other infertile men, some of whom have had injuries to the genital tract that may have caused the immunity against sperm. However in most, the reason why the sperm antibodies develop is not obvious. The sperm antibodies are often present in the blood as well as in the semen and coating of the sperm.

The antibodies may reduce fertility at several levels: such as interference in the sperm production and reducing sperm numbers in the semen, causing clumping together of sperm, reducing sperm motility, preventing sperm from swimming through the liquid in the female genital tract including cervical mucus, and interfering with the process of fertilisation. Men with sperm antibodies and sperm which will not penetrate normal mid-cycle cervical mucus, are severely infertile and rarely produce pregnancies without treatment. Treatment with cortisone-like drugs for several months will reduce the antibody levels, increase sperm motility and mucus penetration and also increase fertility. Overall, approximately 25 per cent of female partners conceive while the man is being treated. Other pregnancies may follow artificial insemination with sperm stored during the treatment. As well as the relatively low success rate there can be unpleasant and serious side effects from cortisone treatment. ICSI is an alternative approach.

### ••• Disorders of sexual function 0.5%

In a small number of couples (less than one per cent) disorders of sexual function are the only reason for the infertility.

Disorders of sexual function include: failure of sexual intercourse because of inadequate penile erections (impotence), failure of ejaculation, retrograde ejaculation and low frequency or mistiming of intercourse. With retrograde ejaculation, the tube between the bladder and penis does not close during ejaculation so that semen passes into the bladder instead of out via the urethra. Occasionally these conditions respond to treatment, but most often they do not. However if adequate sperm can be obtained by masturbation, nocturnal emission, vibroejaculation or electroejaculation, artificial insemination of the woman may be successful in producing a pregnancy. If the semen quality is reduced ICSI may be a more efficient method of treatment.

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## Reversible conditions 0.02%

Sometimes there are obvious factors contributing to the poor results of sperm tests: incorrect sperm collection techniques, such as too short or too long an interval since previous ejaculation, recent illness, such as influenza, inflammation in the genital tract such as epididymitis or prostatitis, heavy alcohol or social drug consumption, obesity, frequent hot spa baths or saunas, use of anabolic steroids, social drugs and certain medical treatments. Removing the cause can result in improvement of semen quality within a few months.

## Untreatable Subfertility: 75%

### Oligozoospermia 35%

### Asthenozoospermia and Teratozoospermia 35%

### Normozoospermia with functional defects 5%

Three quarters of men investigated for infertility have sperm present in the semen, but lower numbers than normal – oligozoospermia (35 per cent); or adequate numbers, but with reduced motility (asthenozoospermia), abnormal morphology (teratozoospermia) or both (35 per cent). A few (5 per cent) have normal semen tests (normozoospermia) but there are abnormalities which impair the fertilising ability of the sperm.

At the present, very little is known about the mechanisms by which sperm production and function are reduced either in men with an obvious cause such as previous undescended testes or inflammation of the testes, or in men who have no apparent cause for the problem. There are also men in the general community with poor sperm test results who have no major problems producing pregnancies.

## Other Conditions Associated with Infertility

Dilated veins in the scrotum (varicoceles) are often present in men (20 - 40 per cent).

Also not uncommon are: previous testicular injuries; minor hormone disorders; surgery for torsion (twisting) of the testis; failure of descent of testes; and past episodes of inflammation of the testes, epididymis, prostate or urethra that may have been sexually transmitted. These conditions may cause or contribute to the poor semen quality, but it has not been proved that treatments improve the semen test results and increase fertility.

There are some genetic causes of male infertility that may need investigation and genetic counselling about the risks of having children with similar infertility or other health problems, for example cystic fibrosis with bilateral congenital absence of the vas. Genetic defects, such as microdeletions on the long arm of the male determining Y chromosome and other yet to be discovered mutations, are responsible for some of the more severe defects of sperm production or function and these defects may be transmitted directly to sons or to future generations.

Factors often suspected as being significant such as tobacco smoking, moderate alcohol intake, quality of diet, exercise, mental stress and anxiety, exposure to environmental toxins and exposure to heat as a result of wearing tight underpants are of uncertain relevance as causes of disorders or sperm production or function. Changing lifestyle may be important for good health in the long term, but there is usually no consistent marked change in the semen test results.

## Management

### Combination of Male and Female Disorders

The female partners of men with reduced sperm numbers or function often have disorders such as irregular ovulation, endometriosis or tubal blockages which contribute to the infertility. As might be expected in infertile couples, problems with the woman are found more often when the man has less severe abnormalities. It cannot be overemphasised that

both partners in the infertile couple must be investigated in detail. Abnormalities in the woman should be corrected where possible even though there is no effective treatment for the semen abnormality. Treatments commonly used such as ovulation induction with or without artificial insemination and IVF mainly involve the female.

## Ineffectiveness of Treatment

Many treatments have been used in attempts to remedy reduced sperm output or function in the past. Such treatments include: operations for varicoceles, nutritional supplements, drugs which alter hormone levels and artificial insemination with husband's semen. None of these have been proved to increase pregnancy rates.

There are problems in assessing the success of treatment of infertile men. First, semen test results are very variable from day to day within the one man so that an apparent increase in sperm number (for example, from 3 to 20 million per ml) may result from a chance fluctuation that has nothing to do with the treatment the man happens to be taking at the time. Second, the patients are subfertile, not sterile; pregnancies occur, but at a lower rate than normal. Thus if a pregnancy occurs during treatment, it may not necessarily be due to the treatment. To demonstrate that a treatment is effective, it must be shown that semen tests improve more often and pregnancy rates are higher than with similar men given no treatment.

## Outlook for Fertility

In the general community, average pregnancy rates are about 20 per cent per month. That is, of women trying to conceive; about one in five is successful in the first month, one in five of the remainder successful in the second month, one in five of the remainder successful in the third month etc. However, the rate drops with time, so that approximately 50 per cent of couples conceive within four or five months, and 85 per cent within one year.



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When couples in which the man has poor semen tests are followed over several years, a proportion conceive naturally whether or not they have been treated. In a large group of infertile men seen in Melbourne who had at least some motile sperm in their semen and whose wives were not sterile, the pregnancy rate was approximately four per cent per month for the first few months. Overall, 30 per cent of the female partners conceived in one year and 45 per cent by two years. Factors, which were related to the pregnancy rates, were as follows:

• Sperm number – the higher the sperm concentration in semen the higher the pregnancy rate, see table

Average sperm concentration million/ml	% pregnant after 1 year	% pregnant after 2 years
<2	15	21
2-5	20	38
5-20	30	46
20-100	37	55
>100	47	61

• Length of time the couple had been trying to produce a pregnancy i.e. the longer the period of infertility, the lower the pregnancy rate

• Age of wife – the older, the lower the pregnancy rate

• Previous pregnancy in the couple (same woman and man) is associated with a higher pregnancy rate than in couples with no previous pregnancies

Pregnancy rates can be predicted from these factors so that patients can be advised about their chances of producing a pregnancy. This should enable a couple to make plans

regarding the length of time they would like to try themselves before changing to other alternatives such as IVF or donor insemination. Other factors being equal, those with better chances of conceiving spontaneously should try longer than those with little chance of having a child of their own. However, this must be balanced against the added stress of further waiting and hoping for a pregnancy where the chances of success are low.

## In Vitro Fertilisation (IVF)

IVF produces moderately good results for couples with male infertility. Standard IVF procedures produce good fertilisation rates unless the sperm morphology, motility or concentration is very low, or there is a specific defect of the fertilisation process. For severe semen abnormalities, for example, if there are less than two million normal motile sperm in the semen, sperm morphology is >95 per cent abnormal or sperm are obtained from above obstructions in the genital tract, there is a substantial chance of failure of fertilisation with standard IVF. In these situations ICSI is used to improve the chances of fertilisation occurring.

The live birth pregnancy rate following IVF declines with increasing numbers of transfers but averages 5 to 12 per cent per embryo transferred either fresh or after storage frozen. Usually one, or at most, two embryos are transferred at a time. The cumulative chance of a successful pregnancy is about 13 per cent after one transfer, 22 per cent after two transfers, 31 per cent after three transfers and 50 per cent after six transfers. Other factors affecting the success of IVF include female age (with a decline after 35 years), quality and number of cells in the embryos and previous successful IVF treatments.

## Intracytoplasmic Sperm Injection (ICSI)

ICSI is now the method of choice for treating severe sperm problems. With this technique a single sperm is injected into the substance (cytoplasm) of each oocyte

with a fine glass needle. This procedure may also be applied to situations where fertilisation could fail because of sperm antibodies or certain specific disorders of sperm motility, shape or function. Provided that a live sperm can be found for each oocyte good results can be obtained with average normal fertilisation rates the same as those for normal semen in standard IVF.

## Research

Research is being conducted to determine the causes of male infertility and you may be contacted to volunteer to provide additional semen samples or blood to check for specific gene defects as tests for these become available in the future.

Specimens of semen, blood or tissue collected for diagnostic purposes may also be used for research purposes. If you have any objection to this please let your doctor or the laboratory know so the remaining portions of samples will be discarded and not used for research purposes.

## Follow-up

Information about pregnancies, including the precise timing of conception and the outcome and the number of months trying during which the pregnancy could have occurred, is very valuable for determining which factors are useful for predicting pregnancy rates. It is important that contact between the couples and the doctor is maintained and that the information is accurate, for example pregnancies occurring from donor sperm must not be attributed to the male partner.

## Second opinions

If you would like to have any aspect of your case reviewed by other doctors or clinics, ask to have a summary of the medical notes and copies of the results of tests sent to them or to you. Your doctor will usually be quite happy to do this and to refer you to other infertility experts. It is most important that you are satisfied that everything has been done to help you.

## For Further Information

### AccessAustralia:

Australia's National Infertility Network  
PO Box 6769,  
Silverwater,  
NSW 2138

[www.access.org.au](http://www.access.org.au)

## Information about Adoption

### Catholic Care

[www.ccam.org.au](http://www.ccam.org.au)

### Intercountry Adoption Service

[www.dhs.vic.gov.au](http://www.dhs.vic.gov.au)

(see websites for other states)

Patient Information sheet  
provided by Dr HWG Baker

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