

What is assisted reproductive technology (ART)?



ART refers to technologies and associated methods used to assist people in achieving a pregnancy.

ART is used:

- as infertility treatment for couples
- by women who can not become pregnant without treatment
- by women who can not carry a baby in pregnancy or give birth without treatment
- to reduce the chance of a child inheriting a genetic disease or abnormality.

What is ART?

ART covers a wide spectrum of technologies. Simple techniques are often attempted initially, as they are less invasive than more advanced options.

These techniques include:

- ovulation induction
- artificial insemination, also known as intrauterine insemination
- donor insemination.

Advanced techniques are:

- in-vitro fertilisation (IVF)
- intracytoplasmic sperm injection (ICSI)
- pre-implantation genetic diagnosis (PGD).

Counselling is provided to ensure that people are fully aware of their treatment's process and any associated risks.

How eggs are naturally formed in the female body

It is useful to understand how eggs are normally formed in a woman's body to understand which stage is being targeted in the relevant ART method. The pituitary gland in the brain regulates the menstrual cycle by producing two hormones: follicle-stimulating hormone and luteinising hormone. The follicle-stimulating hormone stimulates the growth of several follicles in the ovaries, which are fluid-filled sacks containing one egg in each. As the follicles grow, one becomes dominant and the other follicles stop developing. Eventually, the luteinising hormone is released by the pituitary gland, and this causes the egg to mature. When the follicle bursts and releases the egg, ovulation has occurred. The fallopian tube captures the egg, which may then be fertilised by sperm.

How sperm is naturally formed in the male body

It is also useful to understand how sperm is normally formed in a man's body to understand why sperm-related issues may arise. Sperm are formed in the testes, which are a pair of egg-shaped glands that are suspended in the scrotum. In the testes, cells divide over and over again to produce sperm. The sperm is then released into the epididymis, which is a long coiled tube where the sperm spends two to ten days maturing. When ejaculation begins, the sperm then moves on through to the urethra in the penis.

This process is regulated by the pituitary gland, by controlling the release of both luteinising hormone and follicle stimulating hormone into the bloodstream. The luteinising hormone aids in the production of testosterone, which together with the follicle stimulating hormone, stimulates the production of sperm.

Simple techniques

Ovulation induction

Ovulation induction may be used by women who are not ovulating or are not ovulating regularly, or who are producing only low levels of hormones that are required to enable her to conceive. Ovulation induction involves taking a hormone medication (oral tablet or injection), which stimulates the production of follicle-stimulating hormone. This encourages the development of one or more follicles. When the follicles are large enough, another hormone is administered which releases the egg from the follicle. If the couple has intercourse around this time, the chances of conception are greatly increased.

Artificial insemination or intrauterine insemination

Artificial insemination, also known as intrauterine insemination, is used to treat women who have normal and healthy fallopian tubes, but for some reason can not achieve conception. This may be due to mechanical difficulties with intercourse – for example a man is not able to achieve an erection or has structural problems of the penis after trauma or surgery. Artificial insemination might also be used when semen has been frozen because of a male partner's absence or before cancer treatment.

The process of artificial insemination involves insertion of a male partner's semen through the female's cervix and into the uterus at or near the time of ovulation. This procedure can be performed during a natural menstrual cycle, or hormonal stimulation can be used if the woman has irregular menstrual cycles.

It is also possible to conduct artificial insemination at home, and most ART clinics will provide information as to how to do this.

If a few attempts with artificial insemination do not achieve pregnancy, the use of IVF or ICSI may be discussed. See below for information regarding these procedures.

Donor treatment

There are several ways that donor sperm, eggs, or embryos can be used to facilitate ART treatments.

Donor insemination

Donor insemination using the sperm of a donor is utilised when:

- a male partner does not produce sperm, or
- a male partner does not produce normal sperm, or
- there is a high risk of a man passing on a genetic disease or abnormality to a child.

Donor insemination may also be used as part of IVF for single women, or women in same-sex relationships. The process of donor insemination is the same as artificial insemination (as outlined above), but the sperm used is that of a donor, rather than the male partner within a relationship.

What is ART?

Donor eggs

Treatment with donor eggs is possible if a woman can not produce eggs or her eggs are of low quality. This may occur due to age or premature ovarian failure (where the woman has stopped producing eggs). Use of donor eggs may also be an option in cases of recurrent miscarriage, or if there is a high risk of the woman passing on a genetic disease or abnormality to a child. In these cases, the egg donor undergoes the initial steps of IVF to collect her eggs. When this has been done, sperm from the male partner of the recipient woman, or donor sperm, will be combined with the donor eggs. Two to five days later, when embryos are formed, embryo transfer will be carried out and an embryo will be inserted into the woman's uterus. Hormone tablets must be taken in preparation for the embryo transfer, and for approximately 10 weeks after the embryos have been transferred.

Donor embryos

Treatment using donated embryos is also possible if a person or couple needs donor sperm and donor eggs. Although rare, some couples choose to donate frozen embryos that they no longer need (after IVF procedures, for example) for use by people undergoing IVF. The embryo is transferred into a woman's uterus in the few days after ovulation occurs.

Advanced techniques

In-vitro fertilisation (IVF)

Technically, IVF is the name given to any process used to conceive a child outside the body. IVF is used in a range of circumstances to assist with conception but is often the sole means of achieving pregnancy for women whose fallopian tubes are damaged or blocked due to disease. As a result of the damage or blockage, there is an obstruction between the egg and sperm, and IVF is required to allow this fertilisation to occur.

In IVF, the woman's eggs are collected, along with sperm from the male partner or donor. The egg and sperm are left in a culture dish in a laboratory to allow the egg to be fertilised by the sperm. This creates an embryo, which is then placed back into the woman's uterus in a procedure called the embryo transfer.

Sometimes more than one embryo develops in the laboratory, and it is possible to freeze these embryos for use in later transfer procedures.

Gamete intrafallopian transfer (GIFT)

GIFT was launched as a more 'natural' version of IVF. Instead of fertilisation occurring in a culture dish in a laboratory, the woman's eggs are retrieved from her ovaries and inserted between two layers of sperm in fine tubing. This tubing is then fed into one of the woman's fallopian tubes, where the egg and sperm are left to fertilise naturally.

These days, GIFT is very rarely used. However, it may be used as an option for couples who don't want to use IVF for religious reasons, providing that the woman's fallopian tubes are functioning.

Intracytoplasmic sperm injection (ICSI)

ICSI is used for the same reasons as IVF, but especially when a man has sperm-related problems such as low sperm count. Essentially, ICSI follows the same process as IVF, except ICSI involves the direct injection of a single sperm into each egg to achieve fertilisation. After this, the process is exactly the same as described for IVF.

Pre-implantation genetic diagnosis (PGD)

PGD is largely used as a means for reducing the risk of an individual or couple passing on a specific genetic or chromosomal disease or abnormality to their child. PGD may also be appropriate for women older than 38 or for individuals or couples who have experienced repeated miscarriage or repeated IVF failure.

In PGD, embryos are generated through the process of IVF and then one or two cells from the embryo are screened for a genetic condition prior to the transfer of the embryo into a woman's uterus. The screening gives information regarding the genetic status of the embryo, enabling selection of unaffected embryos prior to implantation and before pregnancy is established. This allows the individual or couple to choose not to be impregnated with an affected embryo, rather than face a difficult choice of whether or not to terminate a pregnancy.

A list of conditions that PGD is commonly used to identify can be found at the Victorian Assisted Reproductive Treatment Authority's Pre-implantation Genetic Diagnosis page.

More information about all the above ART methods can be obtained from ART clinics.

Surrogacy

Surrogacy is a form of ART in which a woman (the surrogate mother) carries a child for another person or couple with the intention of surrendering the child to that person or couple immediately after birth.

For detailed information regarding surrogacy, please see the Victorian Assisted Reproductive Treatment Authority's Surrogacy FAQs page.