

# A Modern Technique: In vitro Fertilisation

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**Abstract:** *In vitro fertilization, popularly known as IVF, has taken the attention of the public since its sensational introduction in 1978. Today assisted reproductive technology is available throughout most of the civilized world, and the practice is largely different from that used during the early days. Refinements in laboratory technology and clinical practice have allowed IVF to evolve into a medical procedure that is efficient, safe, readily accessible, and relatively affordable. More than 2 million IVF children have been born to date, and it is likely that continued enhancements will widen its appeal and applicability. IVF is a major treatment of infertility and highly utilised treatment option of assisted reproductive technology. Advances in IVF over the past decade have made this route of achieving pregnancy very popular amongst patients and clinicians and it has also become more feasible in low- and middle-income countries in terms of availability and cost.*

**Keywords:** technology, treatment, practice, assisted, reproductive, enhancement, applicability, popular, feasible, income

## 1. Introduction

In vitro fertilisation (IVF) is a process of fertilisation where an egg is combined with sperm outside the body, in vitro ("in glass"). The process involves monitoring and stimulating a woman's ovulatory process, removing an ovum or ova (egg or eggs) from the woman's ovaries and letting sperm fertilise them in a liquid in a laboratory. After the fertilised egg (zygote) undergoes embryo culture for 2–6 days, it is implanted in the same or another woman's uterus, with the intention of establishing a successful pregnancy.

IVF is a type of assisted reproductive technology used for infertility treatment and gestational surrogacy. A fertilised egg may be implanted into a surrogate's uterus, and the resulting child is genetically unrelated to the surrogate. Some countries have banned or otherwise regulate the availability of IVF treatment, giving rise to fertility tourism. Restrictions on the availability of IVF include costs and age, in order for a woman to carry a healthy pregnancy to term. IVF is generally not used until less invasive or expensive options have failed or been determined unlikely to work.

## 2. IVF Technique Process

### Step 1: Day 1 of your period

The first official day of your IVF treatment cycle is day 1 of your period. Everyone's body is different, and your fertility nurse will help you understand how to identify day 1.

### Step 2: Stimulating your ovaries

The stimulation phase starts from day 1. In a natural monthly cycle, your ovaries normally produce 1 egg. You'll take medication for 8-14 days to encourage the follicles in your ovaries (where the eggs live) to produce more eggs. Your specialist prescribes medication specific to your body and treatment plan. It's usually in the form of injections, which can vary from 1-2 for the cycle, or 1-2 per day. It can be daunting, but your fertility nurse will be there to show you exactly how and where to give the injections. You can get your partner involved too and watch and learn together to get it right. It quickly becomes a habit and you'll be an expert in no time.

The most common hormones in the medications used to stimulate the follicles are:

- Follicle-stimulating hormone (FSH)
- Luteinizing hormone (LH).

Both hormones are produced naturally in the body. The eggs are already there; the medication boosts the natural levels to encourage more eggs to develop.

We keep an eye on your ovaries and how the follicles are developing with blood tests and ultrasounds. Your medication will be adjusted if needed. You will have some transvaginal ultrasounds (a probe is inserted internally). Our team will support you through these processes and make you as comfortable as we can.

We'll track you more frequently towards the end of the stimulation phase to time the 'trigger injection' perfectly. The trigger injection gets the eggs ready for ovulation – the natural process where eggs are released and you have your period. Your fertility nurse tells you exactly when to do the trigger injection. Your fertility specialist will schedule the egg retrieval before you ovulate.

### Step 3: Egg retrieval

Egg retrieval, or egg 'pick up', is a hospital day procedure where the eggs are collected from your ovaries. An anaesthetist will get you ready for a general anaesthetic. You'll be asleep and the procedure takes about 20-30 minutes.

Your fertility specialist uses the latest ultrasound technology to guide a needle into each ovary. It's delicate work where every millimetre counts, and this is where the experience of our specialists pays off. You can't see an egg with the naked eye; they're contained in the fluid within the follicles in your ovaries. The specialist removes fluid from the follicles that look like they've grown enough to have an egg inside.

Your fertility specialist should have a fair idea from your ultrasounds how many eggs there are before retrieval. The average number of eggs collected is 8-15.

Recovery takes about 30 minutes and you'll be able to walk

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out on your own. It's a good idea to have a support person with you as you won't be able to drive after the procedure.

#### Step 4: The sperm

If you're a couple planning on using fresh sperm, the male will produce a sample the morning of the egg retrieval. If you are using frozen or donor sperm, our scientists will have it ready in the lab.

The sperm is graded using 4 different levels of quality. It's washed in a special mixture to slow it down so our scientists can spot the best ones under the microscope. A perfect, healthy sperm is not too fat or thin, with a tail that's not too long or short. The best sperm are selected, and they're ready and waiting in the lab to be introduced to the eggs.

#### Step 5: Fertilisation

Your fertility specialist gives our scientists the eggs they have retrieved, still in the fluid from the follicles of the ovaries. The scientists use powerful microscopes to find the eggs in the fluid so they can be removed.

It's important the eggs are fertilised quickly. The eggs and some sperm are placed in a dish. They have the chance to find each other and fertilise like they would naturally within your body.

#### Step 6: Embryo development

If the sperm fertilises the egg, it becomes an embryo. Our scientists put the embryo into a special incubator where the conditions for growth and development are perfect.

We create the perfect growing conditions using a mix of amino acids, just like your body would use to nurture the embryo.

Our scientists keep an eye on the embryos over 5-6 days. What we want is:

A two- to four-cell embryo on day 2 and a six- to eight-cell embryo on day 3 (called the cleavage stage). We know implanting embryos at the blastocyst stage into the uterus boosts your chances of a successful pregnancy. Unfortunately, not all eggs will fertilise and reach embryo stage. The eggs might not be mature or the sperm not be strong enough. We know you'll be waiting on news, so we'll keep you up to date with the progress of your egg, sperm and embryo development.

#### Stage 7: Embryo transfer

If your embryo develops in the lab, you're ready for it to be transferred into your uterus. Your fertility nurses will contact you to explain what you will need to do to prepare. The embryo transfer is a very simple process, like a pap smear. It takes about 5 minutes, you'll be awake, there's no anaesthetic, and you can get up straight away. You can continue with your day, the embryo can't fall out if you stand up or go to the toilet.

A scientist prepares your embryo by placing it in a small tube called a catheter. It's critical this is done by an expert to disturb the embryo as little as possible. Your fertility specialist places the catheter through your cervix and into your uterus.

Other embryos are frozen using our advanced technology, to use in future treatment.

#### Step 8: The final blood test

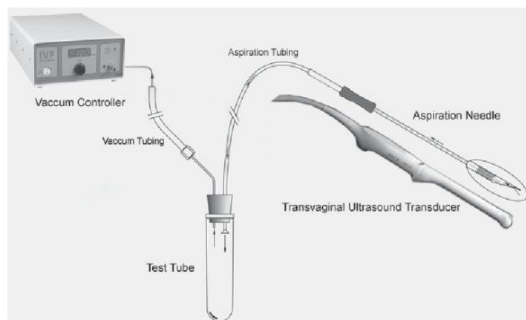
Approximately two weeks after your embryo transfer, you'll have a blood test to measure your levels of the hormone hCG (human chorionic gonadotropin). hCG in your bloodstream usually means a positive pregnancy test. Your nurse will let you know exactly when you need to have your blood test, as it may vary for some patients.



### 3. Embryo Cryopreservation

Clinical and laboratory methodology used for ART continued to evolve and improve, and a surplus of embryos in excess to what is used or needed for the initial IVF treatment became increasingly commonplace. During the early days of IVF, options for the patient with supernumerary embryos included discarding them, donating them to another infertile couple, or donating them for use in experimental research. Although cryopreservation of the embryos was an option, the freezing and thawing processes often caused permanent injury to the cells, and most embryos did not survive. This is best reflected in the very low rates of pregnancy seen following the transfer of frozen/thawed embryos throughout the 1980s. Intense efforts to develop various freezing/thawing techniques and cryoprotective agents eventually resulted in the first reported human pregnancy from a frozen embryo in 1983, which unfortunately ended in premature rupture of the membranes and termination of pregnancy at 24 weeks of gestation (Trounson and Mohr 1983).

Despite the initial set back, technology in cryopreservation continued to improve throughout the 1980s, leading to an increase in embryo survival rate and pregnancy rates. During the initial years of experimentation, at best approximately 50% of embryos survived the freeze/thaw process and resulted in a pregnancy rate of 13.4% per embryo transfer procedure, as only 4.6% of the individual thawed embryos implanted (Friedler et al 1988). By 2003, frozen embryo transfers accounted for 21 981 of the 112 872 IVF cycles (17.8%) performed in the US, with an overall live birth rate of 27.0% per embryo transfer procedure.



#### 4. Designer Baby

A designer baby is a baby whose genetic makeup has been selected or altered, often to include a particular gene or to remove genes associated with disease. This process usually involves analysing human embryos to identify genes associated with disease, and selecting embryos which have the desired genetic makeup - a process known as pre-implantation genetic diagnosis. Other potential methods by which a baby's genetic information can be altered involve directly editing the genome - a person's genetic code - before birth. This process is not routinely performed and only one instance of this is known to have occurred as of 2019, where

Chinese twins Lulu and Nana were edited as embryos, causing widespread criticism.

Genetically altered embryos can be achieved by introducing the desired genetic material into the embryo itself, or into the sperm and/or egg cells of the parents - either by delivering the desired genes directly into the cell or using gene editing technology. This process is known as germline engineering and performing this on embryos which will be brought to term is not typically permitted by law. Editing embryos in this manner means that the genetic changes can be carried down to future generations, and since the technology concerns editing the genes of an unborn baby, it is considered controversial and is subject to ethical debate. While some scientists condone the use of this technology to treat disease, some have raised concerns that this could be translated into using the technology for cosmetic means and enhancement of human traits, with implications for the wider society

Survey regarding awareness of in vitro fertilisation among the population of Delhi and Perm (Russia)

Questions	Perm (Russia) (n%)		Delhi (n%)	
	Yes	No	Yes	No
Have you heard of term in vitro fertilisation (IVF)?	148 (18.3)	661 (81.7)	50 (25)	150 (75)
Do you know why IVF is performed?	144 (17.8)	665 (82.2)	49 (24.5)	151 (75.5)
Is it possible for a woman to have baby after menopause ?	132 (91.7)	12 (8.3)	46 (93.9)	3(61)
Are ivf babies normal?	144 (17.8)	665 (82.2)	50 (24.5)	151 (75.5)
Do you think test tube babies should be socially accepted?	148 (18.3)	661 (81.7)	50 (25)	150 (75)
Should surrogacy be socially accepted?	100 (12.4)	709 (87.6)	2 (1)	198 (99)

#### 5. Conclusion

IVF may be used to overcome female infertility when it is due to problems with the fallopian tubes, making in vivo fertilisation difficult. It can also assist in male infertility, in those cases where there is a defect in sperm quality; in such situations intracytoplasmic sperm injection (ICSI) may be used, where a sperm cell is injected directly into the egg cell. This is used when sperm has difficulty penetrating the egg. In these cases the partner's or a donor's sperm may be used. ICSI is also used when sperm numbers are very low. When indicated, the use of ICSI has been found to increase the success rates of IVF.

According to UK's NICE guidelines, IVF treatment is appropriate in cases of unexplained infertility for women who have not conceived after 2 years of regular unprotected sexual intercourse.

In women with an ovulation, it may be an alternative after 7 - 12 attempted cycles of ovulation induction, since the latter is expensive and more easy to control. IVF is a type of assisted reproductive technology used for infertility treatment and gestational surrogacy. A fertilised egg may be implanted into a surrogate's uterus, and the resulting child is genetically unrelated to the surrogate. Some countries have banned or otherwise regulate the availability of IVF treatment, giving rise to fertility tourism.

#### References

- [1] Moreton C (14 January 2007). "World's first test-tube baby Louise Brown has a child of her own". Independent. London. Retrieved 21 May 2010. The 28-year-old, whose pioneering conception by in-vitro fertilisation made her famous around the world. The fertility specialists Patrick Steptoe and Bob Edwards became the first to successfully carry out IVF by extracting an egg, impregnating it with sperm and planting the resulting embryo back into the mother
- [2] Jump up to:<sup>a</sup> <sup>b</sup> Gosden R (June 2018). "Jean Marian Purdy remembered - the hidden life of an IVF pioneer". Human Fertility. 21 (2): 86–89. doi:10.1080/14647273.2017.1351042. PMID 28881151.
- [3] "At 74, Andhra Woman Becomes The Oldest-Ever To Give Birth". NDTV.com. 6 September 2019. Retrieved 5 November 2015.
- [4] Jump up to:<sup>a</sup> <sup>b</sup> "After IVF, some couples get pregnant without help". Reuters. 3 May 2012. Retrieved 5 November 2015.

#### Author Profile



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