

In Vitro Fertilization Overview

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Pregnancy Image Gallery A **microscopic view of sperm implantation during in vitro fertilization. See more pregnancy pictures.**

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Infertility, defined as the inability to become pregnant after one year of unprotected sex, is a problem faced by nearly 6.1 million Americans -- that's nearly 10 percent of men and women of reproductive age [source: eMedicineHealth]. Because this problem is so prevalent, fertility treatments abound. **Assisted reproductive technology** (ART) is a group of fertility treatments that involve both the sperm and the egg. **In vitro fertilization** (IVF) is the most

common type of ART. In IVF, the sperm fertilizes the egg outside the body, and doctors implant it into the woman's uterus in hopes of a successful pregnancy. Other forms of ART include intracytoplasmic sperm injection (ICSI), gamete intrafallopian transfer (GIFT) and zygote intrafallopian transfer (ZIFT).

The history of IVF is relatively short. Louise Brown of England was the first baby born via IVF, in 1978. The next IVF baby was born later that same year in India. Soon, people started calling these infants "test-tube babies." In 1981, the first American test-tube baby was born, and the number has continued to increase each year. According to the Centers for Disease Control, more than 48,000 babies were born in 2003 through ART -- 99 percent of these with IVF [source: CDC].

People just starting the fertility process -- if the woman doesn't have severely damaged fallopian tubes -- usually attempt other treatments before IVF.

Depending on the source of the problem, women can take antibiotics, fertility drugs or prescription hormones to increase the chances of pregnancy. Surgery could be the answer for women who suffer from structural problems in the fallopian tubes or uterus. On the male side of the equation, one option is medication that increases sperm production. Men can also take antibiotics and prescription hormones or try a few lifestyle changes, like wearing looser underwear and avoiding hot showers and saunas.

If these treatments don't work, **artificial insemination** may be the next step. In this procedure, the sperm (from the male half of the couple or a sperm bank) is collected and manually placed in the woman's uterus or fallopian tubes. Another pre-ART option is **intrauterine insemination**, or IUI, where the sperm is placed directly into the woman's uterus using a catheter, which gives the sperm a head start in the race to the egg.

It's usually when all else fails that people turn to ART treatments, and most use IVF. People are most likely to use IVF when low sperm count or blocked or damaged fallopian tubes are the culprit. Women who suffer from endometriosis may also benefit from IVF treatment.

Now that you have a general idea of IVF, let's get into the specifics. In the next section, we'll explain the fertilization process.

The In Vitro Process



Doctors perform laparoscopic surgery on a woman in preparation for in vitro fertilization.

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chance of having a baby after an IVF cycle, with the chance dropping to 20 to 25 percent in women between 35 and 40. Women over 40 have a 6 to 10 percent chance of a live birth per cycle of treatment [source: [CDC](#)].

The saying "nothing worth having comes easy" could refer to the process of trying to conceive via IVF. An IVF cycle takes four to six weeks to complete and usually costs about \$12,000 [source: [Baby Center](#)]. Some women may have to endure multiple cycles before getting pregnant. In fact, in the United States, women under the age of 35 have only a 30 to 35 percent

There are five steps in the IVF treatment cycle.

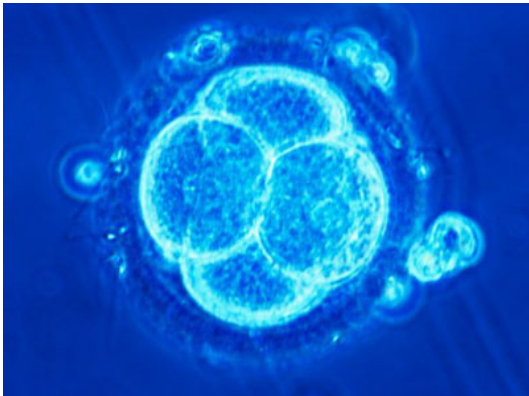
1. **Ovarian stimulation.** This step involves the use of ovulation, or fertility, drugs. These hormones, taken over a period of eight to 14 days, stimulate a woman's ovaries to produce several eggs per menstrual cycle instead of one. Successful IVF usually requires the fertilization of multiple eggs -- some may not fertilize or develop normally after fertilization. During this process, the physician will use ultrasounds or blood testing to determine when the eggs are ready for retrieval.
2. **Egg retrieval.** Once the eggs are deemed ready for retrieval, the doctor performs a transvaginal ultrasound aspiration. This is a simple surgical procedure that uses a small amount of anesthesia, such as a mild sedative. Once the ultrasound locates the mature follicles in the ovary, the doctor inserts a needle into the follicles and removes the eggs with suction. If the ultrasound can't find or access the ovaries, doctors might have to perform laparoscopic surgery. This technique -- in which doctors cut a small

incision in the abdomen and locate the ovaries with a tiny fiber-optic lens -- is still simple and short, but it requires stronger anesthesia.

3. **Insemination.** After retrieval, doctors examine the eggs and decide which of them hold the most potential for a successful pregnancy. They place these eggs in an IVF culture medium to await insemination. Meanwhile, they separate the father's sperm from his semen. The most motile sperm (the "best swimmers") are then added to the eggs in the incubator.
4. **Fertilization and embryo culture.** Usually within a matter of hours, a sperm cell penetrates an egg and fertilizes it. The following day, doctors visually confirm fertilization if they can see two pronuclei. These pronuclei are the basis of the embryo formation -- they will unite to form the nucleus of the zygote, which divides to become an embryo. A two- to four-cell embryo appears approximately two days after fertilization. On the third day, a six- to 10-cell embryo is seen. Five days after fertilization, the embryo can be called a blastocyst, which means it has formed a fluid cavity that results in the formation of fetal tissues and placenta. However, many embryos are not observed for this long. They can be placed in the uterus as early as one day and as late as six days after fertilization. In most cases, they're observed for two to three days to determine if the development is normal.
5. **Embryo transfer.** About two to three days after fertilization, the resulting embryo or embryos are transferred to the woman's uterus. Doctors suspend them in a drop of fluid and draw it into a transfer catheter -- a long, thin, flexible tube that has a syringe on one end. They then guide the catheter into the vagina, past the cervix and into the uterus. The patient is encouraged to remain in a resting position for an hour or two to prevent any stress on the body. If the embryo or embryos do attach to the uterine wall, a positive pregnancy test will result.

Of course, something with this many steps is bound to have risks. We'll discuss the most common risks of IVF in the next section.

Risks of In Vitro Fertilization



A four-cell human embryo
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The stages of IVF have different risks associated with them. During ovarian stimulation, women can get **ovarian hyperstimulation syndrome (OHSS)**, which causes swollen, painful ovaries. Nearly 30 percent of IVF patients experience at least a mild case of OHSS [source: [CDC](#)]. Mild cases can usually be treated with over-the-counter pain medication and a reduction in activity level -- OHSS generally resolves on

its own in the absence of pregnancy. In moderate cases, which are less common, ovaries swell and fluid accumulates in the abdominal cavities. Symptoms of moderate OHSS include heartburn, gas, nausea, vomiting and loss of appetite. About 1 to 2 percent of women undergoing IVF develop severe OHSS, which may require hospitalization and involves sudden and excessive weight gain, severe abdominal pain with nausea or vomiting, and shortness of breath [source: [CDC](#)].

During egg retrieval, risk depends on the retrieval process.

Transvaginal ultrasound aspiration carries a small risk of bleeding and infection and, sometimes, damage to surrounding structures like the bowel and bladder. The risks associated with laparoscopy include difficulty breathing, chest infection, allergic reactions to medications and nerve damage -- the same as with any surgery in which anesthesia is required.

When more than one embryo is transferred, there is always the risk of a multiple pregnancy. An infertile couple may take this as good news, but the presence of more than one embryo increases the risk to the embryos and to the mother. The most common is premature delivery. The babies could develop complications after birth or be born too early to survive. About 5 percent of IVF pregnancies are ectopic, which means that the fertilized egg develops outside the uterus, usually in the fallopian tubes [source: [American Society for Reproductive Medicine](#)]. This complication, unfortunately, requires immediate destruction of the fetus.

Other Assisted Reproductive Technology Treatments

IVF is only one of the assisted reproductive technology (ART) treatments. Here are some of the others:

Gamete intrafallopian transfer (GIFT)

This method is very similar to IVF, but the fertilization process takes place in the woman's fallopian tubes. The downsides are that it requires laparoscopic surgery and fertilization can't be visually confirmed like it is in IVF. Women with damaged fallopian tubes can't use this procedure, so they usually go with IVF. GIFT accounts for about 2 percent of all ART procedures in the United States [source: American Society for Reproductive Medicine].

Zygote intrafallopian transfer (ZIFT)

ZIFT procedures comprise a mere 1 percent of all ART cases in the United States [source: [ASRM](#)]. Fertilization takes place in the laboratory, and the embryo is transferred to the fallopian tube (not the uterus) using laparoscopy.

While neither GIFT nor ZIFT is as successful as IVF, they may be the first option for women who have tried other methods but whose infertility problems are not yet considered severe. Couples can try GIFT and ZIFT after six unsuccessful intrauterine insemination cycles. One advantage of GIFT is that the embryo isn't developed in the lab. This eliminates the moral dilemma of choosing how many embryos to transfer and how many to destroy. But ZIFT has a higher success rate because the egg is fertilized before being placed in the fallopian tube.

Intracytoplasmic sperm injection (ICSI)

ICSI is an adjunctive treatment used in more than 40 percent of all ART procedures [source: [ASRM](#)]. The use of ICSI is indicated when fertilization rates are expected to be lower than normal, usually because of problems with the sperm. ICSI is a micromanipulation technique -- doctors inject a single sperm into the egg to ensure fertilization.

Embryo cryopreservation

This process involves the freezing embryos for future use in IVF. Frozen embryos can be stored for many years, which allows couples to skip steps in future cycles, saving them money and cutting down on invasive procedures.