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In Vitro Fertilization (IVF) in human

IVF, which stands for in vitro fertilization, is an assisted reproductive technology. In vitro, which in Latin translates to “in glass,” refers to a procedure that takes place outside of the body. There are many different indications for IVF. For example, a woman may produce normal eggs, but the eggs cannot reach the uterus because the uterine tubes are blocked or otherwise compromised. A man may have a low sperm count, low sperm motility, sperm with an unusually high percentage of morphological abnormalities, or sperm that are incapable of penetrating the zona pellucida of an egg.

By 2016, some 6.5 million babies had been born using in-vitro fertilization (IVF). According to the Centers for Disease Control and Prevention (CDC), around 1.6 percent of babies born in the United States each year are conceived through assisted reproductive technology (ART). In a normal pregnancy, a male sperm penetrates a woman’s egg and fertilizes it inside her body after ovulation, when a mature egg has been released from the ovaries. The fertilized egg then attaches itself to the wall of the uterus, or womb, and begins developing into a baby. This is known as natural conception. However, if natural or unassisted conception is not possible, fertility treatment is an option. IVF has been used since the late 1970s. **On 25 July 1978, the first “test-tube baby,” Louise Brown, was born. Robert Edwards and Patrick Steptoe, who collaborated on the procedure, is considered to be the pioneers of IVF.**

In 2010, Robert Edwards received the 2010 Nobel Prize in Physiology or Medicine “for the development of in-vitro fertilization.”

In July 2013, an American couple had the first baby to be born through IVF as a result of next-generation DNA sequencing, a new way of screening embryos that improves IVF success rates and significantly reduces the cost of treatment. DNA sequencing technology helps doctors screen embryos created by IVF to identify those most likely to lead to successful pregnancies.

Procedure

Techniques may differ depending on the clinic, but IVF usually involves the following steps:

1. Suppressing the natural menstrual cycle

The woman receives a drug, usually in the form of a daily injection for about 2 weeks, to suppress their natural menstrual cycle.

2. Super ovulation

Fertility drugs containing the fertility hormone follicle stimulating hormone (FSH) are given to the woman. FSH makes the ovaries produce more eggs than usual. Vaginal ultrasound scans can monitor the process in the ovaries.

3. Retrieving the eggs

The eggs are collected through a minor surgical procedure known as “follicular aspiration.” A very thin needle is inserted through the vagina and into an ovary. The needle is which is connected to a suction device. This sucks the eggs out. This process is repeated for each ovary. In 2011, researchers suggested that collecting 15 eggs from the ovaries in one cycle gives the highest chance of a successful pregnancy. Frozen or donated eggs may also be used.

4. Insemination and fertilization

The eggs that have been collected are placed together with male sperm and kept in an environmentally controlled chamber. After a few hours, the sperm should enter the egg. Sometimes the sperm is directly injected into the egg. This is known as an intracytoplasmic sperm injection (ICSI). Frozen sperm, retrieved through testicular biopsy, may be used. This is believed to be as effective as fresh sperm in achieving a successful pregnancy. The fertilized egg divides and becomes an embryo. At this point, some centers offer pre-implantation genetic diagnosis (PGD) which can screen an embryo for genetic disorders. This is somewhat controversial and is not always used. One or two of the best embryos are selected for transfer. The woman is then given progesterone or human chorionic gonadotrophin (hCG) to help the lining of the womb receive the embryo.

5. Embryo transfer

Sometimes, more than one embryo is placed in the womb. It is important that the doctor and the couple wishing to have a child discuss how many embryos should be transferred. Normally, a doctor will only transfer more than one embryo if no ideal embryos are available. The transfer of the embryo is done using a thin tube, or catheter. It enters the womb through the vagina. When the embryo sticks to the lining of the womb, healthy embryo growth can begin.

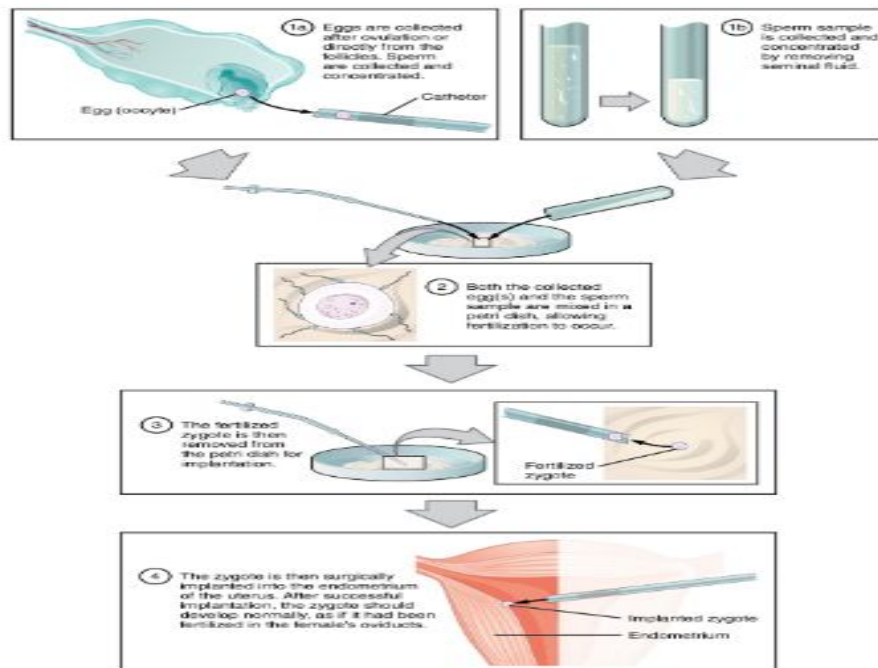


Figure : IVF. In vitro fertilization involves egg collection from the ovaries, fertilization in a petri dish, and the transfer of embryos into the uterus.

Some women may have reactions to the medications that are given during treatment.

The possible side effects of IVF drugs include:

- nausea and vomiting
- difficulty breathing
- irritability
- hot flashes
- enlargement of the ovaries
- difficulty sleeping
- abdominal pain

Bruising can also result from repeated daily injections.

Health risks to the mother

Rarely, the drugs can cause ovarian hyperstimulation syndrome (OHSS). This happens when the ovaries over-respond to the gonadotrophins, so that too many eggs develop in the ovaries. Severe abdominal swelling and shortness of breath can result. If OHSS occurs, the doctor may suggest restarting the whole cycle with a lower dose of gonadotropin. Research published in the *BMJ* has linked IVF with a higher risk of pulmonary embolism, or blockage of the lung's main artery, and venous thromboembolism, or blood clots, during the 1st trimester of pregnancy.

Pregnancy loss

The leading cause of pregnancy loss, whether in IVF or in natural conception, is an abnormal number of chromosomes, known as chromosomal aneuploidy. Detecting aneuploidy in the egg or sperm

before carrying out IVF, or in an embryo before implantation, may help increase the chance of a successful pregnancy.

In 2013, scientists announced that they had developed a new technology called **time-lapse imaging**. The technique may increase the chances of selecting a suitable embryo for successful IVF, though further research needs to be done.

Multiple Births

When more than one embryo is transferred into the womb, there is a higher chance of having twins, triplets, or more babies.

Pregnancies with more than one fetus can result in:

- preterm birth or low birth weight
- double the mother's risk of developing diabetes
- significant increase in the mother's blood pressure

The doctor may recommend that there should only be a single embryo transfer in women with a heightened chance of having twins.

