

# In Vitro Fertilization

- **In vitro fertilization** (IVF) is one of the methods of assisted reproduction (see assisted reproduction). It is also known to the general public as "test-tube babies". However, the test tube has little to do with the method, as the embryos are cultured in Petri dishes. The insemination of the oocyte therefore takes place under laboratory conditions.
- **The indication** to undergo IVF in this way is usually one of two reasons: inability to become pregnant naturally or interest in a method called preimplantation genetic diagnosis.

## IVF Procedure

By application of hormones, the patient's ovaries are stimulated so that multiple oocytes mature in them at once. These are then removed from the ovaries by biopsy and fertilised outside the mother's body - in the embryology laboratory. The woman is under general anaesthesia during the retrieval. The retrieval takes about 15-20 minutes and is outpatient. After the procedure, the woman rests on the bed for two hours and if everything is fine, she can then go home.



### Preparing the ovum for fertilisation

- The two most common methods of ovum preparation:
  1. The oocyte can be mixed with the sperm in a Petri dish and the moment of fertilization is left to "nature" (the first option).
  2. One sperm is injected directly into the prepared egg by the embryologist using **intracytoplasmic sperm injection (ICSI)**.
    - This requires an **inverted microscope with a micromanipulator**, which includes two special pipettes: a **holding pipette** and an **ICSI pipette**. This microscope usually includes a laser and is also used for assisted hatching. Sperm are obtained by masturbation or by **MESA** or **TESE** methods - removal directly from the testicles (TESE) or epididymis (MESA). This procedure is performed by a urologist.

### Cultivation of the embryo

- Cultivation takes place for 3 days (longer in case of prolonged cultivation) in the laboratory in incubators/culturing tanks (temperature 37 °C, correct O<sub>2</sub> and CO<sub>2</sub> concentration).
- Embryos are checked daily or continuously monitored by camera and their development is recorded.

### Embryo implantation

- On day 3 (4, 5), the best developing embryos or embryos not expected to have a hereditary disease (pre-implantation genetic diagnosis) are injected back into the mother's uterus.
- The procedure in which a tube with embryos is inserted through the cervix is not painful for the patient.
- The number of embryos that are transferred depends on the age of the mother and, if necessary, her health. Usually there are 1, sometimes 2 embryos. The remaining embryos are usually preserved by freezing or vitrification (cryopreservation) and, if they are not used for transfer in the future, they can be donated under the conditions laid down by law for scientific purposes.

## Other methods related to IVF

### Assisted Hatching (AH)

- In assisted hatching, the zona pellucida of the developing embryo is gently disturbed. This ensures a higher probability of successful implantation. It can be disturbed mechanically, chemically or most often by laser. The procedure is performed at the patient's request.

### Prolongation of culture (PK)

- In the case of PK, it is possible to select better embryos over a longer period of time. This method is also used in the case of preimplantation genetic diagnosis. The embryos are then injected into the uterus at a stage as if they had entered the uterus naturally from the ovary through the Fallopian tube.

### Cryopreservation x thawing

- Sperm and embryos can be frozen and, if necessary, thawed and used. They are stored in liquid nitrogen and this method is called cryopreservation. Eggs cannot be preserved in this way.

### Preimplantation genetic diagnosis (PGD)

- This method allows genetic testing of the egg (polar body) or embryo before implantation in the uterus.

# Links

## Related articles

- Preimplantation genetic diagnosis
- Assisted Reproduction
- First Week of Embryo Development

## Literature

- ŘEŽÁBEK, Karel. *Asistovaná reprodukce : průvodce ošetřujícího lékaře*. 1. edition. Maxdorf, c2008. ISBN 978-80-7345-154-7.
- DOHERTY, C. Maud - CLARK, Melanie Morrissey. *Léčba neplodnosti : podrobný rádce pro neplodné páry*. 1. edition. Computer Press, 2006. ISBN 80-251-0771-X.
- MRÁZEK, Milan. *Umělé oplodnění. I*. 1. edition. Triton, 2003. ISBN 80-7254-413-6.