In Vitro fertilization

Buddhi Prakash Jain
Assistant Professor
Department of Zoology
Mahatma Gandhi Central University Motihari Bihar
Email: buddhiprakash@mgcub.ac.in

Followings are the objectives of the lecture:

What is In Vitro fertilization?

Steps in the In vitro fertilization process.

Significance of IVF process.

In vitro fertilization

Assisted reproductive technology (ART): These are the methods or techniques which assist people in achieving pregnancy.

Important ARTs based on the cause of infertility:

1. Artificial insemination (AI).
2. In vitro fertilization (IVF).
3. Gamete intrafallopian transfer (GIFT).
4. Zygote intrafallopian transfer (ZIFT).
5. Intracytoplasmic sperm injection (ICSI).

Thus IVF is a type of assisted reproductive technique used for achieving pregnancy and a treatment of infertility.

IVF: The process of fertilizing egg and sperm outside the female body (i.e. in test tube).

In this technique, first egg and sperms are collected, united outside the body (test tube or culture dish), the resulting zygote or embryo is transferred back to the uterus of the female body.

***Infertility:** According to the World health organization (WHO), Infertility is “a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.”

History of IVF:

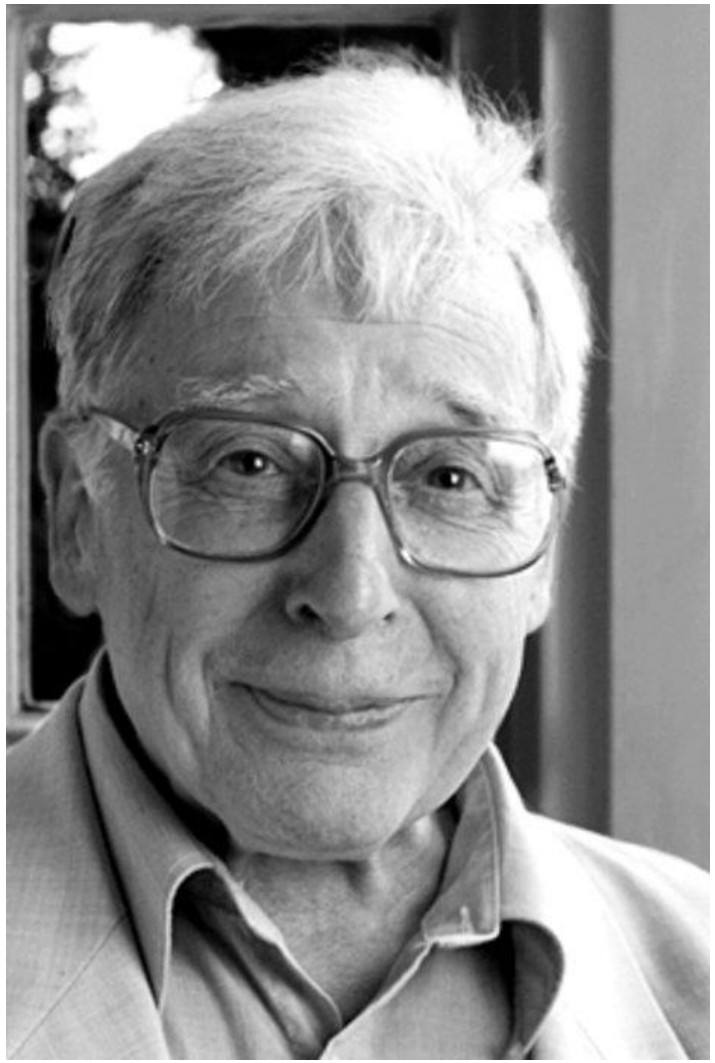
1959: Min Chueh Chang: Invitro fertilization in Rabbit.

1961: Palmer: First retrieval of oocytes/egg by laparoscopy.

1965: Robert Edwards, Georgeanna and Howard: First attempted to fertilize human oocytes in vitro.

25 July 1978: Patrick Steptoe and Robert Edwards: first IVF birth Louise Brown.

2010: Robert Edwards: The Nobel Prize in Medicine for the development of in vitro fertilization.



Robert G. Edwards
The Nobel Prize in Physiology or Medicine 2010

Prize motivation: "for the development of in vitro fertilization."

https://www.nobelprize.org/prizes/medicine/2010/edwards/facts/

Steps of IVF process: Five major steps in the process of IVF

1. Ovary stimulation.
2. Collection of Oocyte.
3. Sperm retrieval and wash.
4. Fertilization and embryo development.
5. Embryo transfer.

1. **Ovary stimulation:**

Different hormones to stimulate the ovary for the production of more than one egg or oocytes.

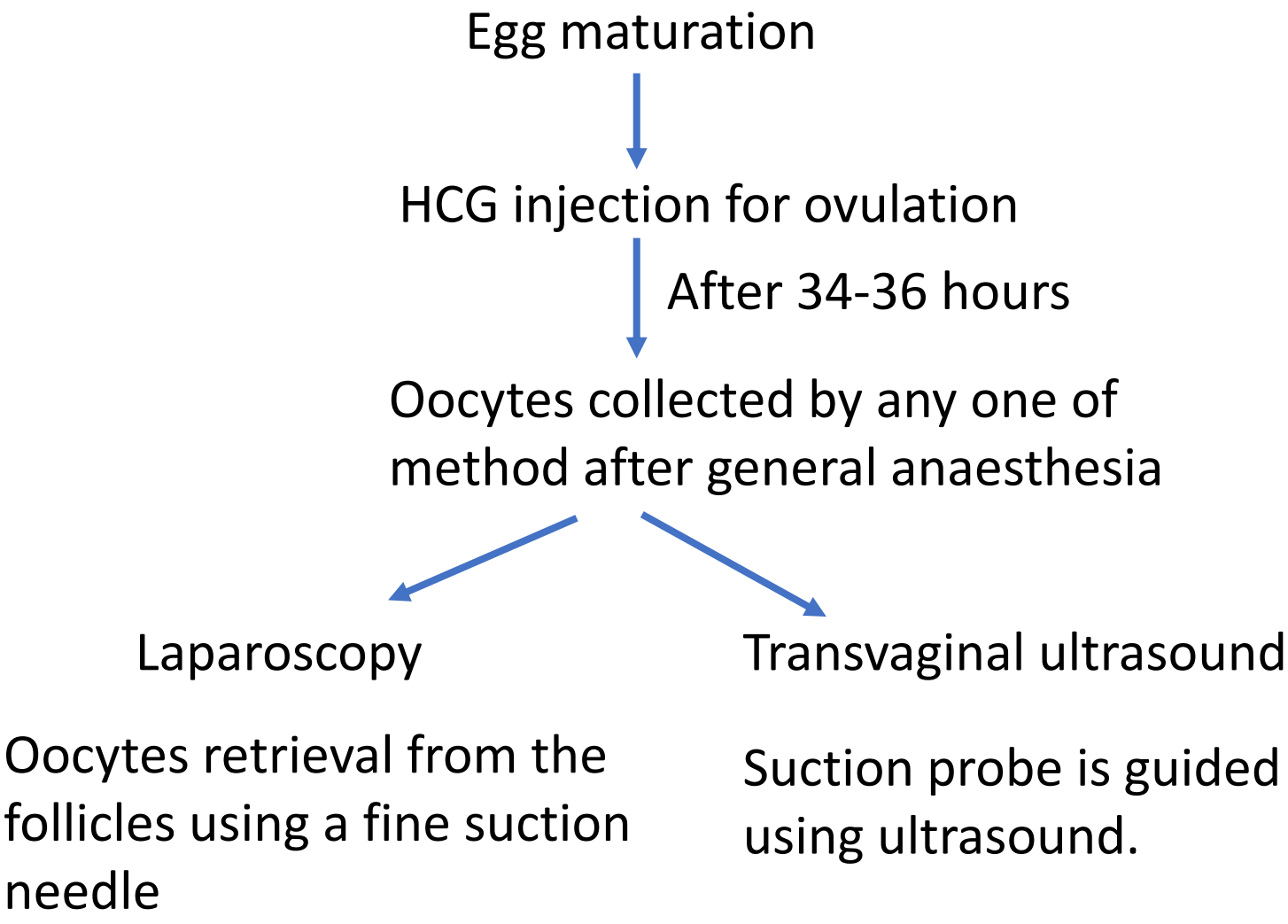
Hormones:
Follicle-stimulating hormone (FSH)
Luteinizing hormone (LH) (used in conjunction with FSH)
Human chorionic gonadotropin (hCG)
human menopausal gonadotropin (hMG)
Clomiphene

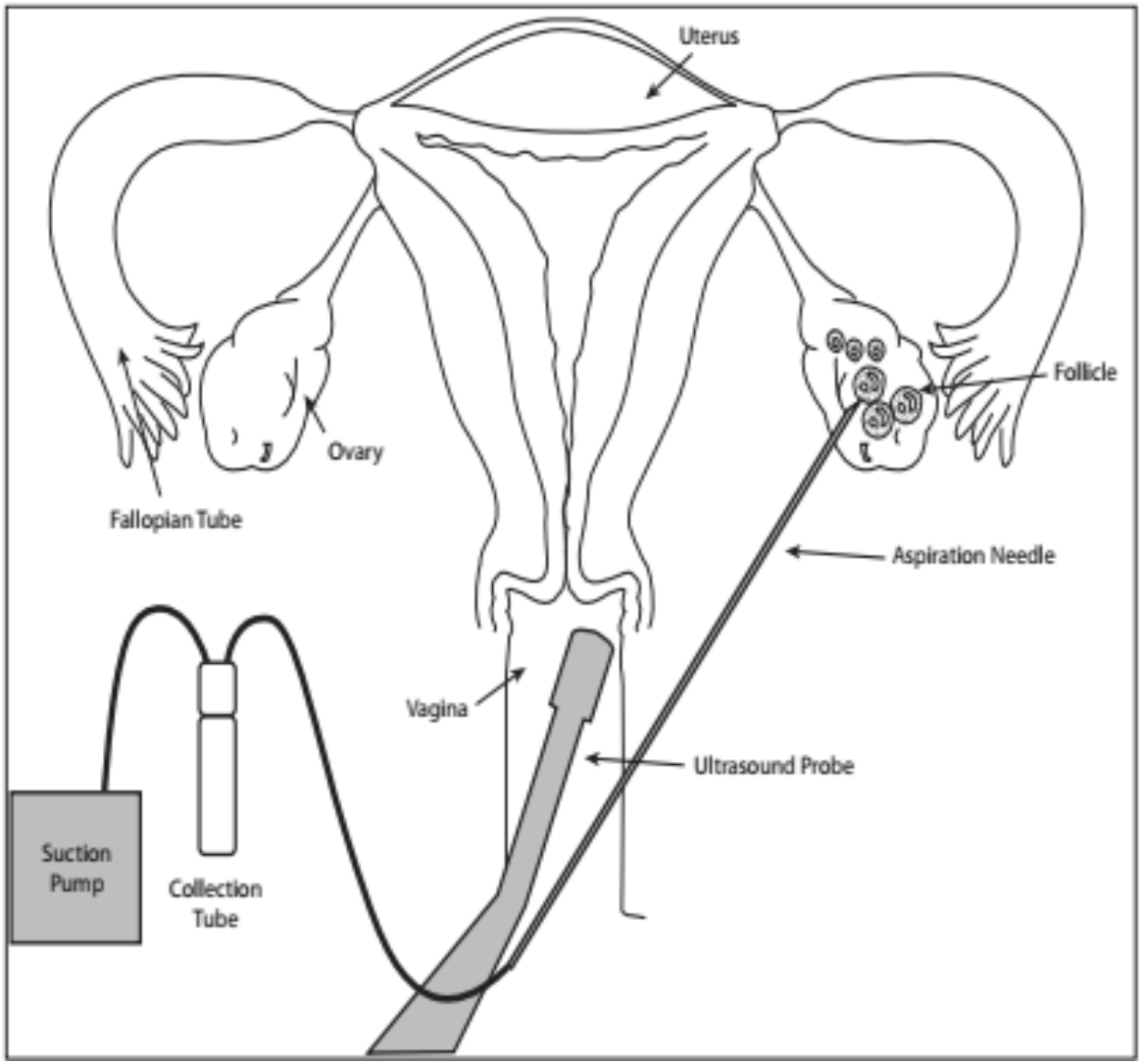
2. Collection of Oocyte:

It is the process of collection of oocytes/egg from the ovary for their fertilization with sperm.

By two methods:

a. Laparoscopy.
b. Transvaginal ultrasound aspiration (TVUA).


Egg maturation
HCG injection for ovulation
After 34-36 hours
Oocytes collected by any one of method after general anaesthesia
Laparoscopy
Oocytes retrieval from the follicles using a fine suction needle
Transvaginal ultrasound
Suction probe is guided using ultrasound.



Egg/oocytes collection by transvaginal ultrasound guided needle.

https://www.reproductivefacts.org/

3. Sperm retrieval and wash:

2-3 hours before the fertilization process of the sperm and egg, semen is collected from the male partner.

After collection, suspended in suitable culture media and incubated at 37^0C for 30-60 minutes.

Some of the sperm extraction method:

a. Testicular sperm extraction **(TESE).**
b. Percutaneous Epididymal Sperm Aspiration (**PESA**)
c. Microsurgical Epididymal Sperm Aspiration (**MESA**)

4. Fertilization and Embryo development:

Eggs and sperms are examined in the laboratory for quality and maturity.

Mature egg placed in a IVF culture medium and it is incubated with 50000-100000 active and motile sperms.

If sperms are less motile or non motile then one sperm is directly placed inside the cytoplasm of the oocyte. This method is ICSI (Intracytoplasmic sperm injection).

After the 3rd day of fertilization, the zygote divides to become 6-10 celled embryo.

5. Embryo transfer:

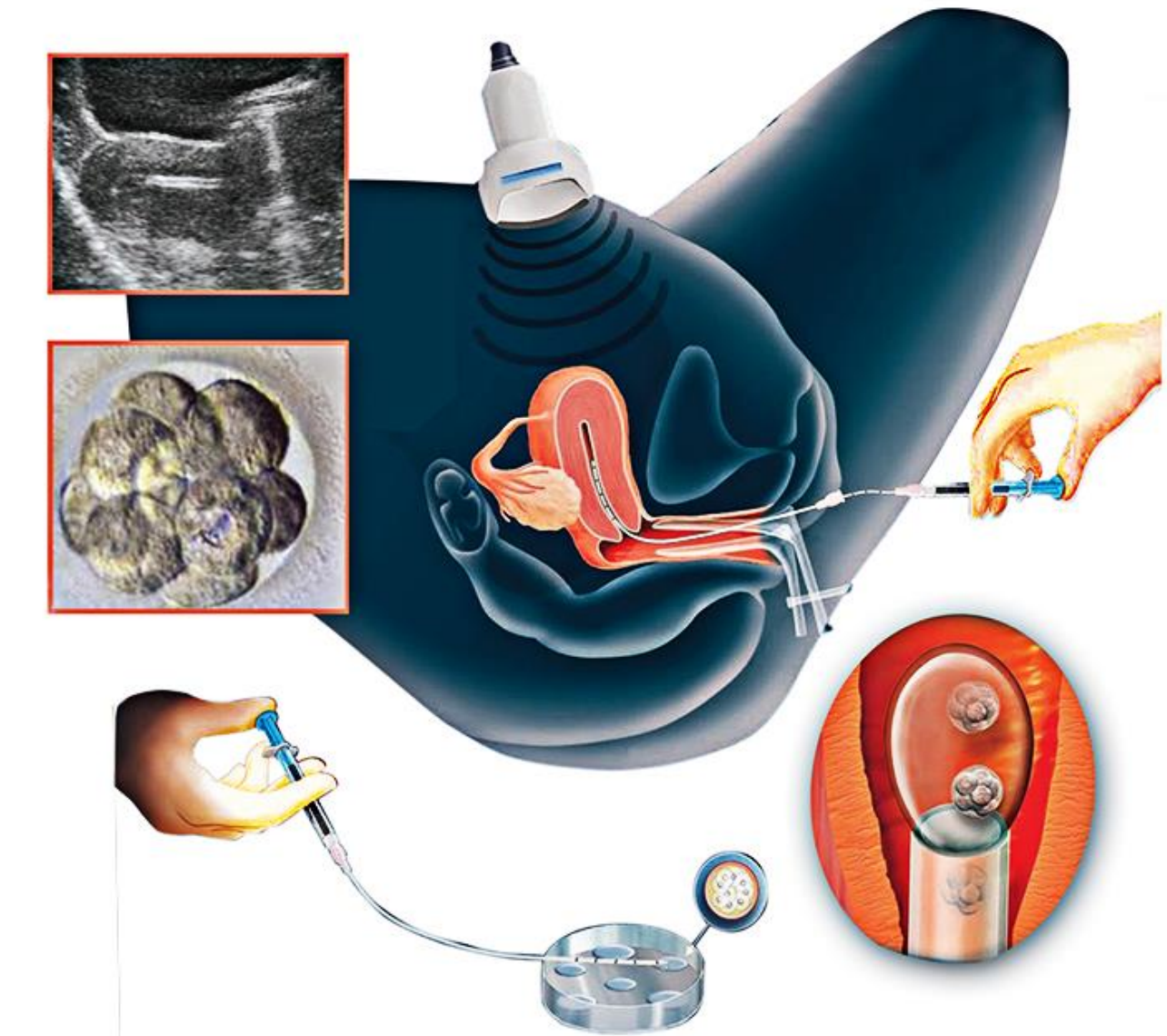
Last step.

No aesthesia required.

On the 3rd to 5th day of oocyte retrieval.

Embryo first suspended in a culture medium and transferred to the uterine cavity with the help of catheter.

The number of embryos to transfer depends on many factors as maternal age, quality of embryos etc.



https://ivf-india.co.in/embryo-transfer/

Significance of IVF process:

Advantages: IVF is a method of ART for conceiving and treatments of infertility.
It helps to achieve pregnancy who face the following problems:

- Blockage in the fallopian tube.
- Endometriosis.
- Ovulation dysfunction.
- Male infertility.
- Embryos cam be screened for genetic disorders.
- Polycystic ovary syndrome (PCOS).

Disadvantages:

Success rate is low.

Side effects while ovarian stimulation by hormones.

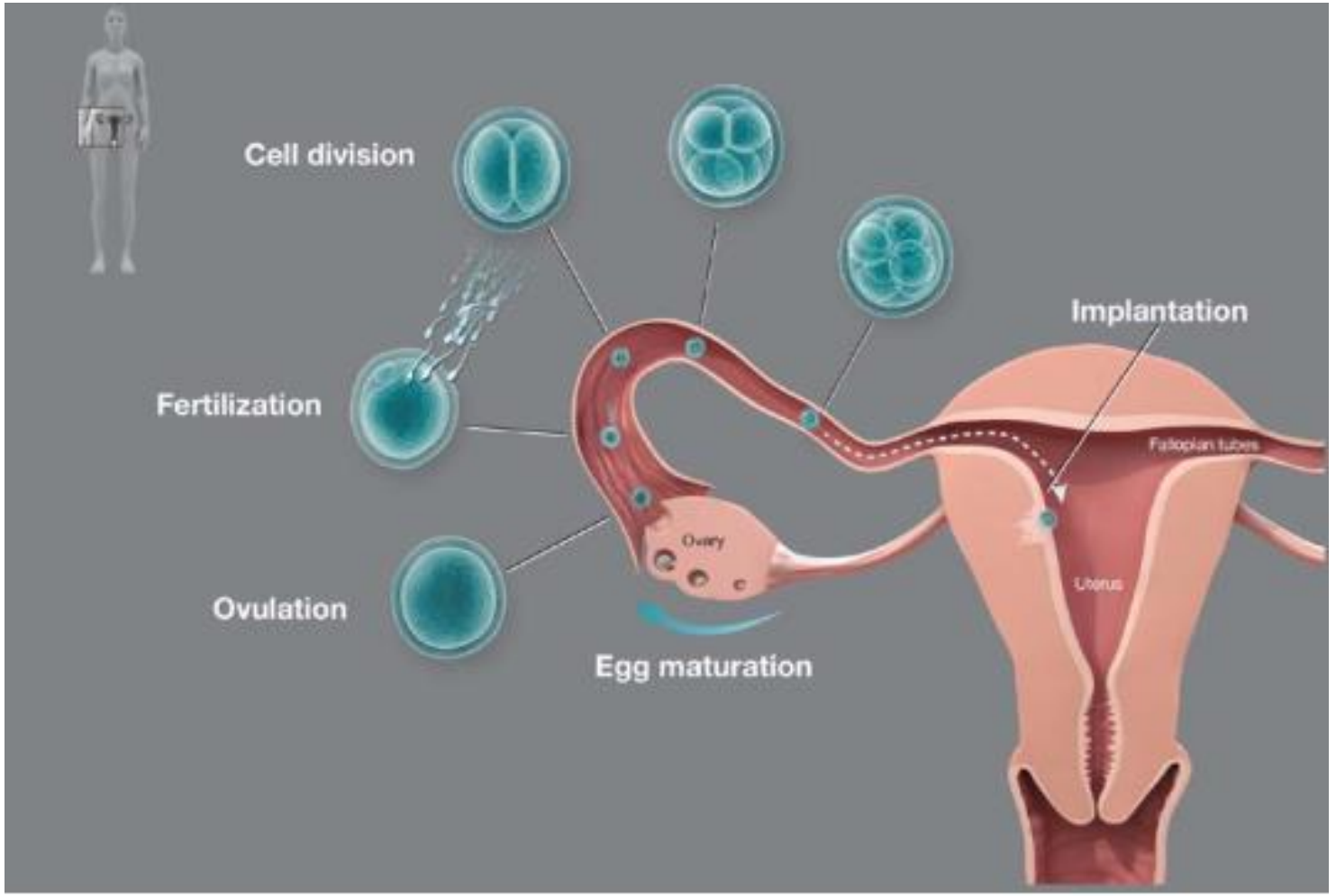
Multiple and ectopic pregnancy.

Hormonal imbalance.

Expensive.

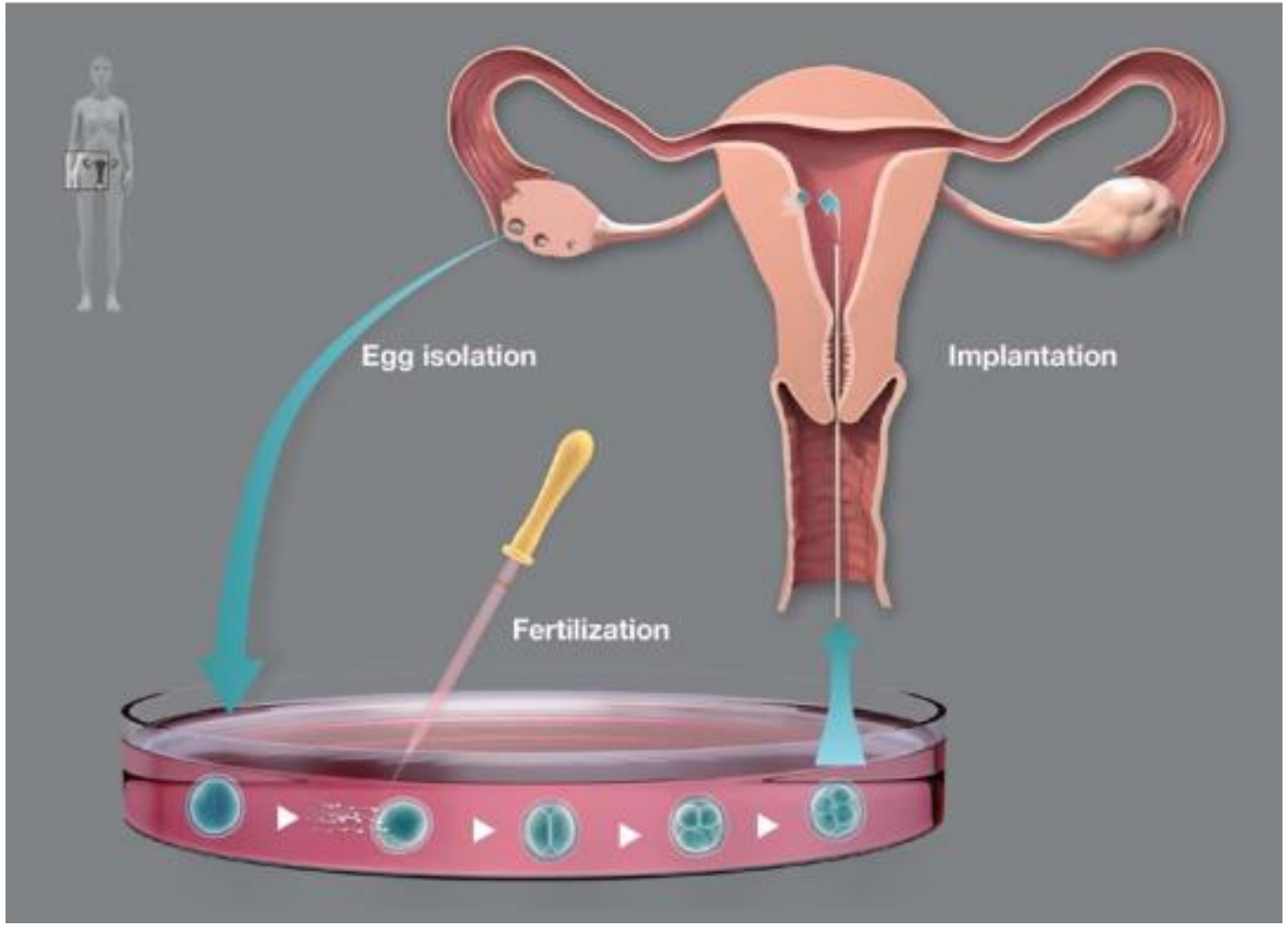
Ethical and social concern.

Summary



Normal fertilization process in humans

https://www.nobelprize.org/uploads/2018/06/advanced-medicineprize2010.pdf



IVF process by R Edwards.

https://www.nobelprize.org/uploads/2018/06/advanced-medicineprize2010.pdf

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THANK YOU