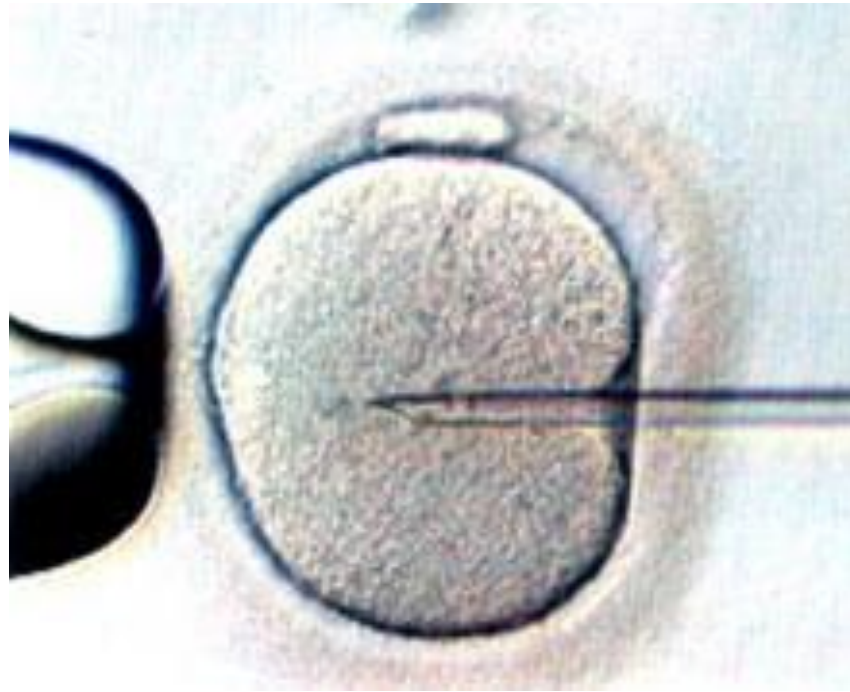


Reproductive Technology



Assisted Reproduction

When a couple is sub-fertile or infertile they may need Assisted Reproduction to become pregnant:

- Replace source of gametes
 - Sperm, oocyte or zygote donors
- Aid in the fertilization process
- Treat cause of infertility

What is ART?

- Group of high tech treatment methods to improve infertility.
- Techniques include
 - In Vitro Fertilization
 - Artificial Insemination
 - Gamete Intra-Fallopian Transfer
 - And many more



History of ART



1978- first successful birth using In Vitro Fertilization

Infertility

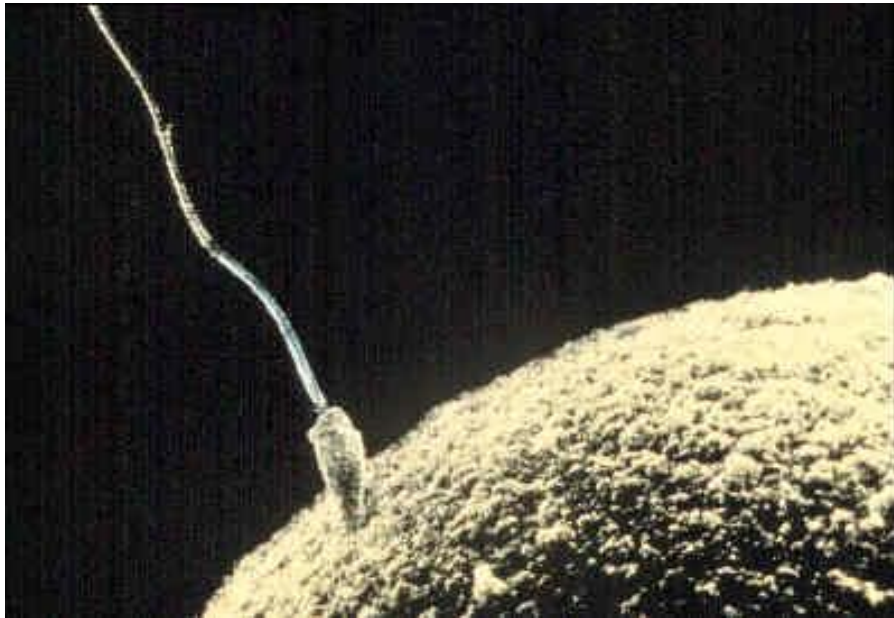
- Clinically defined as inability to conceive after more than one year of intercourse without contraception
- Affects the reproductive organs of both men and women.
- World Health Organization
 - Defines sub-fertility as diminished ability to conceive
 - Infertility as complete inability to ever conceive



Infertility Statistics

- About 35% of infertility cases are caused by male factors.
- About 35% of infertility cases are caused by physical female factors.
- About 15% of infertility cases are caused by hormonal female factors.
- In about 10% of infertile couples the cause is unknown.
- 5% of infertile cases is caused by a combination of factors in both partners.
- The chances of becoming pregnant decreases 3-5% per year after the age of 30.

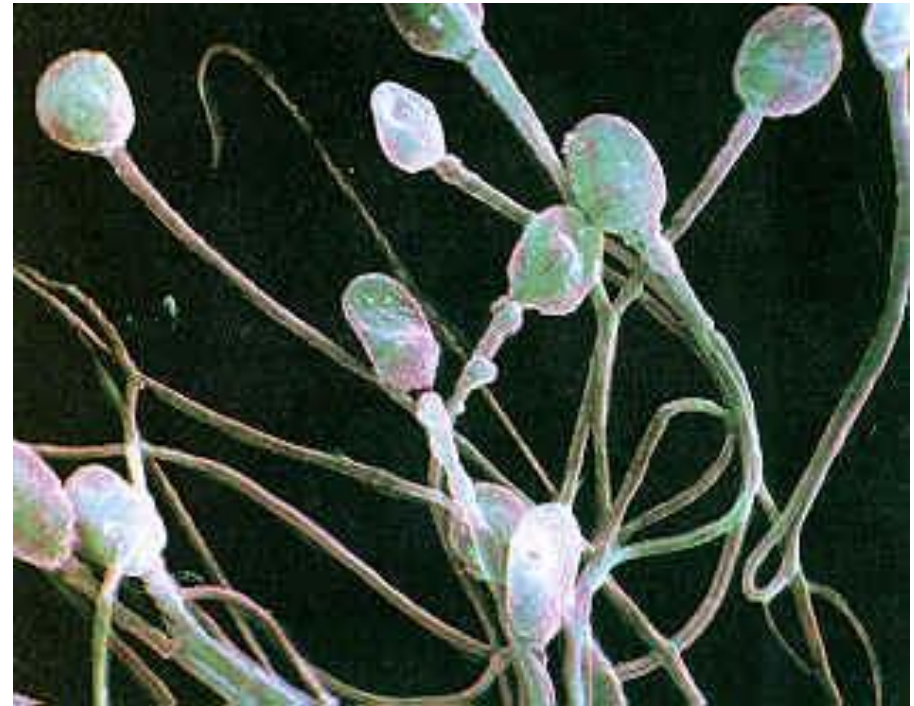
Factors Affecting Conception



- Production of healthy sperm
- Healthy eggs by the woman
- Unblocked fallopian tubes
- The ability for the sperm to fertilize the egg
- The ability for the embryo to implant in the uterus

Causes of Infertility in Men

- Azoospermia-lack of sperm production
- Inability to ejaculate normally
- Varicocele- veins in the scrotum are enlarged which can heat the inside of the scrotum and can affect sperm production.
- Oligospermia – low sperm count
 - Caused by: hormones, environment, physical
- Poor sperm quality
 - Motility – sperm can't swim
 - Abnormality – sperm are abnormally shaped
- Antibodies against own sperm
 - Autoimmune disorder



Treatment of Male Infertility

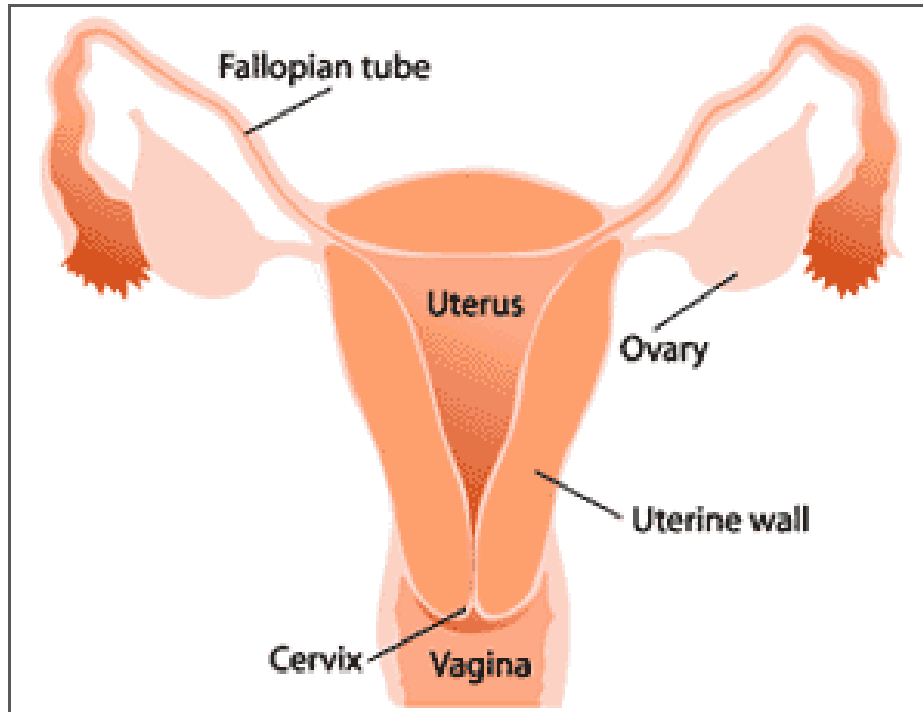
- Primary – change environment
 - Avoid heat, drugs, toxins
 - Timing intercourse
- Secondary – correct hormone levels, surgery corrects physical problems, immune suppressants
- Final – Assisted Reproduction Technologies

Female Infertility

Problems:

- Irregular/malfunctioning ovulation
 - Hormone imbalance, malfunctioning or absent ovaries or tubes
- Physical blockage
 - Fibroids or Endometriosis
 - Blocked/abnormal Fallopian tubes
- Vaginal secretions
 - Hormones or certain diseases

Causes of Infertility in Women



- The older a woman is, the higher her chances of becoming infertile.
- Ovulation disorder
- Blocked fallopian tubes caused by a pelvic inflammatory disease or endometriosis (a condition that causes adhesions and cysts).

Genetics of Female Infertility

- Irregular/malfunctioning ovulation
 - Genes: Hormones, thyroid, pituitary problems
 - Environment: Birth control, stress
- Physical blockage
 - Genes: Cancer, developmental defect
 - Environment: Cancer or infections
- Vaginal secretions
 - Genes: Hormones, mucus disorders, immune

Treatment of Female Infertility

- Primary – change environment
 - Timing intercourse - checking for ovulation
 - Decrease stress, diet, exercise, etc
- Secondary – correct hormone levels, surgery to correct physical problems
- Final – Assisted Reproduction Technologies
 - More often necessary for female infertility

Most Common Choices of Treatment



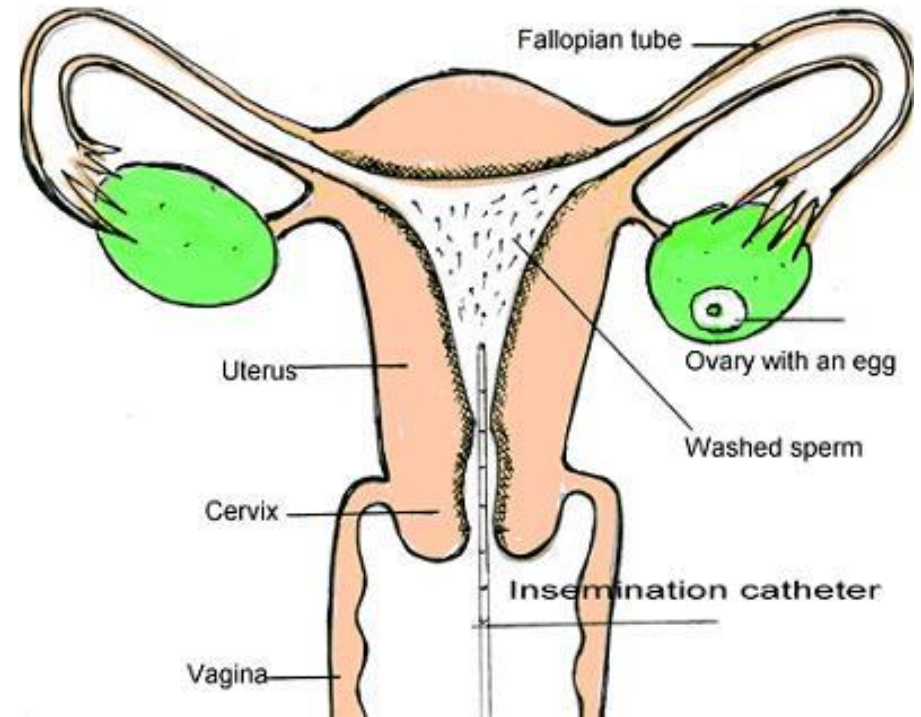
- Artificial Insemination
- In Vitro Fertilization
- Intra-Cytoplasmic Sperm Injection
- Frozen Embryos
- Gamete Intra Fallopian Transfer
- Zygote Intra Fallopian Transfer

Assisted Reproductive Technologies

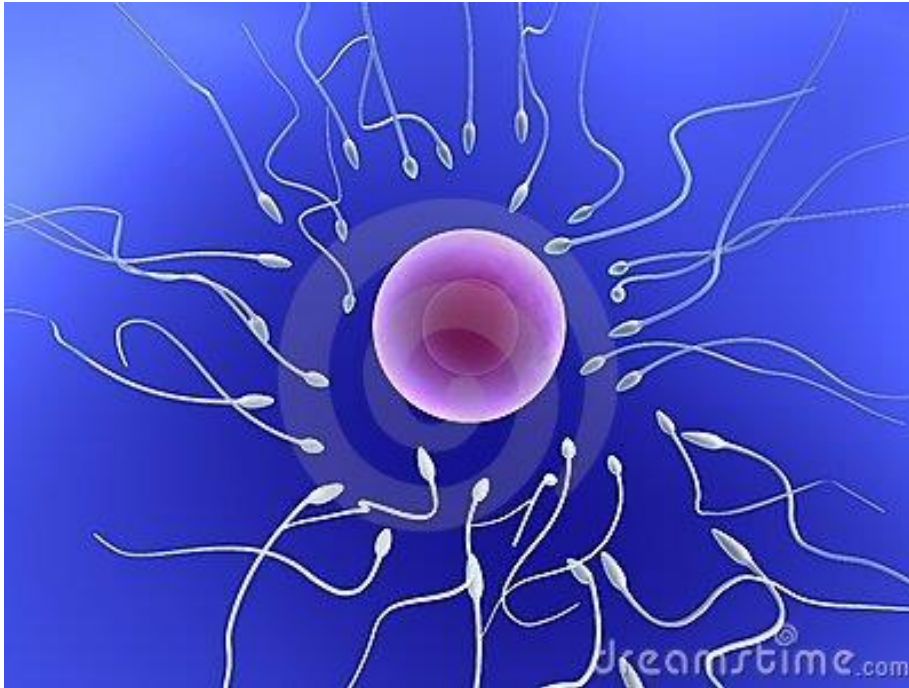
Artificial Insemination

Intrauterine insemination (IUI)

- Sperm is collected and placed into a woman's vagina, cervical canal or in the uterus.
- Sperm can come from your partner or an anonymous donor.



In-Vitro Fertilization



- A woman's eggs are removed from the ovary and mixed with sperm in a laboratory. Then once fertilized, the embryos are placed into the woman's uterus.

Sperm and oocyte are mixed in Petri dish
Embryo at 8 or 16 cell stage implanted into
uterus

in vitro Fertilization (IVF)

The steps of IVF are:

- Superovulation
- Egg Retrieval
- Fertilization
- Embryo Transfer

Superovulation or ovarian stimulation

A woman takes medication to stimulate the ovaries to make many mature eggs at one time.

These medications are given by injection for 8 to 14 days.

A health care provider closely monitors the development of the eggs using transvaginal ultrasound and blood tests to assess follicle growth and estrogen production by the ovaries.

When the eggs are mature—as determined by the size of the ovarian follicles and the level of estrogen—an injection of the hormone hCG initiates the ovulation process.

A health care provider takes out (egg retrieval) the eggs 34 to 36 hours after the hCG injection.

Egg Retrieval

This is the process used to remove the oocytes from the ovaries so they can be fertilized.

The steps for egg retrieval are as follows:

- An ultrasound probe is inserted into the vagina to visualize the ovaries and the follicles, which contain the eggs.
- A needle is inserted through the wall of the vagina to the ovaries. Generally, ultrasound is used to guide the placement of the needle.
- Suction is used to pull the eggs from the ovaries into the needle.

Fertilization

A man provides a semen sample.

If the sperm are healthy, they are placed in a dish with the egg, and left overnight in an incubator for fertilization.

Embryos that develop from IVF are placed into the uterus 1 to 6 days after retrieval.

Embryo Transfer

A health care provider inserts a long, thin tube through the vagina and into the uterus and injects the embryo into the uterus. The embryo should implant into the lining of the uterus 6 to 10 days after retrieval.

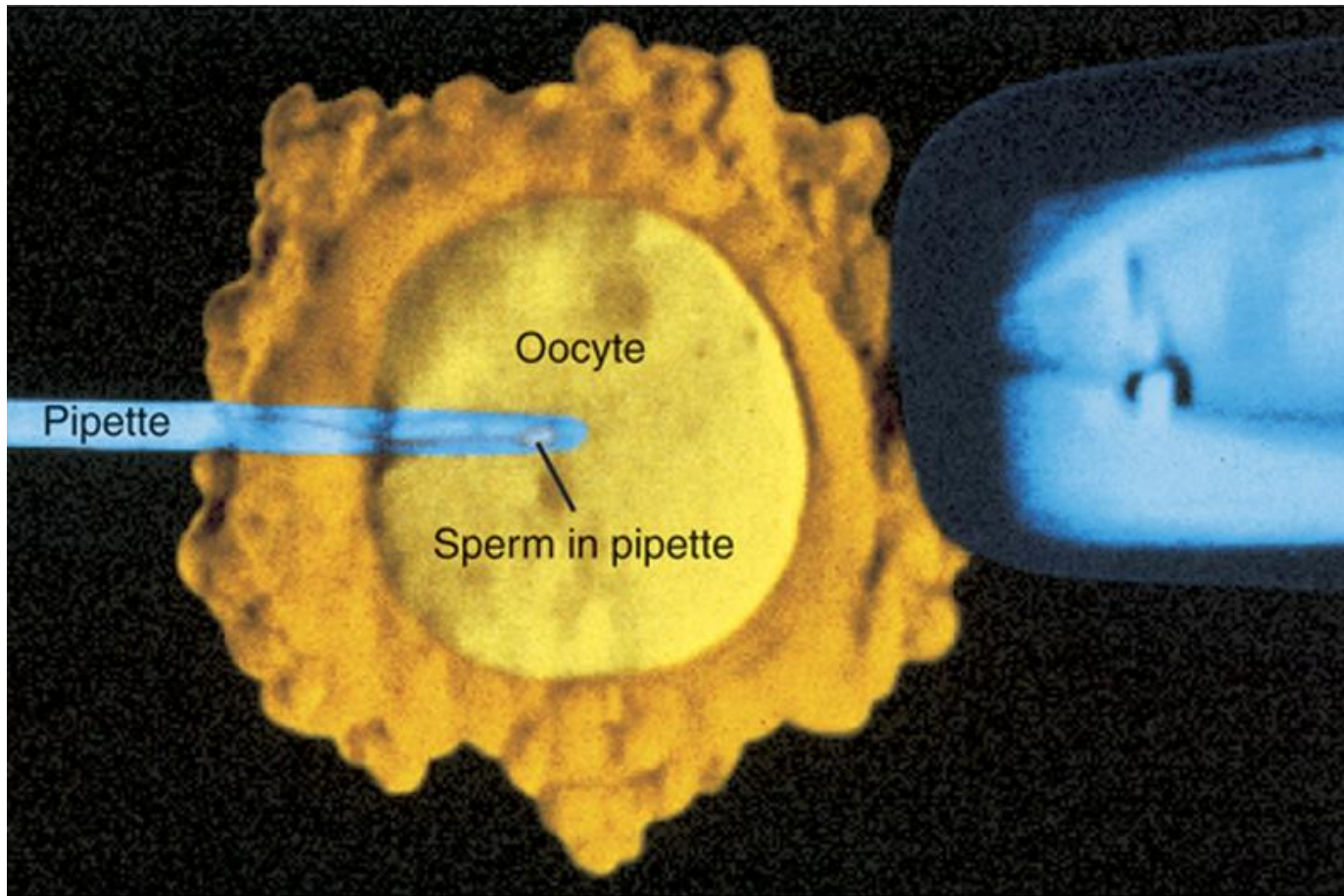
Women receive estrogen and progesterone medications to prepare their uterine linings for implantation.

in vitro Fertilization (IVF)

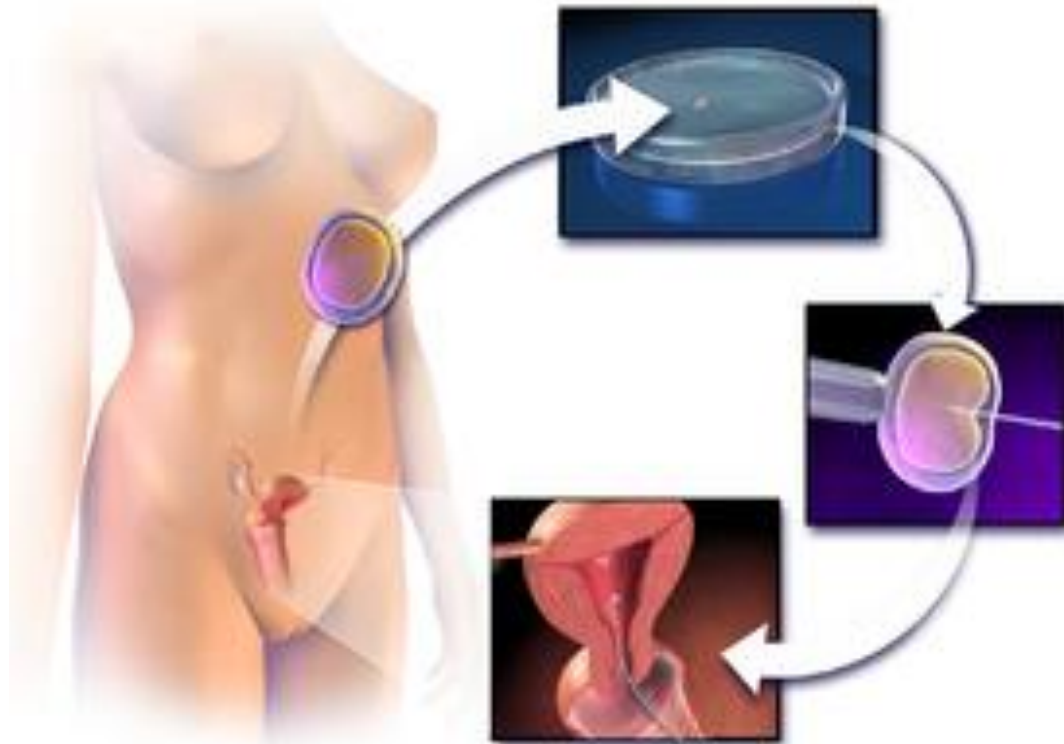
- Problem is that egg and sperm can't meet:
 - Blocked tubes or abnormal structures
 - Not enough healthy sperm
- Success rate ~ 30%
- Children have ~ twice rate of birth defects

ICSI

- IVF where sperm is injected into oocyte



- ICSI – intracytoplasmic sperm injection
 - Sperm actually microinjected into oocyte
 - Then embryo implanted into uterus
 - Important when father has low sperm count or large number of abnormal sperm

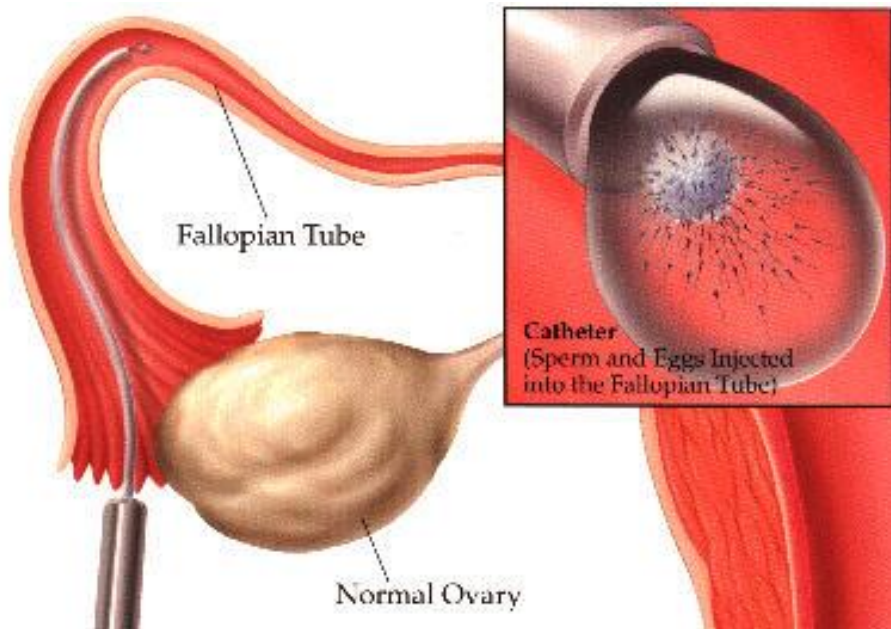


Frozen Embryos



- Embryos may be taken from an individual and stored for later use.
- Once ready to use, they can be thawed and then placed into the uterus.
- This allows a higher chance of pregnancy.

Gamete Intra-Fallopian Transfer (GIFT)



- A mixture of a woman's eggs and sperm are placed into the fallopian tube during a laparoscopy.
- Once inserted, fertilization is allowed to occur.

Helping Fertilization

- GIFT – gamete intrafallopian transfer
 - Deposit the sperm directly into fallopian tubes
 - Or deposit sperm and oocytes (mother's or donor's) into fallopian tubes
 - Like IVF that happens internally (~26%)

Zygote Intra-Fallopian Transfer (ZIFT)



- Mixture of In Vitro Fertilization and Gamete Intra Fallopian Transfer.
- Fertilization takes place outside the uterus and placed into the fallopian tubes.

Helping Fertilization

- ZIFT – zygote intrafallopian transfer
 - Same as IVF only implanted into fallopian tube rather than uterus
 - Less successful than IVF (~23%)

Risks

The majority of IVF-conceived infants do not have birth defects. However, some studies have suggested that ART is associated with an increased risk of birth defects.

There could be an increased risk for medical complications with both the mother and baby.

How Does this Affect Me?

- Knowing your body, as well as taking care of your body increases your chances of becoming pregnant.
- If you are considering having children in the future, the best thing to do is practice safe sex, take care of your body and stay away from harmful contaminants such as smoking and other types of drugs.
- Fertility affects us all, male or female and attending the doctor regularly can increase your chances of becoming pregnant in the future.



Endanger species



Reproductive technologies for endangered mammalian species. Available from:
<https://www.researchgate.net/publication/12188063> Reproductive technologies for endangered mammalian species.