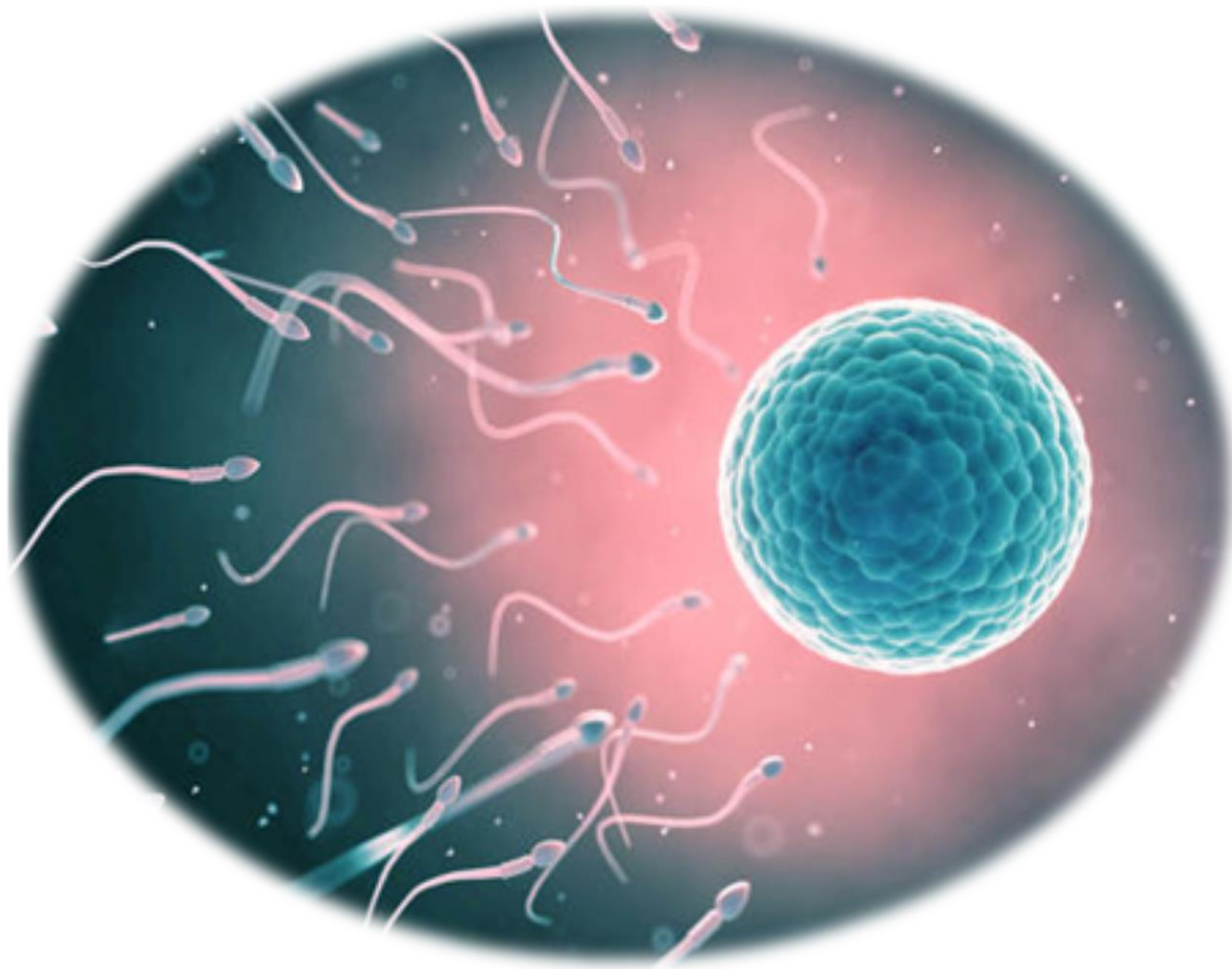


Fertilization



Fertilization

- Also known as generative fertilization, syngamy and impregnation.
- **Fertilization** is the fusion of haploid gametes - egg and sperm, to form the diploid zygote.
- The fusion of the sperm cell nucleus with the egg cell nucleus to produce a zygote (fertilized egg).
- Brings male and females gametes together – produces diploid zygote.
- It also activates the egg, triggering the beginning of embryonic development.
- The process of fertilization involves components and signalling between, both sperm (spermatozoa) and egg (oocyte).
- Fertilization in mammals occurs in the ampulla of the fallopian tube.

Fertilization Preparation

The process of fertilization involves a sperm fusing with an ovum. Prior to the fertilization process commencing both the gametes - oocyte (egg) and spermatozoa (sperm) require completion of a number of biological processes.

1. Oogenesis
2. Spermatogenesis
3. Spermatozoa - Oocyte Interaction
4. Formation of the Zygote

Fusion of the sperm with the egg / Formation of zygote

- In the human, both the head and tail of the spermatozoa enter the cytoplasm of the oocyte.
- The plasma membrane remains on the oocyte surface.
- Head and the neck of the spermatozoon become male pronucleus with haploid number of chromosomes (23, X) or (23, Y).
- the second meiotic division of the oocyte results in haploid number of chromosomes (23, X).
- Unequal division leads to - bigger one, called the female pronucleus, and the smaller one, called second polar body which is pushed to the perivitelline space.
- The male and the female pronuclei unite to form diploid number of chromosomes (46) - zygote.

BLASTOCYST

- Morula is covered by a film of mucus in the uterine cavity on the 4th and 5th day.
- The fluid passes through the canaliculi of the zona pellucida which separates the cells of the morula and is now termed blastocyst.
- Due to blastocyst enlargement the zona pellucida becomes stretched, thinned and gradually disappears.
- Lysis of zona and escape of embryo is called zona hatching.

IMPLANTATION

- Implantation is the stage of pregnancy at which the embryo adheres to the wall of the uterus.
- Implantation occurs in the endometrium of the anterior or posterior wall of the body near the fundus.
- It occurs on the 6th day / the 20th day of a regular menstrual cycle.
- It is by this adhesion that the embryo receives oxygen and nutrients from the mother to be able to grow.

Apposition

- Loose connection between the blastocyst and the endometrium is called the apposition.
- The blastocyst contacts the implantation site of the endometrium.
- On the endometrium, the apposition is usually made where there is a small crypt in it, perhaps because it increases the area of contact with the spherical blastocyst.

Adhesion

- Adhesion is a much stronger attachment to the endometrium than the loose apposition.
- Trophoblast cells of the blastocyst attach to the receptive endometrial epithelium.
- This adhering activity is by microvilli that are on the trophoblast.

Penetration

- The blastocyst is burrowed more and more inside the stratum compactum of the decidua.
- The protrusions of trophoblast cells that adhere into the endometrium continue to proliferate and penetrate into the endometrium.
- The penetrating trophoblast cells differentiate to become a new type of cells, syncytiotrophoblast.
- The rest of the trophoblasts, surrounding the inner cell mass, are called cytotrophoblasts.

Invasion

- Invasive trophoblast cells cross the endometrial epithelial basement membrane and invade the endometrial stroma.
- The syncytiotrophoblasts come into contact with maternal blood and form chorionic villi.
- This is the initiation of forming the placenta.

Gastrulation

- Gastrulation is a phase early in the embryonic development of most animals, during which the blastula (a single-layered hollow sphere of cells) is reorganized into a multilayered structure known as the gastrula.
- Humans are triploblastic organisms.
- In triploblastic organisms, the gastrula is trilaminar (three-layered).
- These three germ layers:
 - ectoderm (outer layer)
 - mesoderm (middle layer)
 - endoderm (inner layer)

- The terms "gastrula" and "gastrulation" were coined by Ernst Haeckel, in 1872.
- Lewis Wolpert, pioneering developmental biologist in the field, has been credited for noting that:

"It is not birth, marriage, or death, but gastrulation which is truly the most important time in your life.

Gestation

- **Gestation** is defined as the time between conception and birth.
- A fetus grows and develops in the womb during **gestation**.
- In mammals, pregnancy begins when a zygote (fertilized ovum) implants in the female's uterus and ends once the fetus leaves the uterus.

Cleavage

- In developmental biology, cleavage is the division of cells in the early embryo, following fertilization.
- The zygotes of many species undergo rapid cell cycles producing a cluster of cells the same size as the original zygote.
- The different cells derived from cleavage are called blastomeres and form a compact mass called the morula.
- Cleavage ends with the formation of the blastula.

Organogenesis

- Organogenesis, in embryology, the series of organized integrated processes that transforms an amorphous mass of cells into a complete organ in the developing embryo.
- The heart is the first organ to form during development of the body.

Parturition

- The action of giving birth to young one.
- Also called as childbirth.
- Childbirth is the culmination of pregnancy, during which a baby grows inside a woman's uterus.
- Childbirth is also called labor.
- Labor is the process of giving birth.
- Birth is the act or process of bearing or bringing forth offspring also referred as parturition.
- Birth, also called childbirth or parturition, process of bringing forth a child from the uterus, or womb.

Hormones

- Dilatation of cervix
 - Relaxin (corpus luteum and placenta)
 - Softens cervix
 - Relaxes birth canal by loosening the connective tissue between pelvic bone
 - Prostaglandins

Breech birth

- Breech birth is when a baby is born bottom first instead of head first, as is normal.
- Around 3–5% of pregnant women at term have a breech baby.
- Due to their higher than average rate of possible complications for the baby, breech births are generally considered higher risk.
- Most babies in the breech position are delivered via caesarean section because it is seen as safer than being born vaginally.