

Fertilization

A process by which **haploid** male gamete fuse with female gamete to give a single **diploid** nucleus (Zygote). Normally occurs in ampulla 12-24 hours after ovulation.

Fertilization

Phase 1

Penetration of corona radiata

Only capacitated sperm can enter corona radiata and undergo acrosomal reaction.

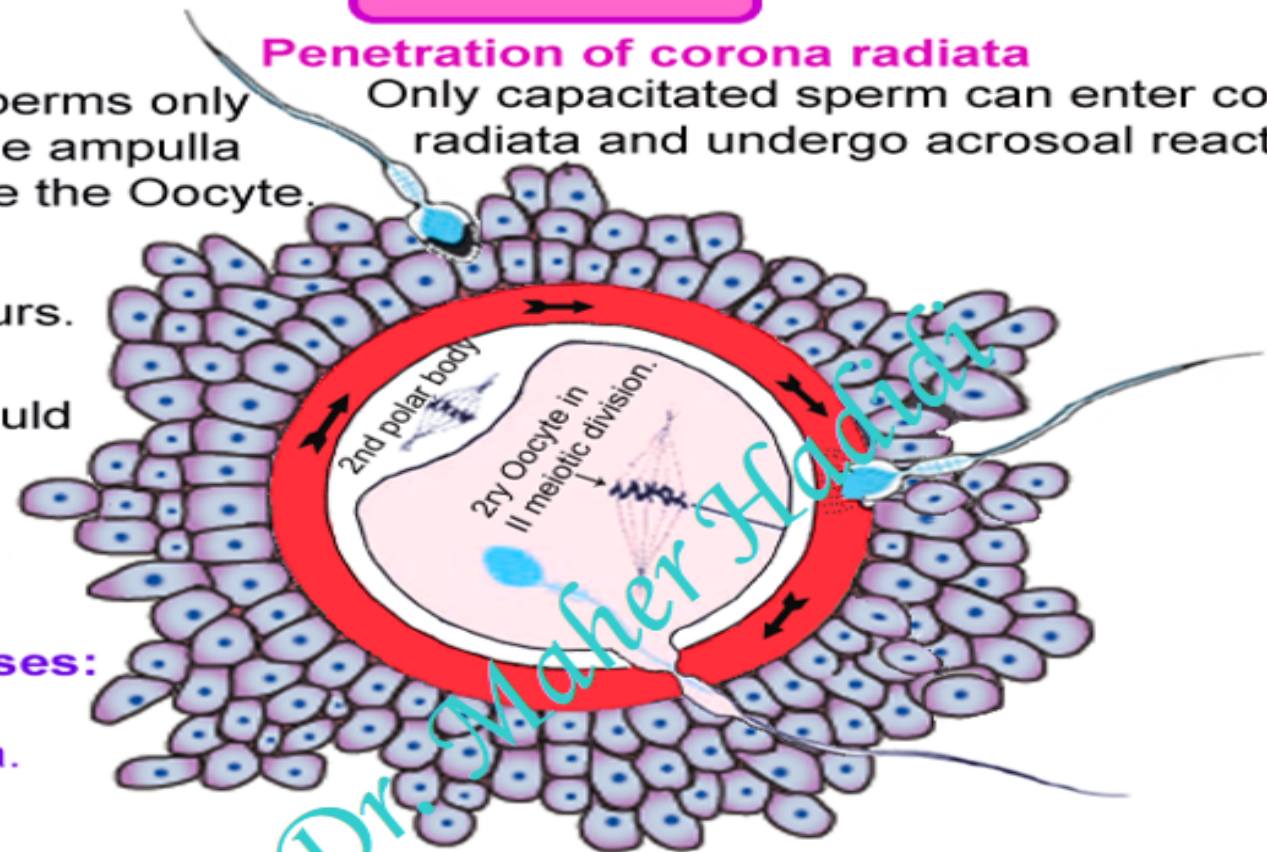
➤ Out of 300 million ejaculated sperms only about 300 sperms can reach the ampulla and only one sperm can fertilize the Oocyte.

➤ The trip from the cervix to the uterine tube needs about 7 hours.

➤ During this trip, the sperms should experience a conditioning period that involves epithelial interactions to be attracted to the 2ry Oocyte.

👉 **Fertilization occurs in 3 phases:**

1. Capacitation.
2. Penetration of Zona pellucida.
3. Fusion of membranes.



Fertilization

Phase 2

Penetration of Zona pellucida

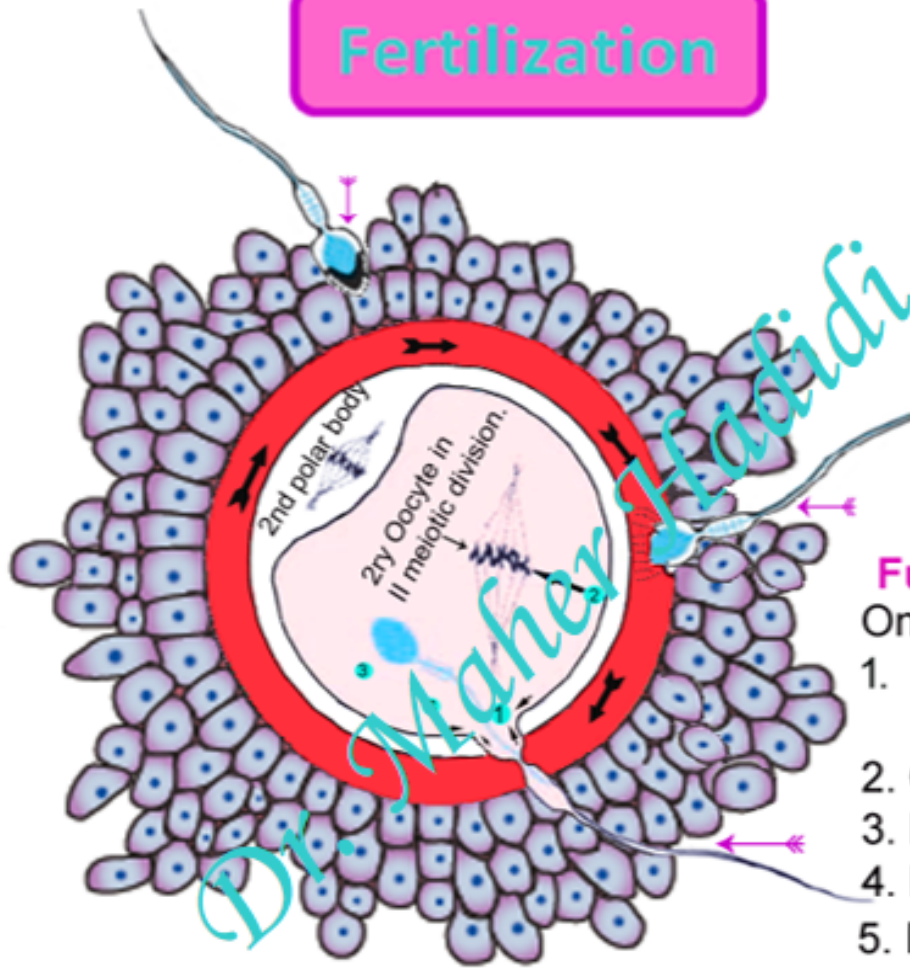
Occurs by acrosomal reaction attracted by ZP3 glycoprotein which, acts a sperm receptor. As a result, the acrosome is induced to release **acrosin** to digest a path through ZP and reaches the oocyte.

Phase 3

Fusion of membranes

Once gametes are contacted,

1. Cell membranes fused together, Oocyte depolarize its membrane and inactivates its ZP3 protein to prevent **Polyspermy**.
2. Oocyte complete meiosis II → Female pronucleus + 2nd polar body.
3. Both nuclei swells and are called the male and female **pronuclei**.
4. Nuclear membranes fused.
5. Maternal and paternal chromosomes replicated in preparation for **subdivisions of zygote**.
6. Midpiece and tail of sperm entered Oocyte cytoplasm will degenerate and the head will form the male pronucleus.



Results of fertilization

1. Restores diploid number of chromosomes.
2. Resumes **II (Metaphase II)** meiotic division.
3. **Sex determination:**

The embryo's chromosomal sex is determined at fertilization by the kind of sperm (X or Y) that fertilizes the ovum.

Fertilization by an X- sperm \Rightarrow XX zygote \Rightarrow Female.

Fertilization by an Y- sperm \Rightarrow XY zygote \Rightarrow Male.

➤ **Therefore, father who determines the sex of the embryo.**

4. Initiates **cleavage** (Partitions) ~ 24h after fertilization.