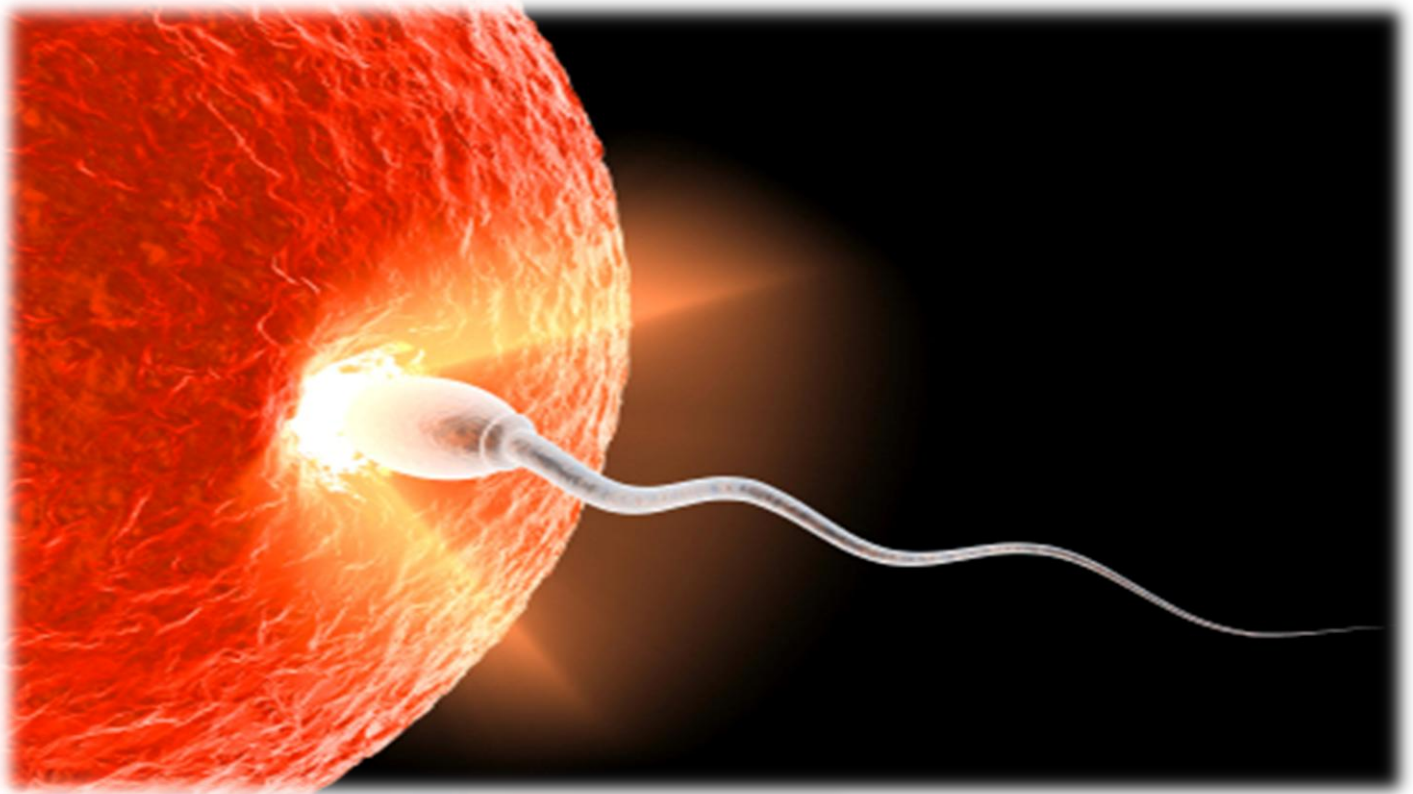


FERTILIZATION, IMPLANTATION & ECTOPIC PREGNANCY



**Dr.Saeed Abulmakarem
has confirmed that the
questions will not come
out of the male's lecture.**

Done by: Salwa Alshibani

Fertilization

After ovulation, the ovum is transported to the ampulla region where the fertilization occurs.

Begins with → a **contact** between sperm & ovum.



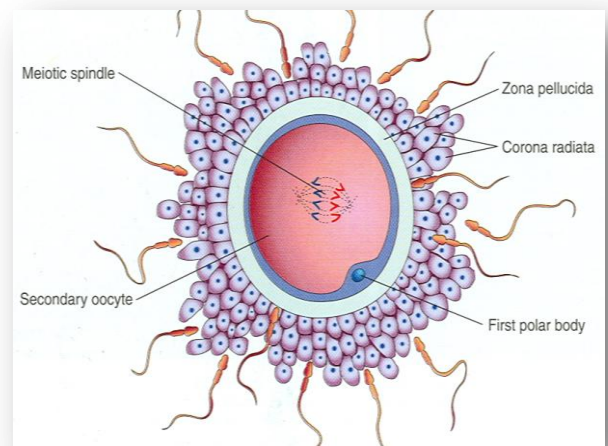
Definition

- the process during which a male gamete (**sperm**) unites with a female gamete (**oocyte**) to form a single cell (**ZYGOTE**).

Site

- Usually in the **ampulla** of the uterine tube (the longest and widest part)

Ends up with → **intermingling** of the maternal and paternal chromosomes.



Phases of Fertilization:

1- **Passage** of the sperm through corona radiata by **the effect of:**

- Hyaluronidase enzyme* secreted from the sperms.
- By movement of its tail.

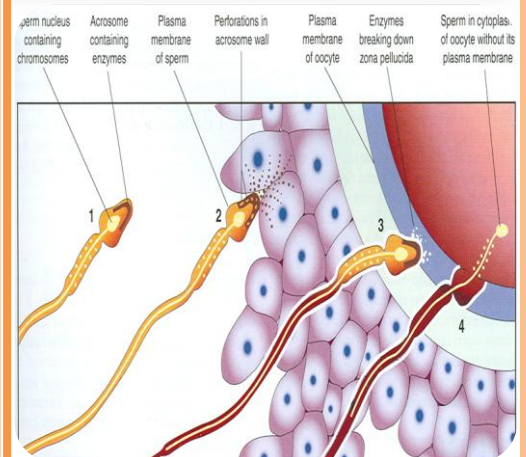
2- **Penetration** of the **zona pellucida** by **acrosine** secreted from **acrosomal cap** of the sperm.

3- **Fusion** of the **plasma membranes** of the oocyte and the sperm.

4- **Completion** of the second meiotic division of the oocyte.

5. **Formation** of the **female pronucleus**.

6. **Formation** of the **male pronucleus**.

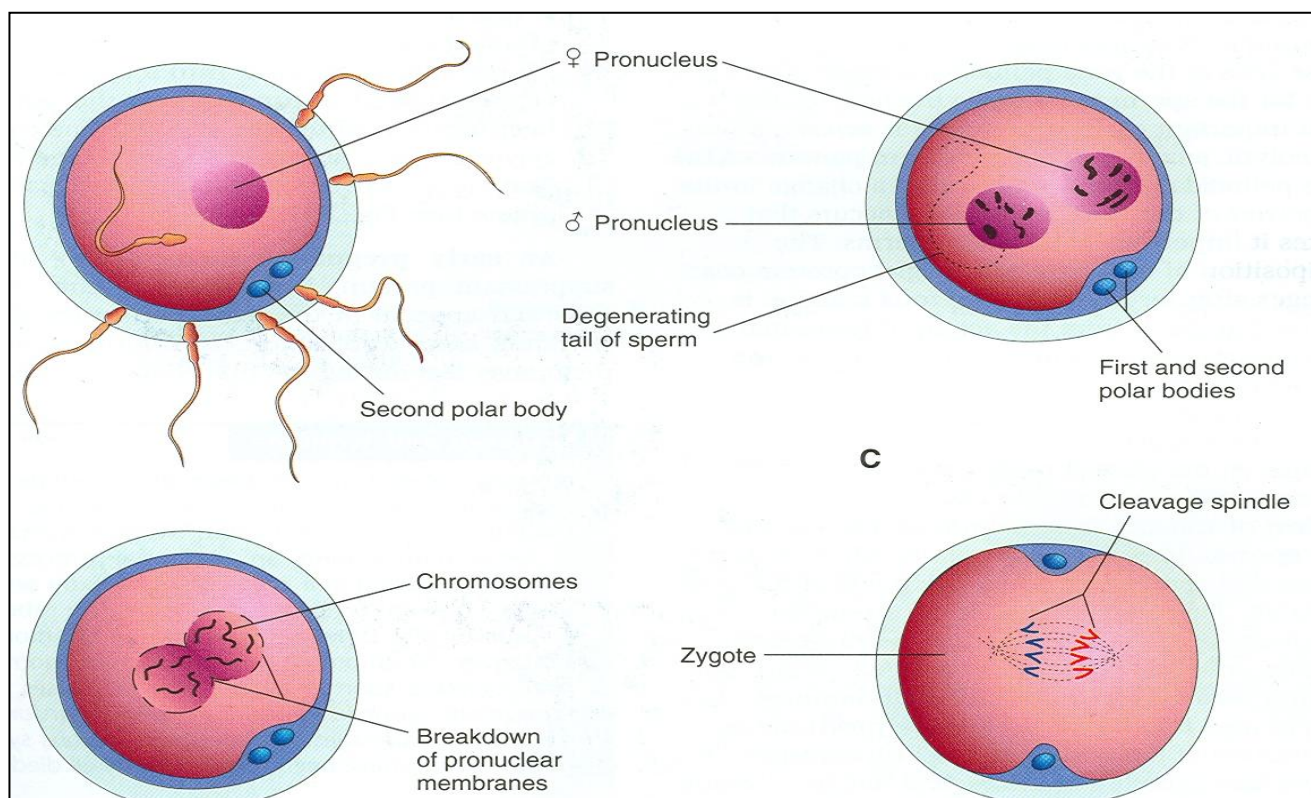


Ovum completes the 1st meiotic division during ovulation.

What happens during the fertilization?

- **Formation of the zygote.** A new combination is formed which is different from either of the parents (Half of its **chromosomes** come from the father & the other half comes from the mother). This mechanism forms **biparental inheritance** and leads to variation of the human species.
- **Determination of the sex of the embryo.** Sex is determined by the type of sperm (**X or Y**) that fertilizes the oocyte. So, it is the **father** whose gamete decides the sex.
- **Zonal reaction.** As soon as the sperm touches the oocyte, the zona pellucid changes its properties and becomes impermeable to the other sperms.

The main results of fertilization:



1. The oocyte completes its 2nd meiotic division.
2. Normal diploid number of chromosomes (46 chromosomes).
3. Determines the chromosomal sex of embryo.

4. Initiates cleavage (cell division) of the zygote.

Cleavage of the zygote:

-It normally occurs in the uterine tube (migrate from lateral end to its medial end) and it begins about 30 hours after fertilization. **Zygote lies within the thick zona pellucida during cleavage.**

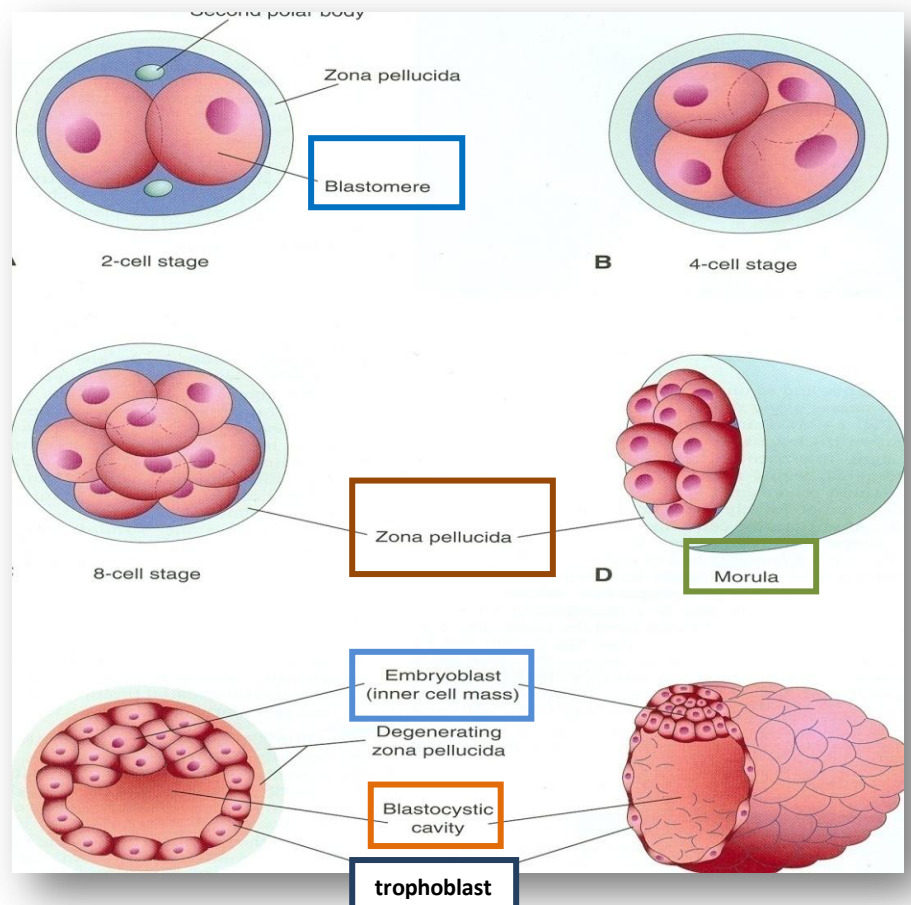
-The zygote undergoes several mitotic divisions. Zygote divides into 2, then 4, then 8, then 16 cells. This will rapidly increase the number of the cells, which are called **Blastomeres.**

-When there are 16-32 blastomeres the developing human is now called **MORULA.**

-The spherical Morula is formed about 3 days after fertilization and it travels down into the uterine cavity.

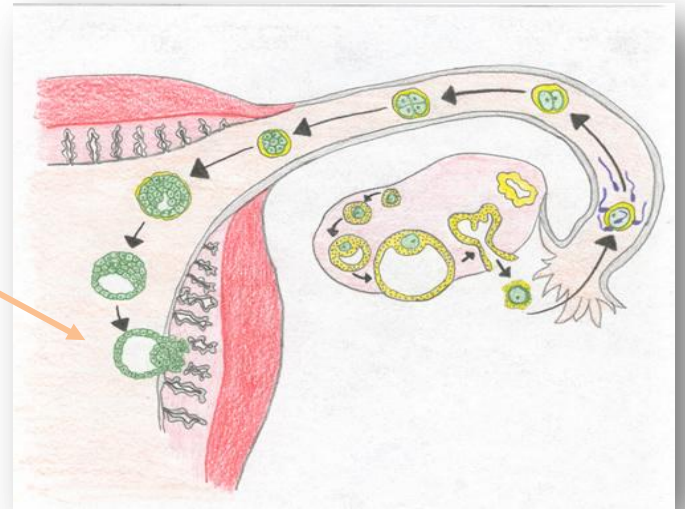
-Ultimately, a cavity appears in the morula (**blastocystic cavity or blastocele**) dividing its cells into 2 parts:

1. Outer cell layer called **trophoblast.**
2. Inner cell layer (mass) or **embryoblast** attached to one of the poles of the blastocyst



IMPLANTATION

The blastocyst has travelled to the uterus.
Now, it is ready to adhere to the surface of the endometrium.



Definition

- the process by which the Blastocyst penetrates the superficial (compact) layer of the endometrium of the uterus

Site

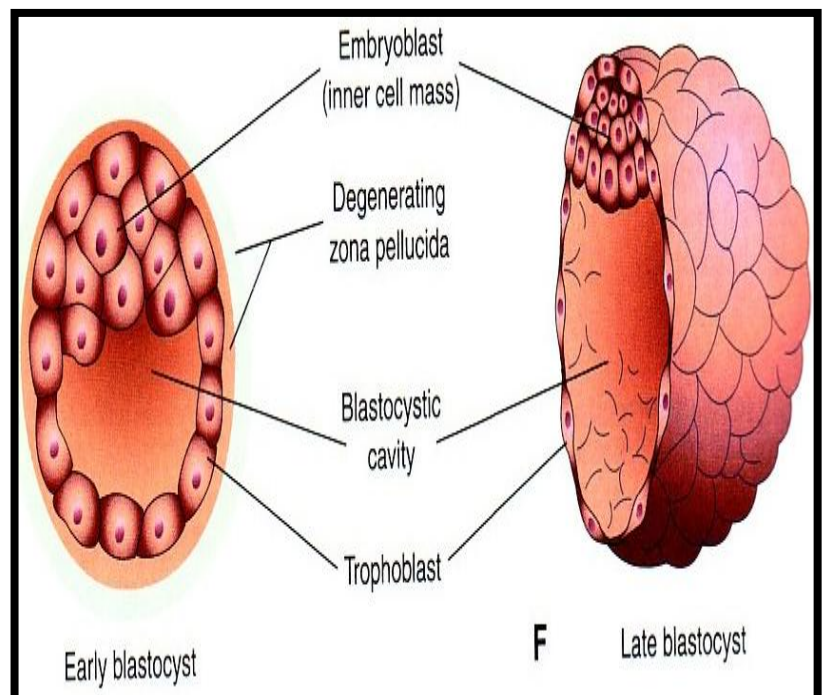
- The posterior wall of the uterus near the fundus.

Time

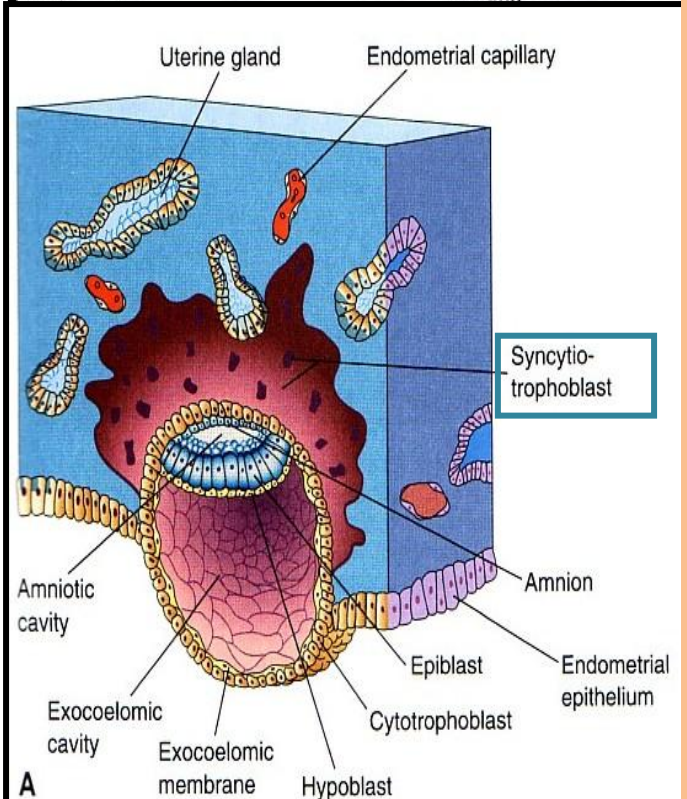
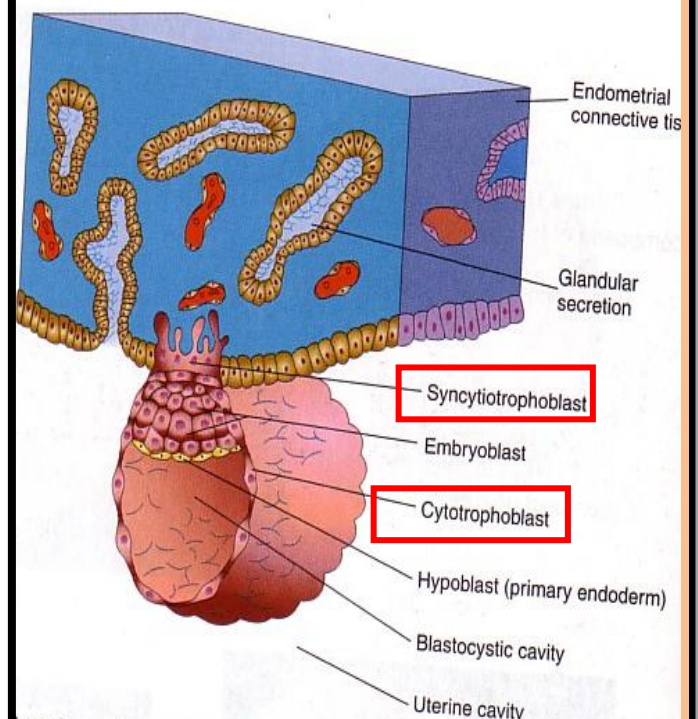
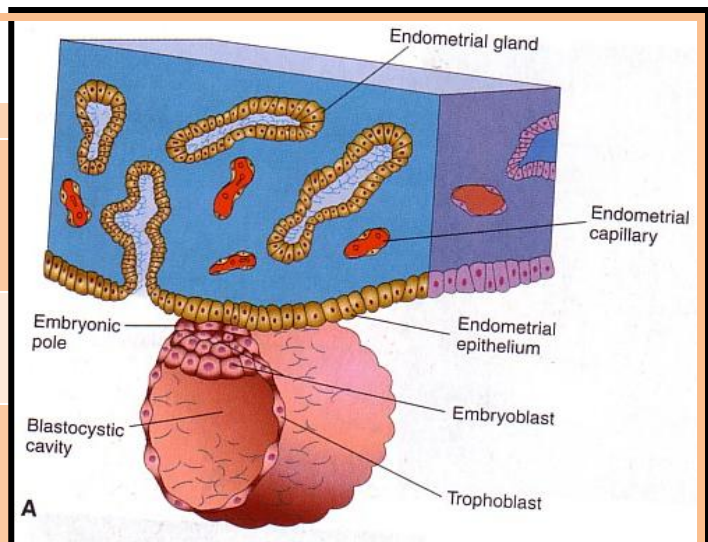
- It begins about the 6th day after fertilization.
- It is completed by the 11th or 12th day.

We said before that the *Blastocyst* has a cavity (blastocystic cavity) and cells that are divided into Embryoblast & Trophoblast.

The embryoblast projects into the blastocystic cavity and the trophoblast forms the wall of the blastocyst.



Day 5	Zona pellucida degenerates & disappears to allow the blastocyst to increase in size and penetrates the endometrium.
Day 6	Blastocyst attaches to the endometrium epithelium
Day 7	<ul style="list-style-type: none"> <u>Trophoblast</u> differentiated into 2 layers: <ol style="list-style-type: none"> Cytotrophoblast, inner layer, mitotically active Syncytiotrophoblast (outer mass multinucleated, with <u>indistinct</u> cell boundary).
Day 8	The blastocyst is embedded superficially in the compact layer of the endometrium.
10 th or 11 th day	Blood-filled Lacunae appear in the Syncytiotrophoblast which communicate forming a network.
11 th or 12 th day.	<p>Uteroplacental circulation is established.</p> <p>(Syncytiotrophoblast erodes the endothelial lining of the maternal capillaries which known as sinusoids)</p> <p>Now blood of maternal capillaries reaches the lacunae.</p>
13 th day	<i>Proliferation</i> of Cytotrophoblast cells produce extension inside the Syncytiotrophoblast to form the primary chorionic villi.



- *Endometrial cells* undergo **apoptosis** (programmed cell death) to facilitate invasion of endometrium by the **Syncytiotrophoblast**.
- Syncytiotrophoblast engulf these degenerated cells for nutrition of the embryo.

Implantation can be detected by:

- 1- Ultrasonography.
- 2- hCG (human chorionic gonadotrophin which is secreted by the Syncytiotrophoblast) by the end of 2nd week.

Ectopic pregnancy (implantation outside the uterus)

1.Placenta Previa

2.Tubal

3.Cervical

4.Ovarian

5.Abdominal

6.Pelvic

Implantation occurs in the lower uterine segment

centralis

lateralis

marginalis

95 to 97% of ectopic pregnancies occurs in the uterine tube

Test yourself

1. Uteroplacental circulation starts at:

- a) 3rd day
- b) 5th day
- c) 8th day
- d) 11 or 12th day

The answer: (d)

2. The normal site of the implantation is:

- a) Anterior wall of the uterus
- b) Posterior wall of the uterus
- c) Medial end of the fallopian tube
- d) Ampulla of the fallopian tube

The answer: (b)