أهلا وسهلا

الأستاذ الدكتور يوسف حسين

أستاذ التشريح وعلم الأجنة ـ كلية الطب ـ جامعة الزقازيق ـ مصر

رئيس قسم التشريح و الأنسجة و الأجنة ـ كلية الطب ـ جامعة مؤتة ـ الأردن

دكتوراة من جامعة كولونيا المانيا

جروب الفيس د. يوسف حسين (استاذ التشريح)

https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists

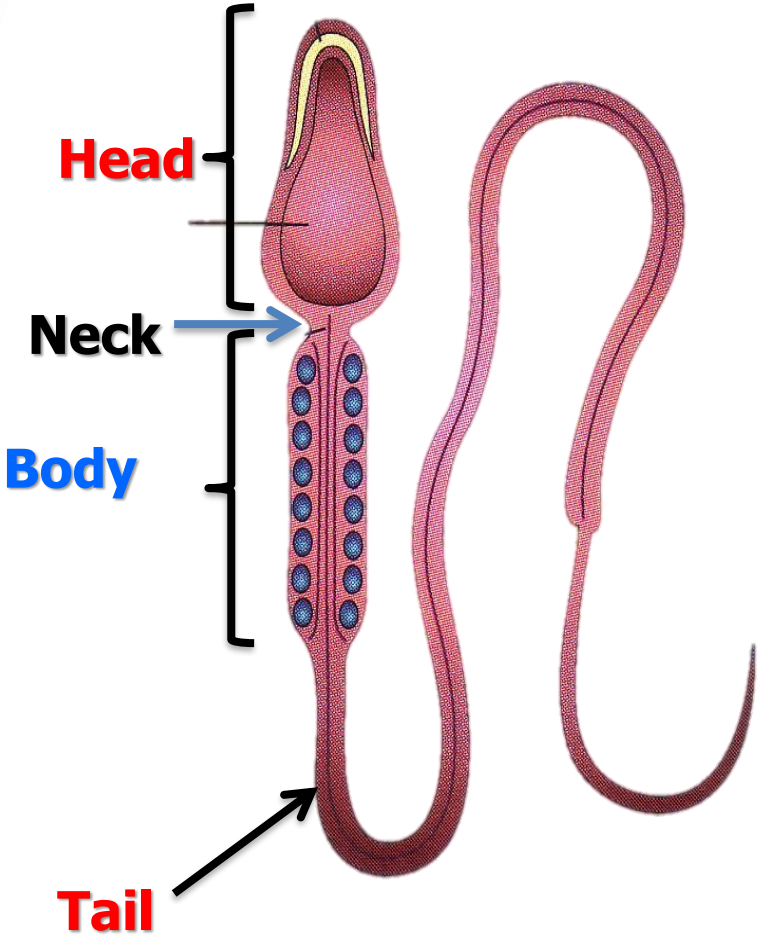
The first week

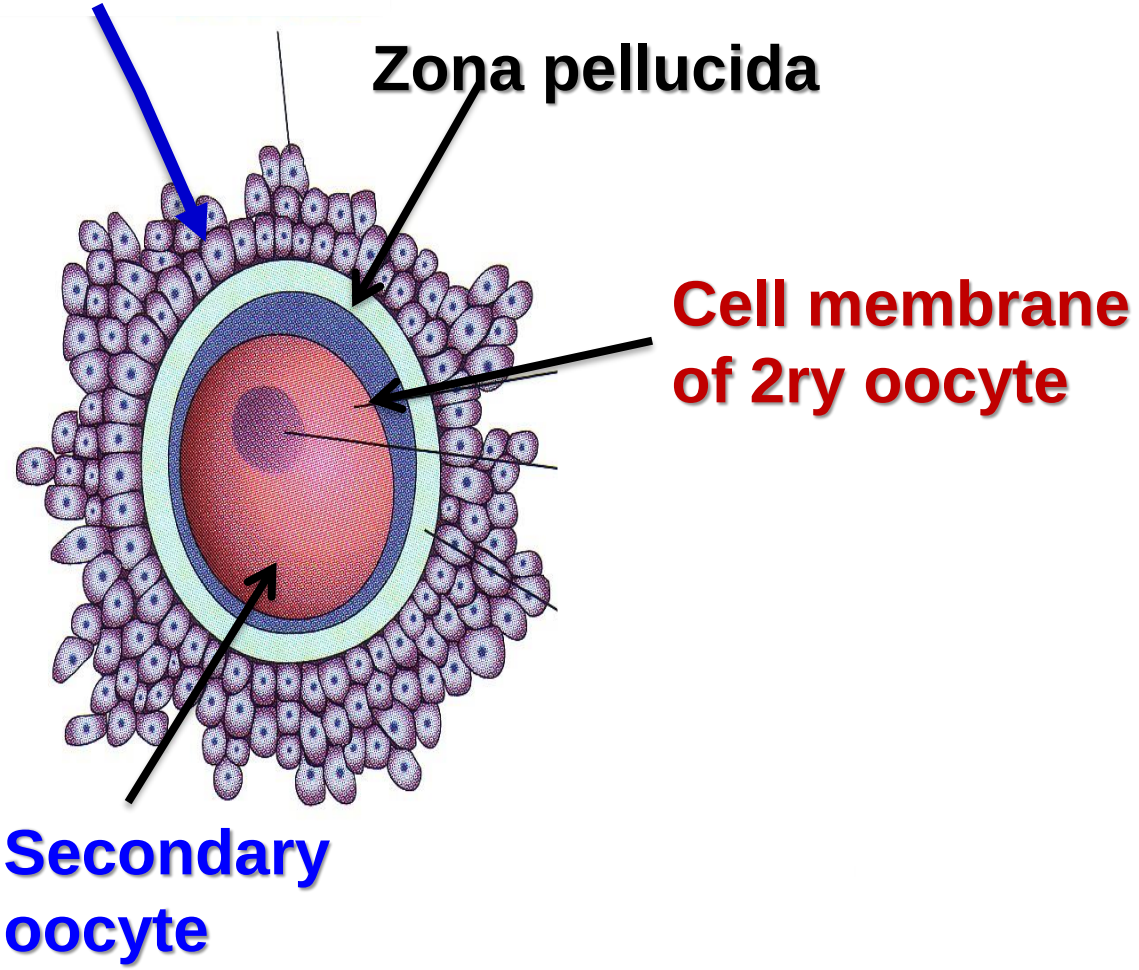
https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists

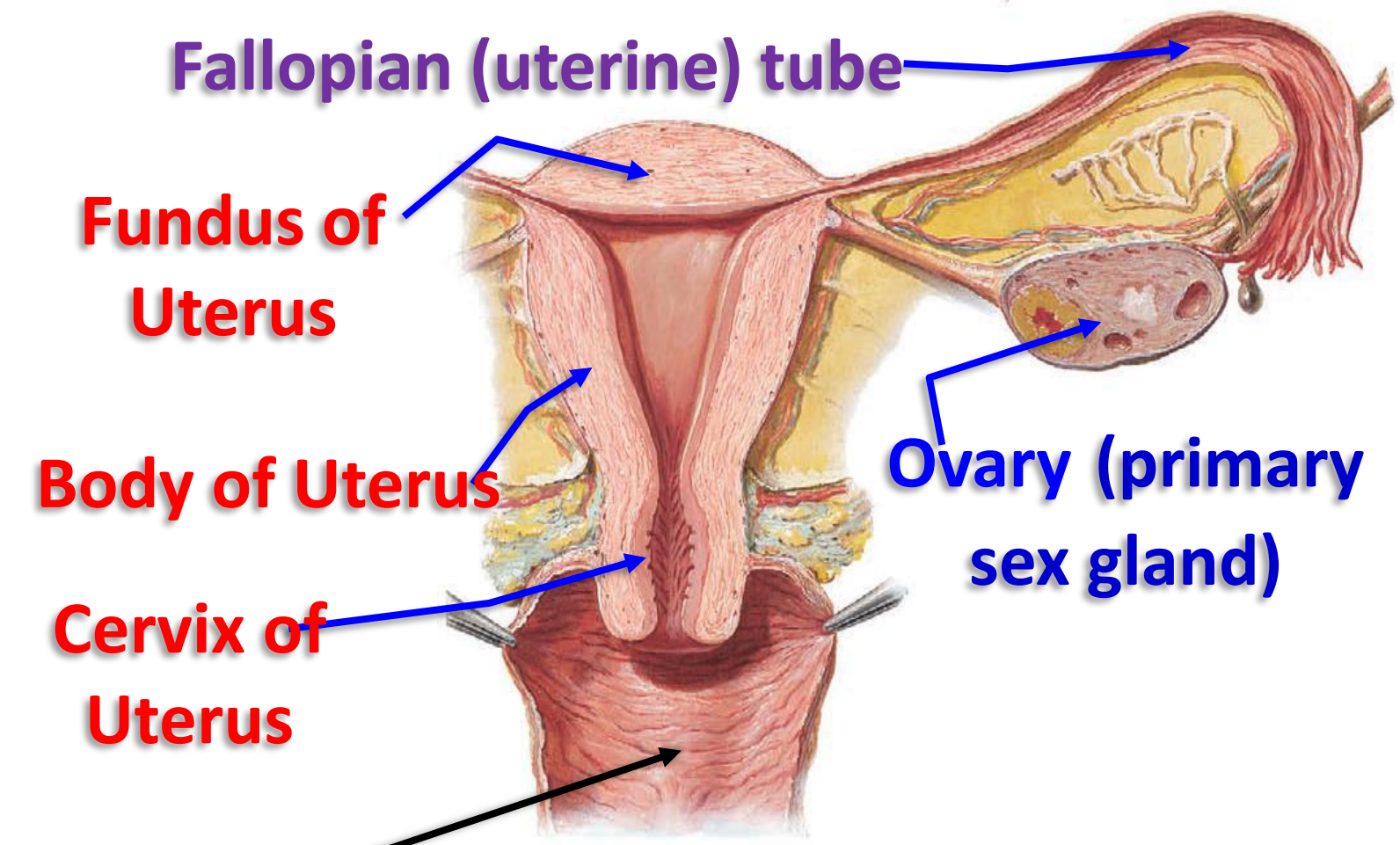
Fertilization

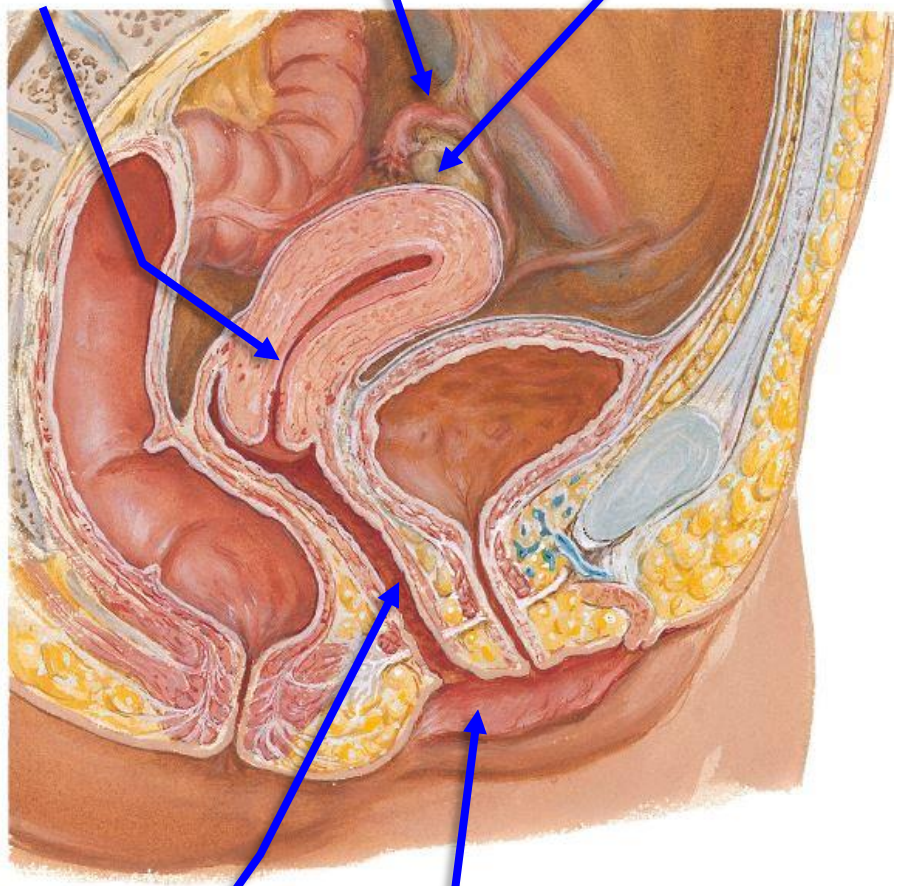
- **Fertilization is the fusion of male gamete (haploid sperm) & female gamete (haploid ovum) to form the diploid zygote.**
- **Time of fertilization: after ovulation that occurs about the 14th day of the ovarian cycle.**
- **Site of fertilization: at ampulla of uterine tube** (lateral 1/3 of uterine tube).
- The lifespan of the ovum is **24 - 48 hours while sperms 48-72 hours.**

Sperm & Corona radiata (ovum)





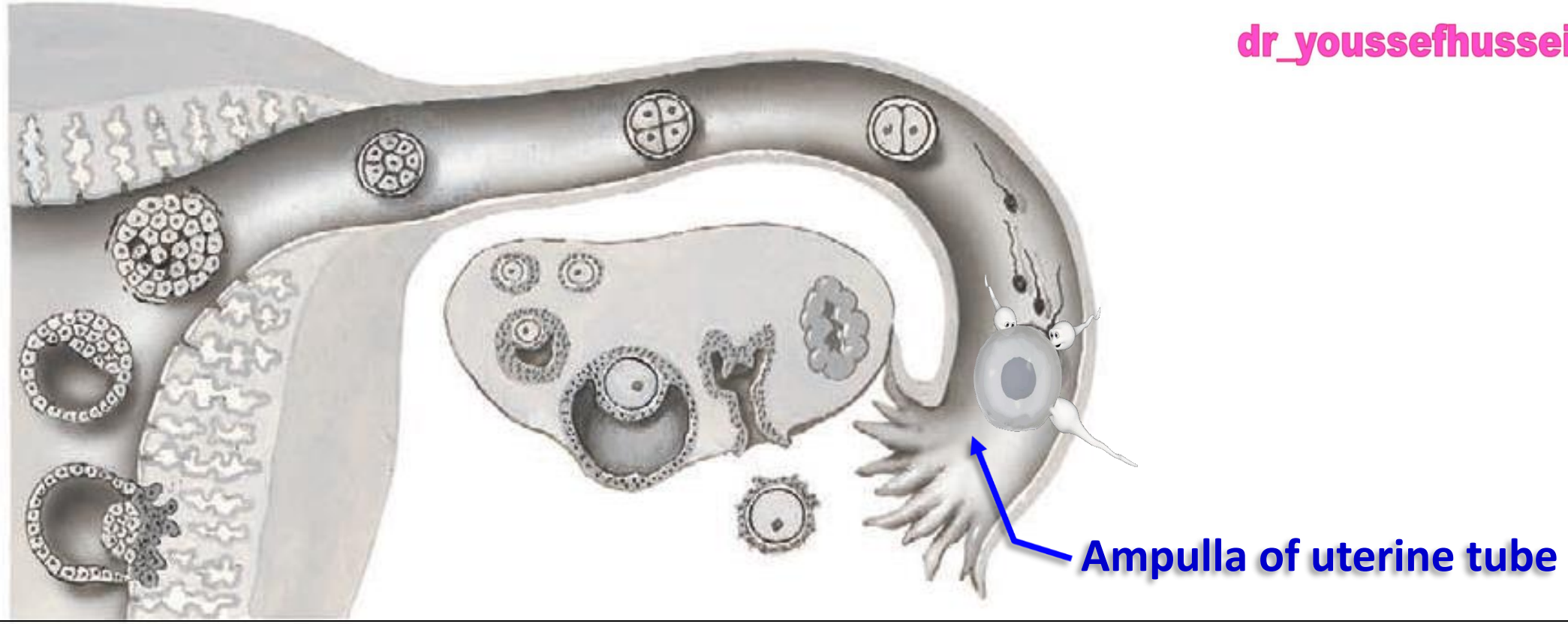




dr_youssefhussein@yahoo.com

Female Reproductive System

dr_youssefhussein@yahoo.com



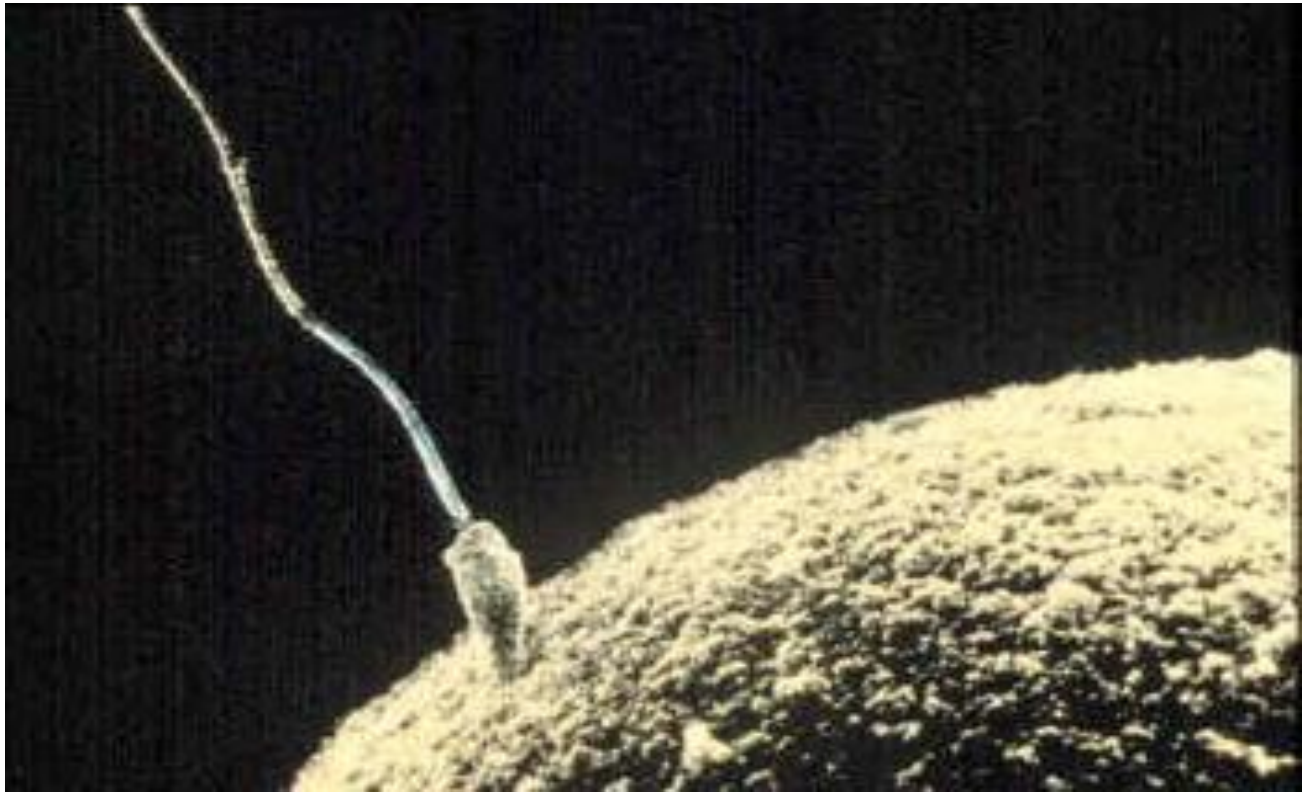
**** The sperms reach lateral 1/3 of the fallopian tube by;**

1- Movement of tails of the sperms.

2- Contraction of smooth muscle of the uterus and fallopian tubes.

3- Movement of the cilia of the uterine tube.

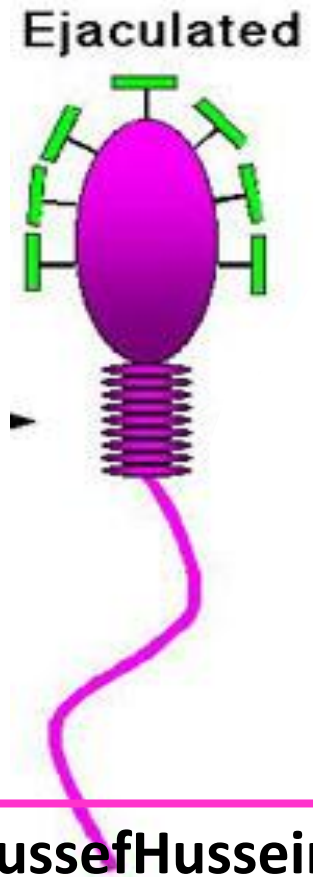
4- At ovulation, increase amount of **secretion** and become **less viscid**, making it more favorable for sperm transport.



- **Number of sperm** about 20-200 million per ml
- **The average volume of semen** at ejaculation is 3-5 ml
- **About 200–300 sperms reach the site of fertilization in uterine tube**
- **Most of sperms able to fertilization within 48 hours.**
- **Only one sperm (its head and neck) can penetrate the secondary oocyte**

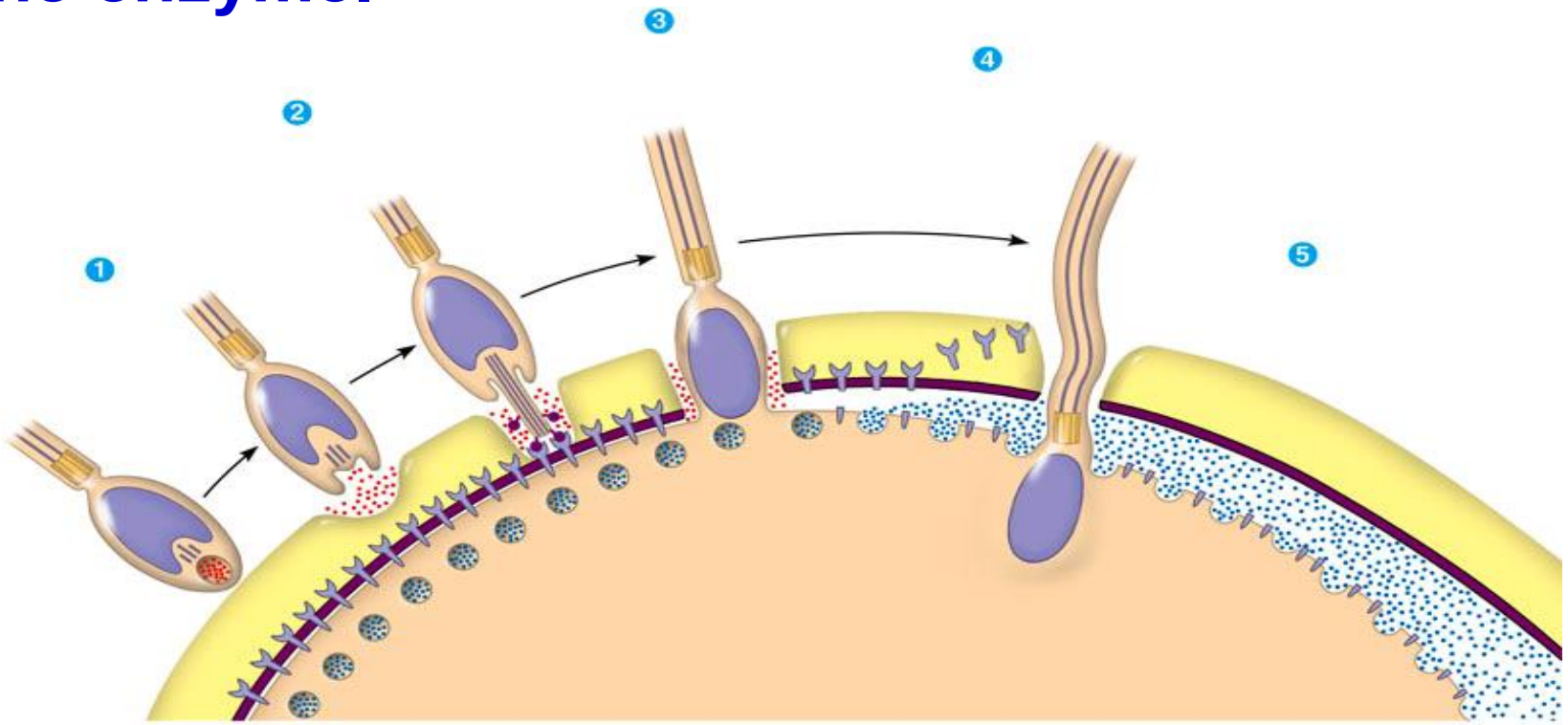
Steps of Fertilization

- **Capacitation, loss of the glycoprotein coat from the acrosomal cap of the sperm head**



- **Acrosomal reaction**; release of the **proteolytic enzymes** from the acrosomal cap to help penetration of the sperm to the ovum.

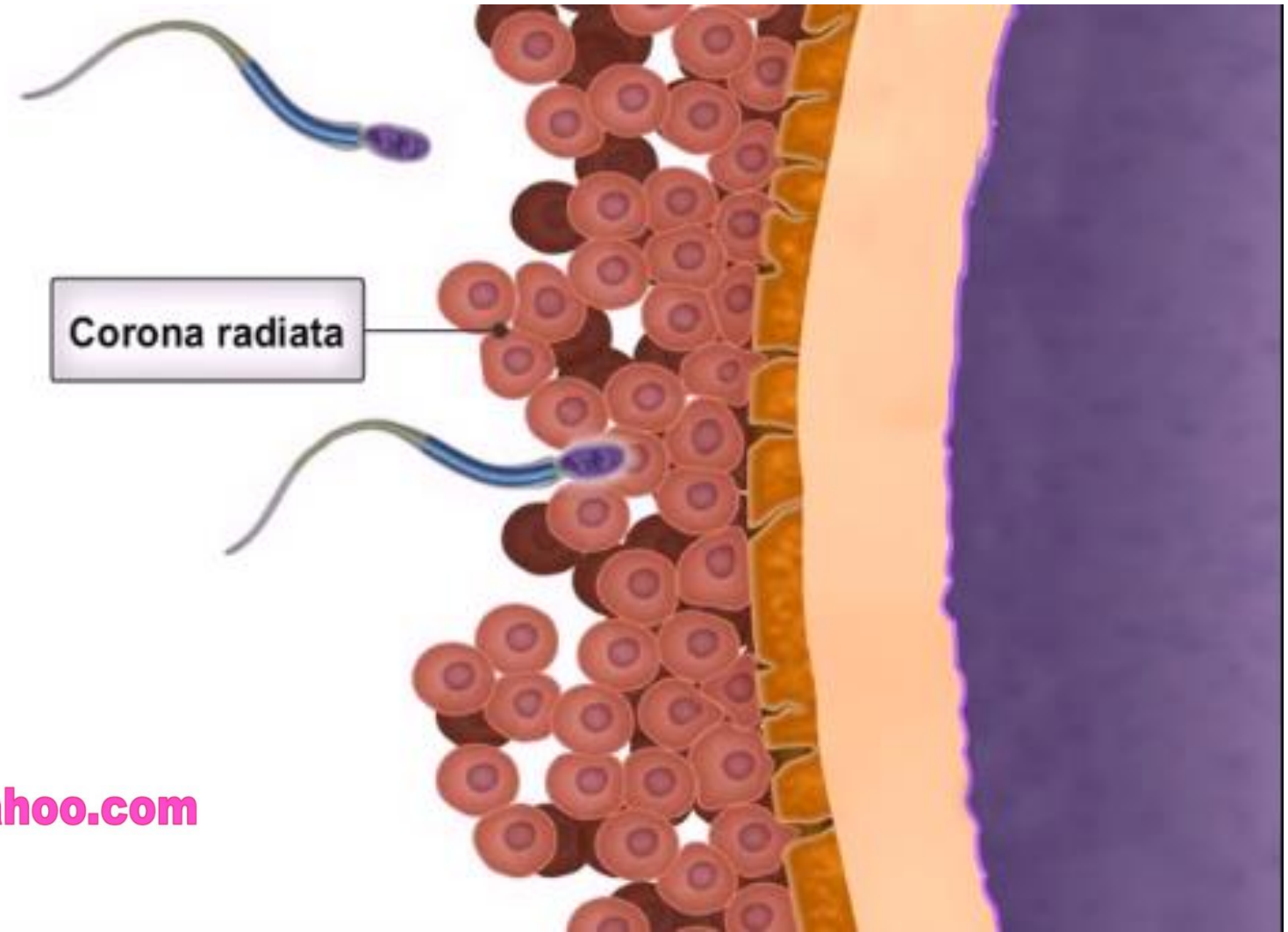
- They include **hyaluronidase enzyme, trypsin like enzyme and zona lysine enzyme.**



Penetration of the corona radiata cells

Penetration of corona radiate cells by :

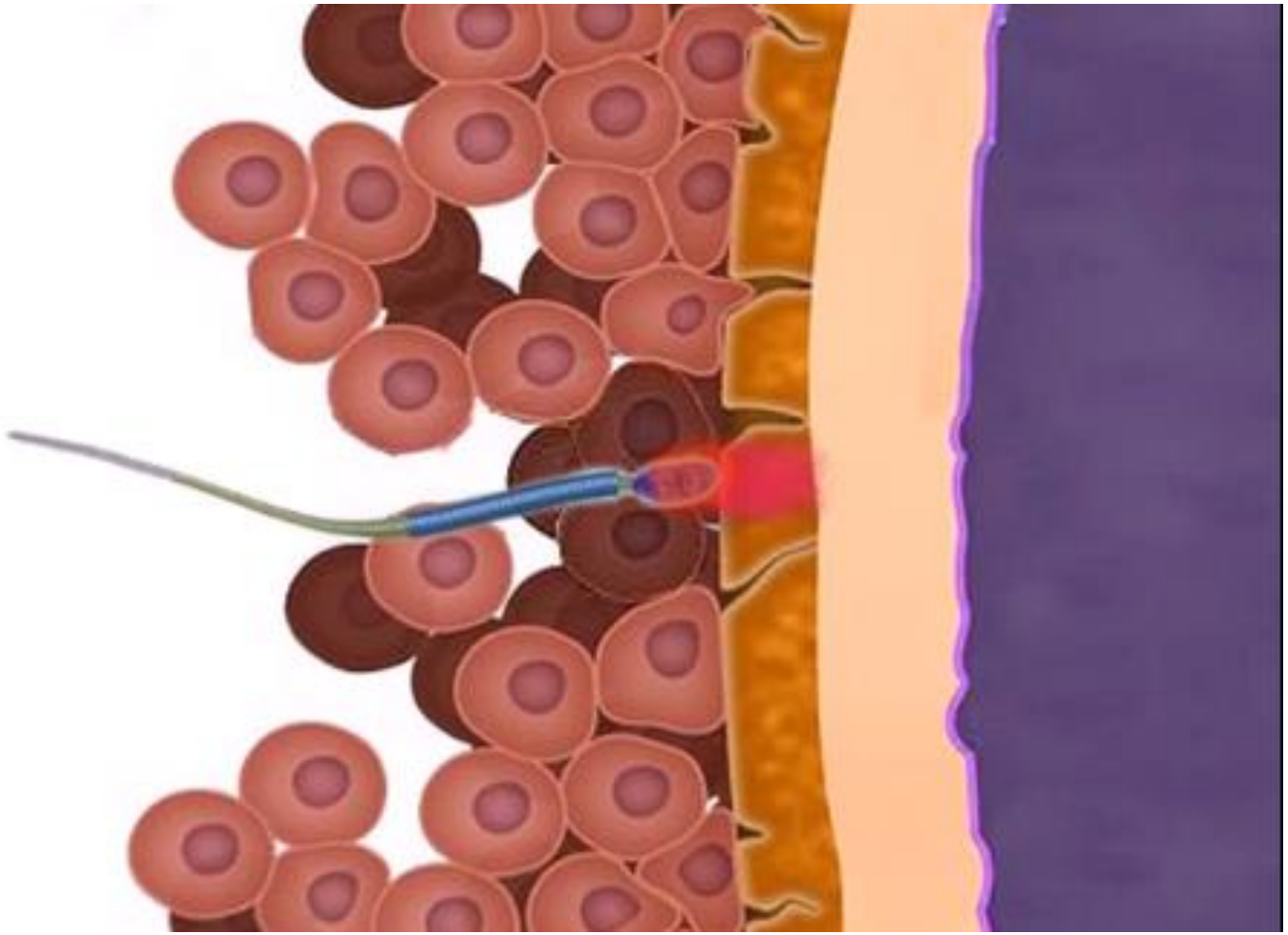
1) Hyaluronidase enzyme of sperms.
2) Mucous secretion of fallopian tube.



dr_youssefhussein@yahoo.com

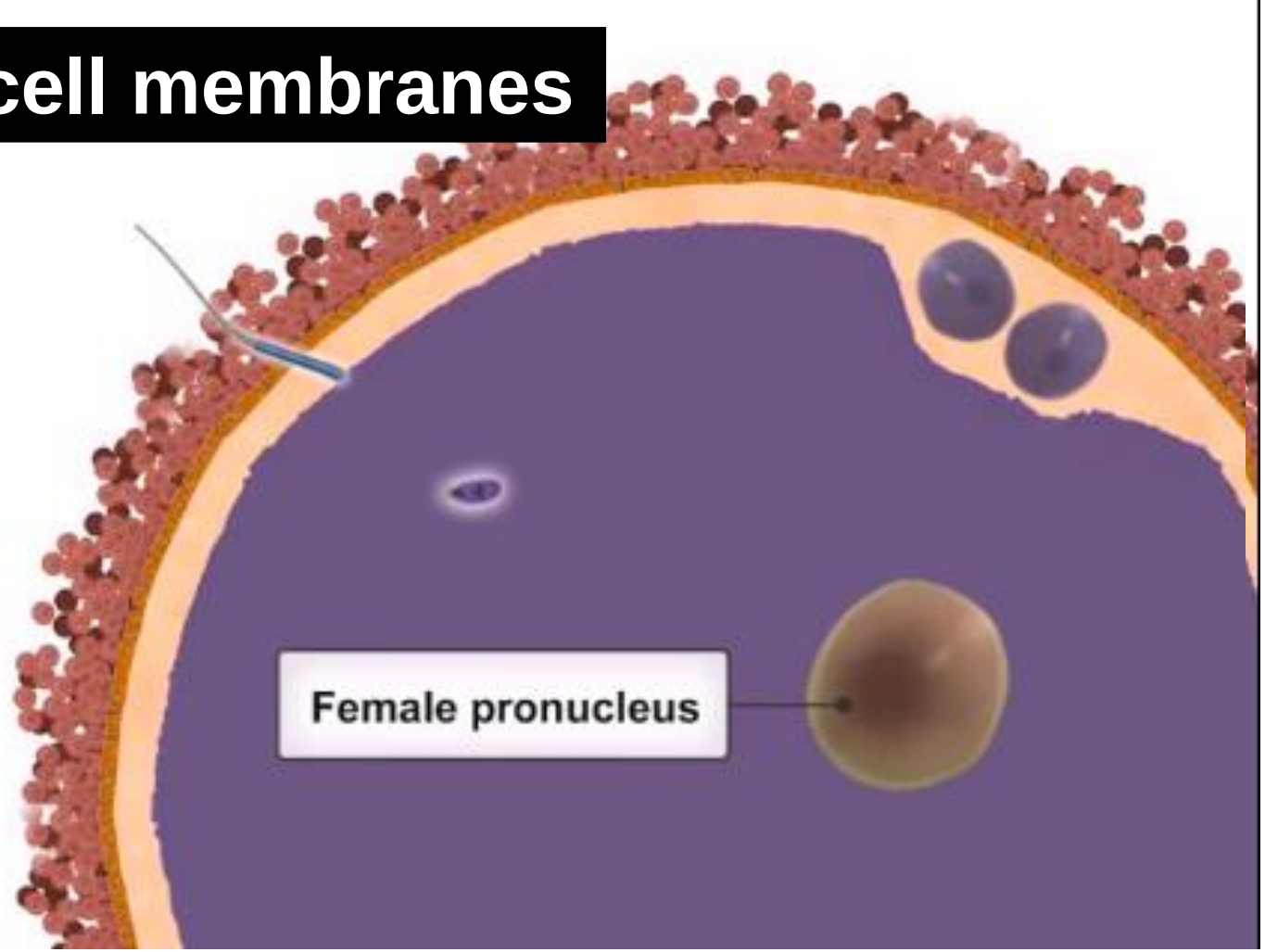
Penetration of the Zona Pellucida

- **Penetration of the zona pellucida** by the **zona lysine enzyme and trypsin like enzyme of the sperms**.
- **Zona reaction:** After penetration of the sperm (Only head and neck), the zona pellucida changes its **chemical composition** to prevent entry of other sperms.



https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists

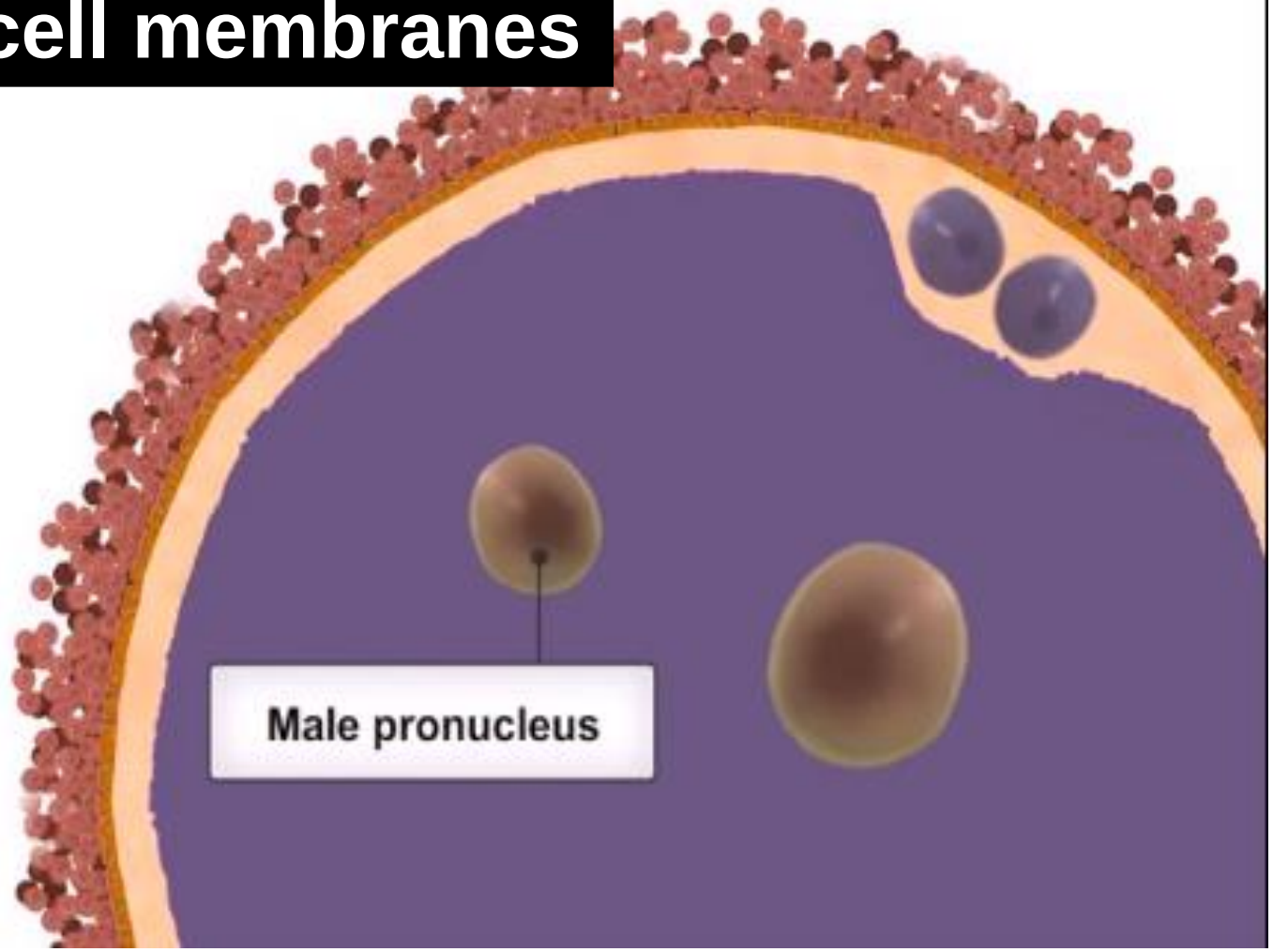
Fusion of gametes cell membranes



a. **Cortical reaction:** after penetration of head and neck of sperm to cell membrane of the 2ry oocyte, It alters its **chemical composition** to prevent entry of other sperm.

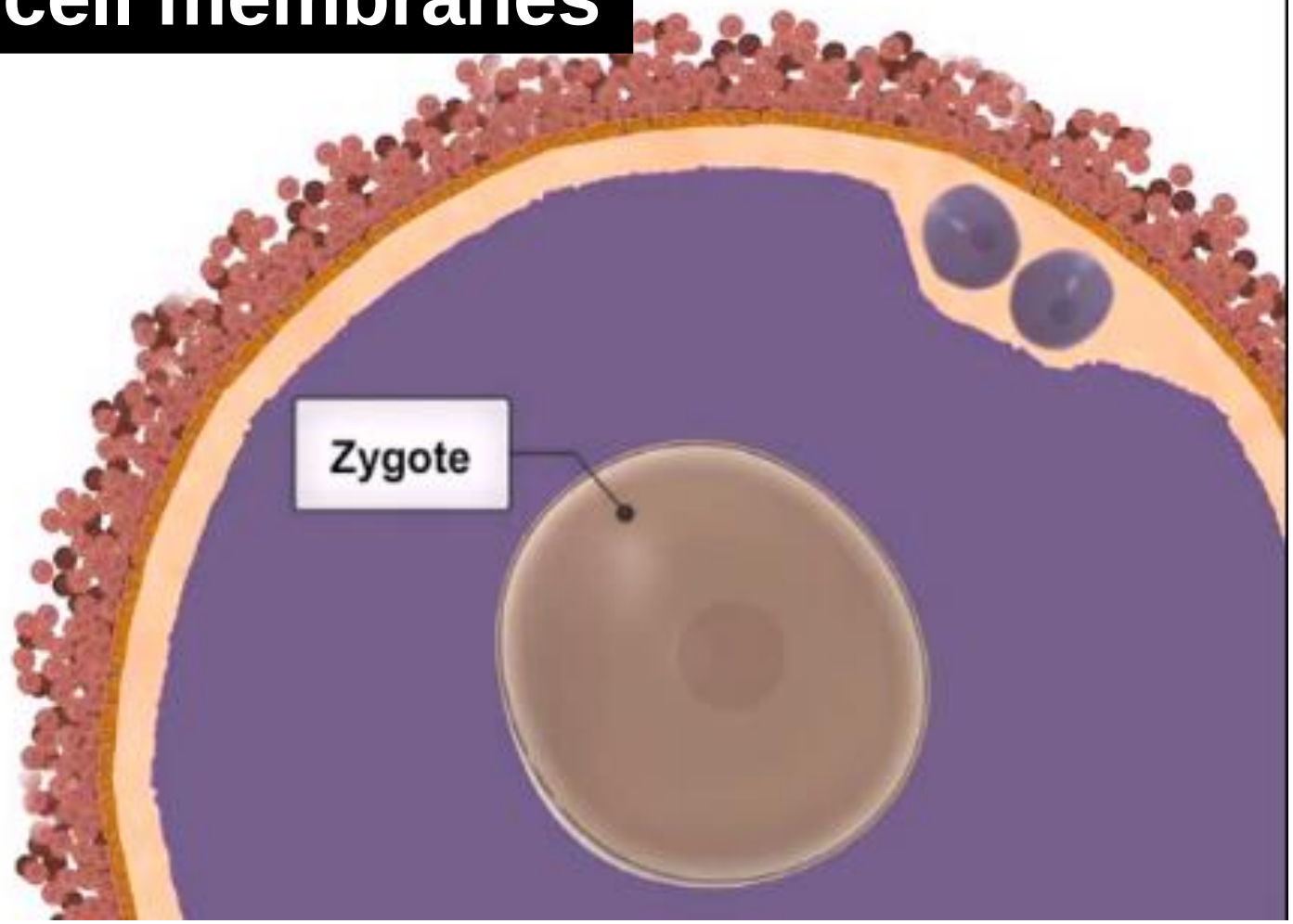
b. The 2ry oocyte completes the **2nd meiotic division** giving rise to definitive **ovum** and 2nd polar body. The nucleus of the ovum enlarged to form **female pronucleus**.

Fusion of gametes cell membranes



- Only head and neck of one sperm penetrates the ovum.
- The head of the sperm swells and forms the male pronucleus

Fusion of gametes cell membranes



- **Both male and female pronuclei become in contact with each other and fuse together to form the zygote (46 chromosomes).**

• Results of Fertilization

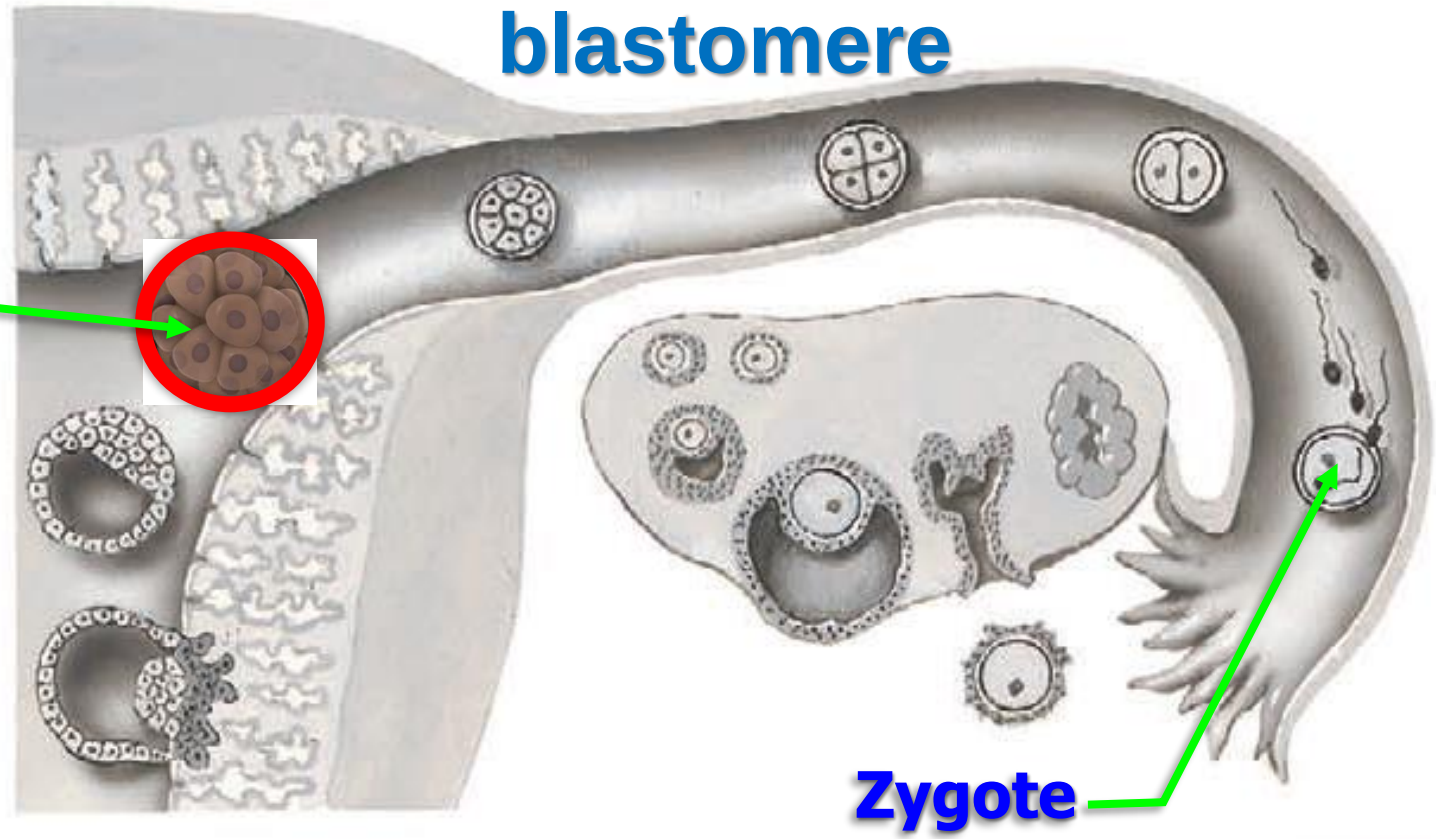
dr_youssefhussein@yahoo.com

- **Formation of zygote.**
- **Restoration of diploid number (46 chromosomes).**
- **Cleavage (segmentation) starts.** Mitosis (cell division) in the new zygote uses **centriole derived from the neck of sperm** but the **oocyte has no centrioles**.
- **Only head and neck of the sperm penetrate, but the body that contains mitochondria does not penetrate, SO, all mitochondria in humans are of maternal origin**.
- **Determination of sex.**
- Determination of **general features** by the autosomes chromosomes.
- Enlarged of **corpus luteum** and continues to secrete progesterone hormones till the **4thmonth** of pregnancy. **After that, it degenerates and its function being carried by placenta.**
- **Inhibition of further ovulation** and menstrual cycle due to inhibition of FSH from pituitary gland by progesterone hormones secreted from the corpus luteum
- The endometrium of the **uterus** becomes more vascular, thickened and its gland are filled by secretion and now called **decidua**

Cleavage (Segmentation)

dr_youssefhussein@yahoo.com

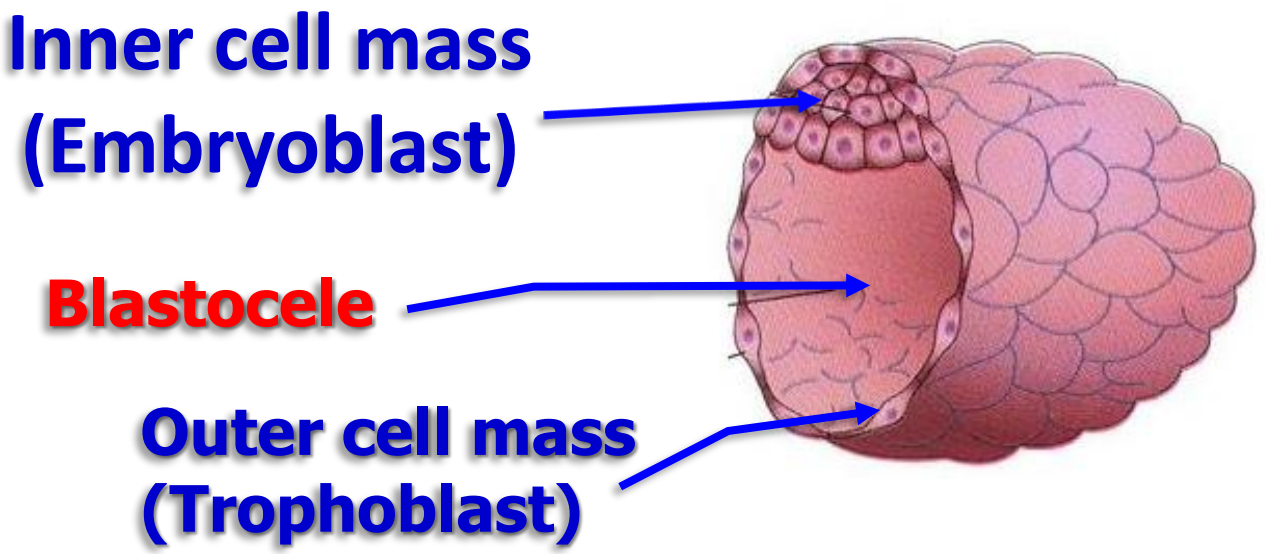
https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists

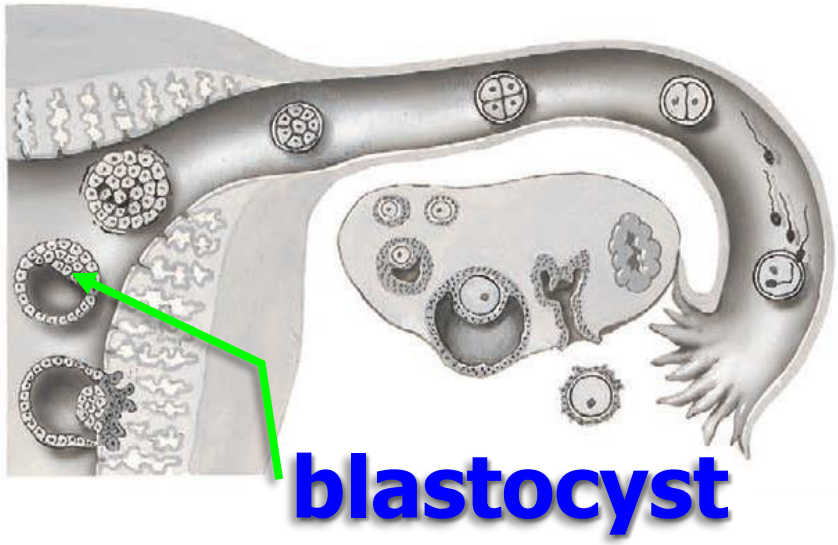


- **Segmentation (Cleavage) Formation of morula التوتية**
- The **zygote** divides repeatedly by **mitotic divisions** leading to an increasing number of cells.
- **Blastomere** is a type of cell produced during cleavage after fertilization and is essential for formation of the morula
- **Morula is a sloid mass and formed** of **16 cells surrounded by zona pellucida**.
- The morula reaches the uterine cavity at the **4th – 5th days** after fertilization.

Formation of Blastocyst

https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists





- **Formation of blastocyst**

- The **blastocyst (**cystic structure) is formed at the **5th days** after fertilization.
- The cells of the morula rapidly proliferate and forming a large number of cells.
- Fluid collects between the cells and form a single cavity called **blastocele**
- **Blastocyst** is surrounded by **zona pellucida** and divided by blastocele cavity into;

  a- Outer layer of flat cells called **trophoblast** that forms the **placenta**.

  b- Inner cell mass (**embryoblast**). This mass will form the **embryo**.

dr_youssefhussein@yahoo.com

Implantation

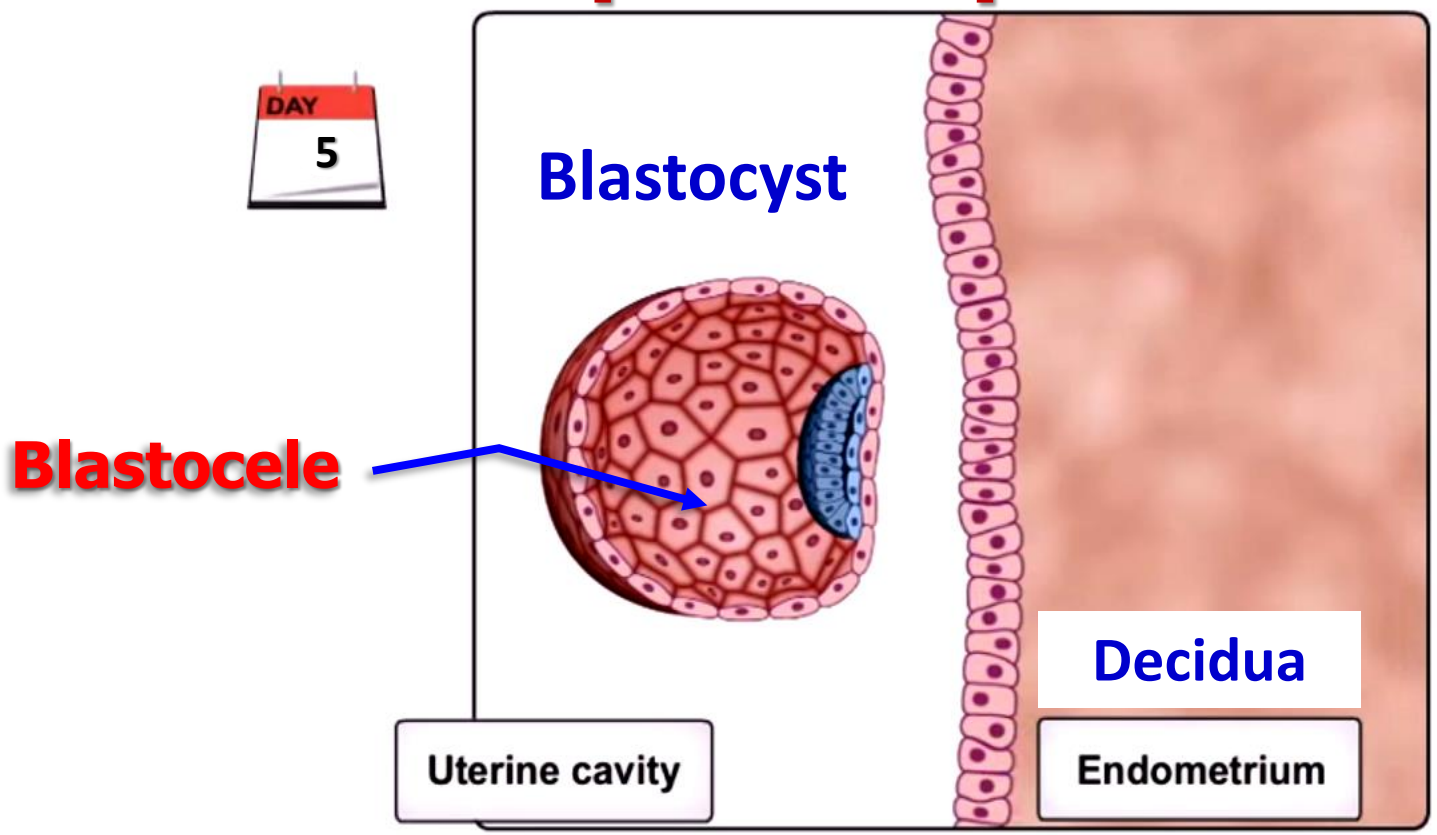
https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists

dr_youssefhussein@yahoo.com

Implanted blastocyst

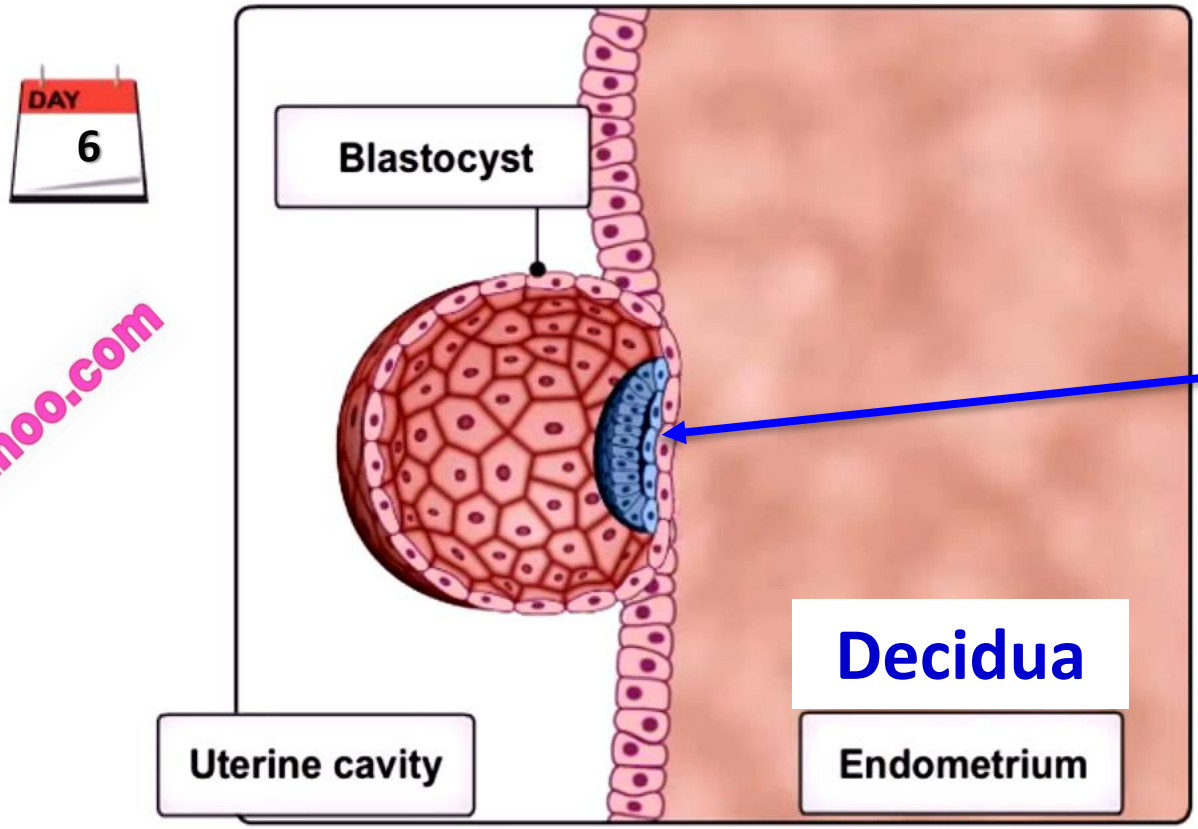
- **Definition**: It is the entrance of the **blastocyst** into the thick endometrium of the uterus (**decidua**) .
- **Site of implantation:** into the middle of the upper part of the posterior wall of the uterus.
- **Timing: Starts at 6th - 8th day and completed at 11th day.**

Steps of implantation



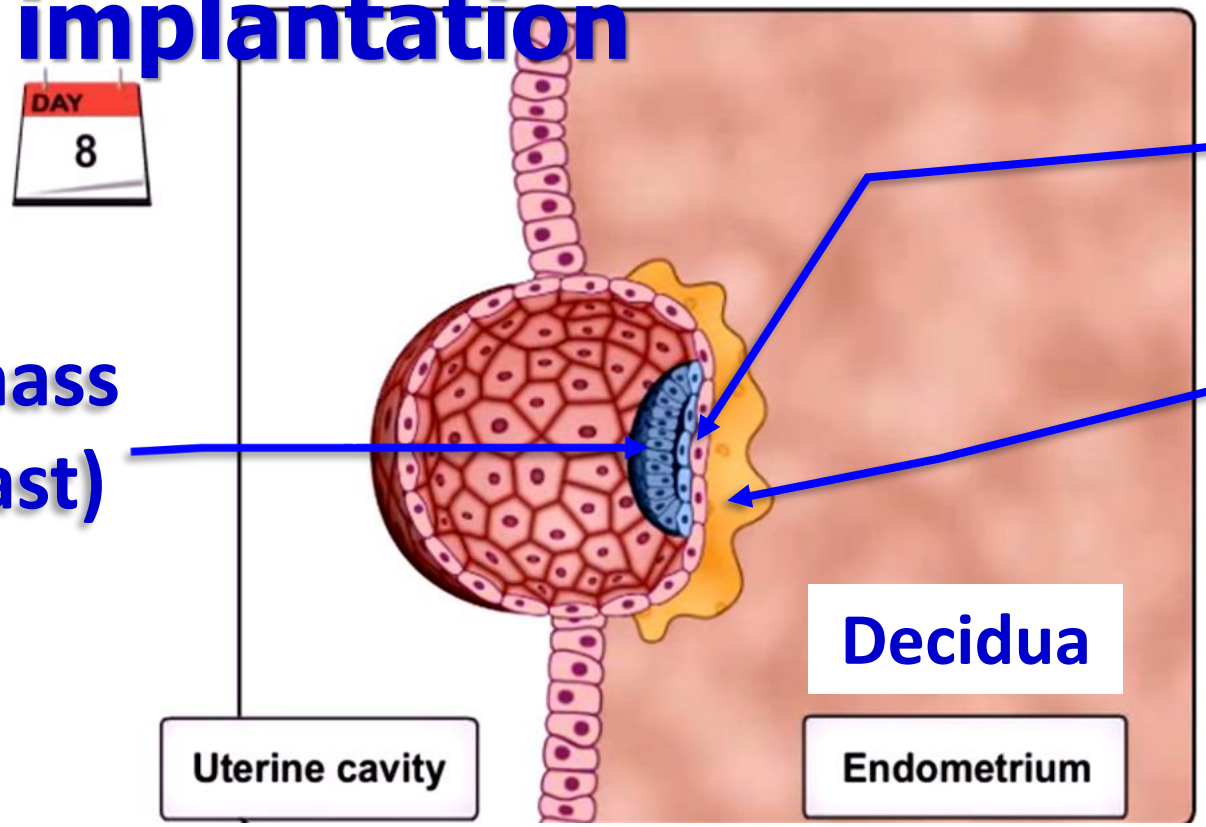
1- Rupture of the zona pellucida around **blastocyst** due to increase amount of fluid in the blastocele cavity

Steps of implantation



2- The trophoblast (outer layer) of the blastocyst adherent to the endometrium (decidua) .

Steps of implantation

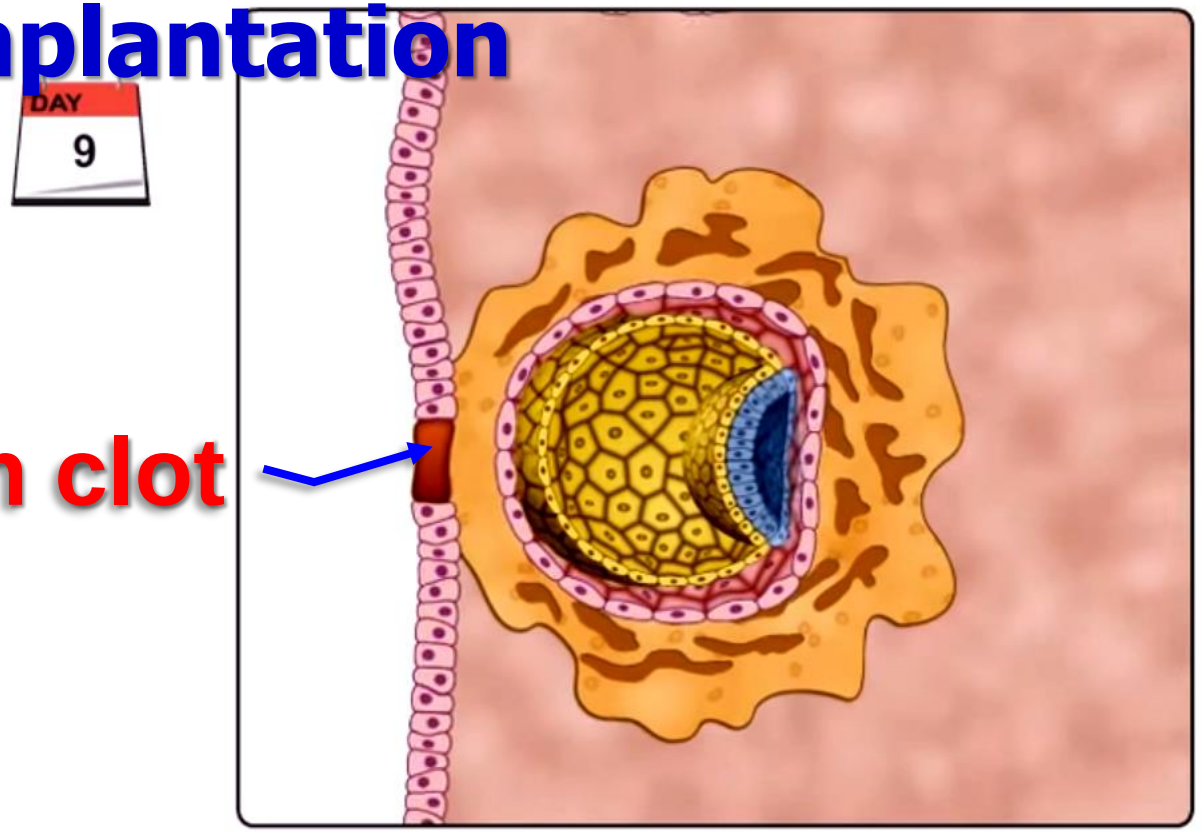


3- The trophoblast covering the inner cell mass **adherent** to the endometrium, and differentiates into **2 layers: 1)** An inner layer called **cytotrophoblast**.

2) An outer layer called **syncytiotrophoblast**.

- The syncytiotrophoblasts have a **phagocytic** function.
- They **erode** the endometrium **(decidua)** and gradually **sink** into it at the side of embryoblast.

Steps of implantation

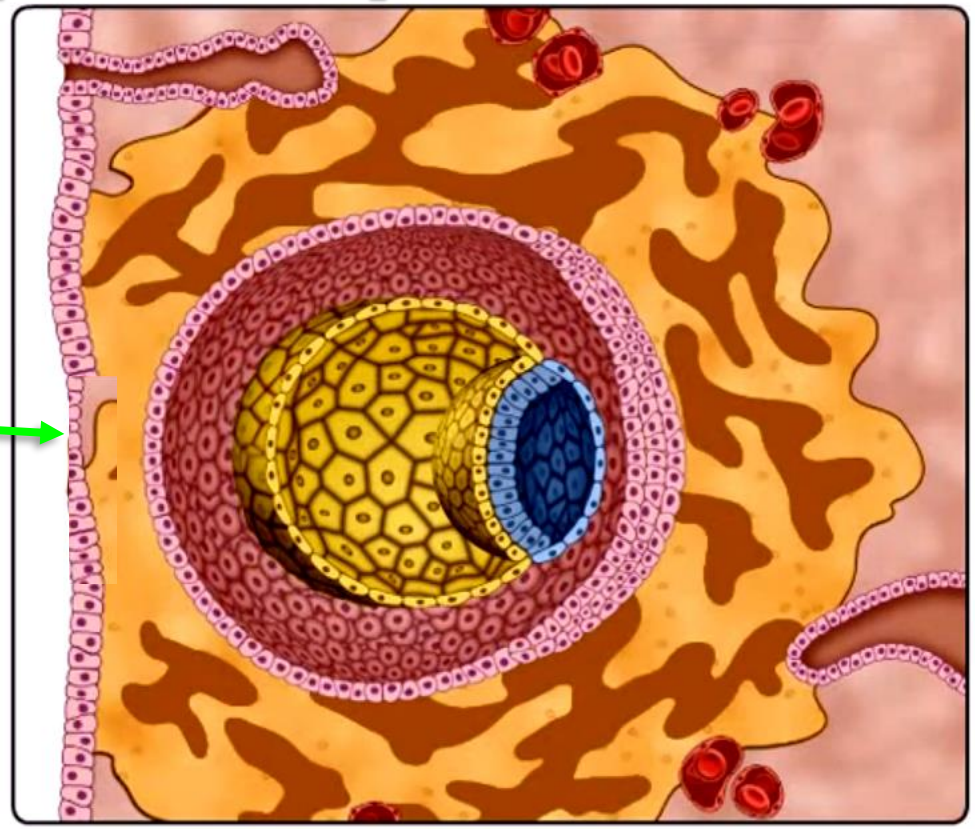


4- The blastocyst becomes embedded into the endometrium **(decidua)** .

- The site of implantation is closed by a **fibrin clot**.

Steps of implantation

Surface epithelium covers the original defect



5- By the 11th to the 12th day of development, the blastocyst is completely embedded in the endometrium (decidua) and the surface epithelium covers the original defect in the uterine wall

Abnormal implantation

(1) Intrauterine abnormal implantation:

- Implantation at any site rather than the normal site

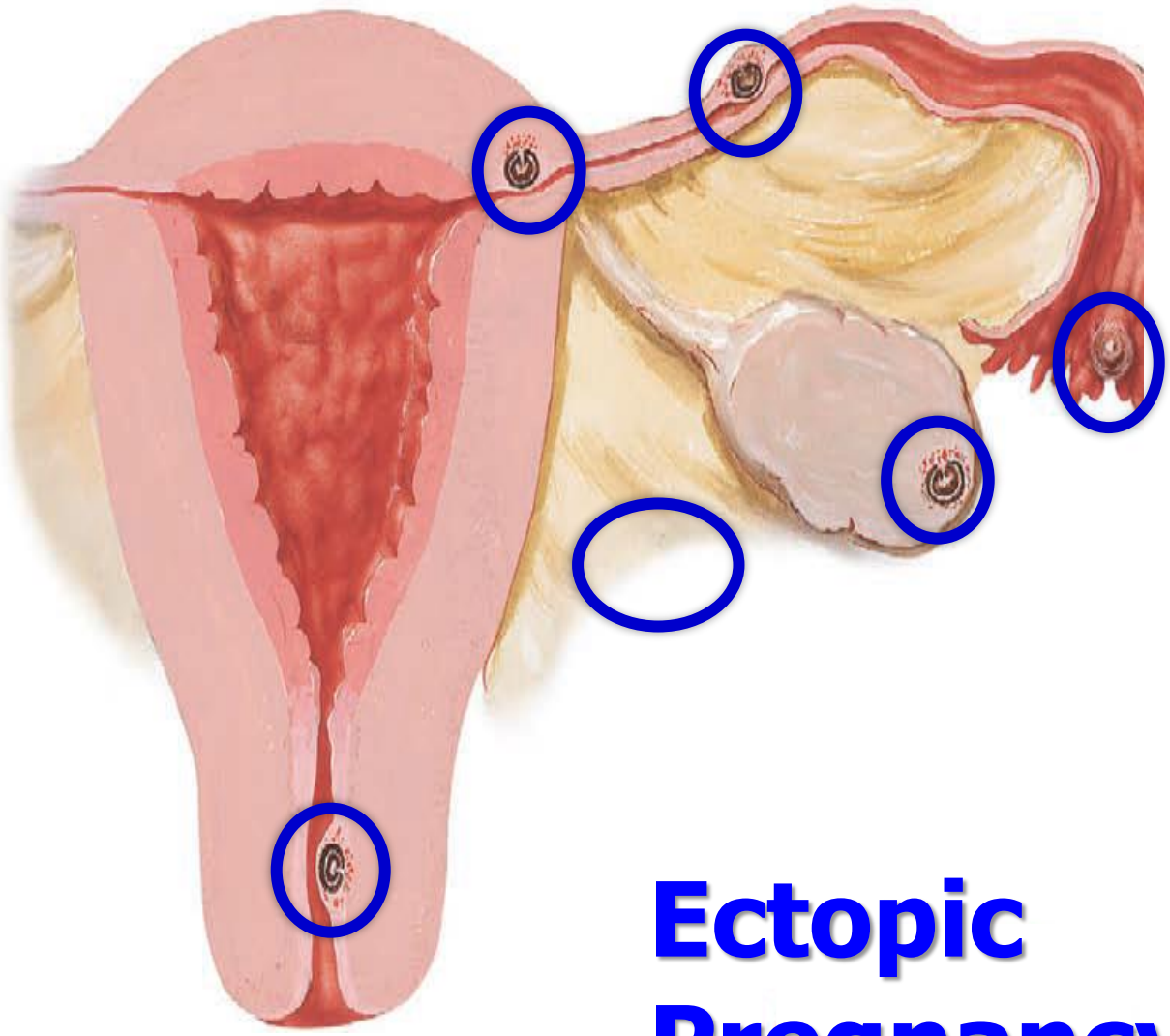
- In this case, the placenta is called **placenta previa**.

(2) Extra uterine abnormal implantation (ectopic pregnancy**):**

1- Tubal pregnancy (uterine tube).

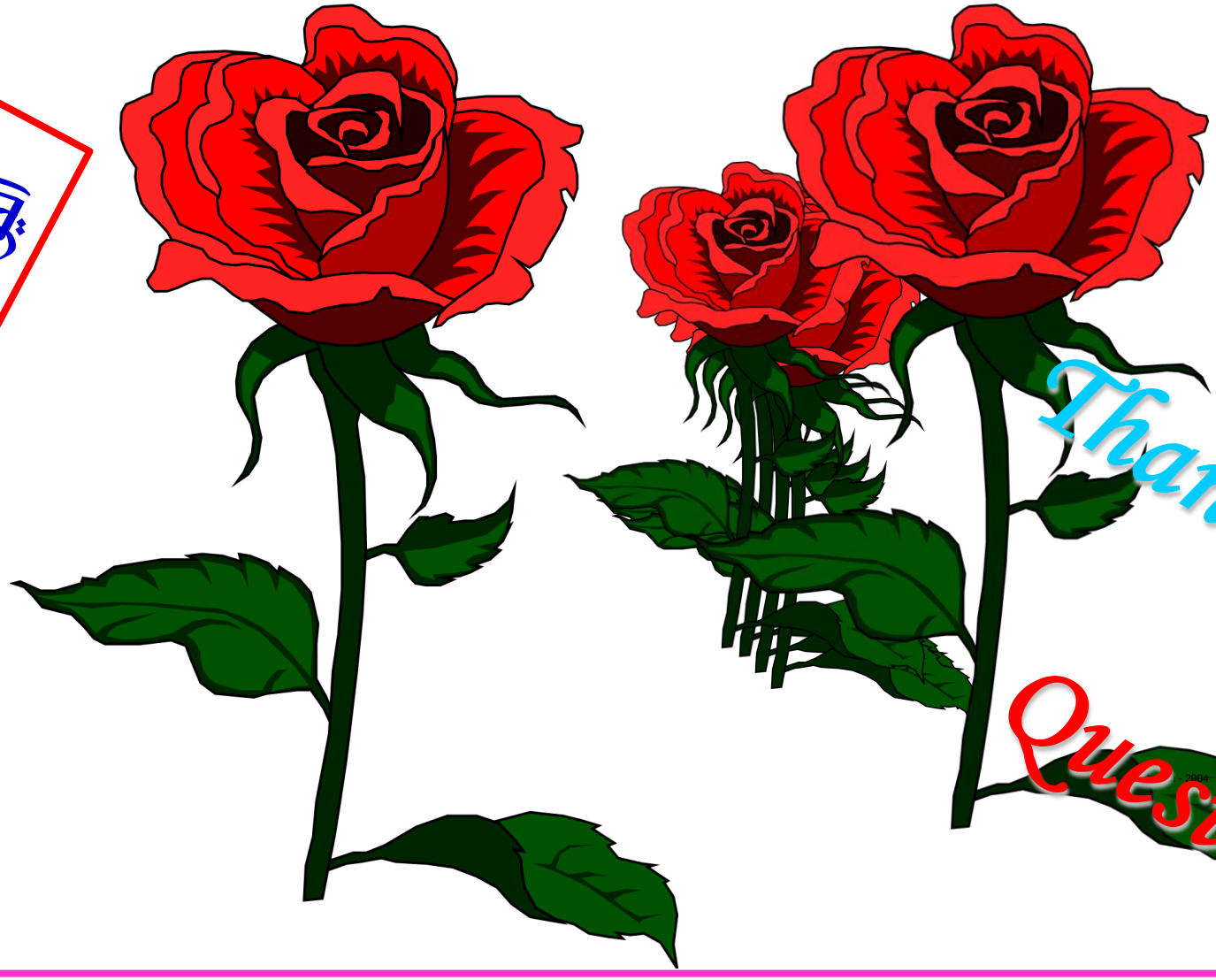
2- Ovarian pregnancy (in ovary).

3- Peritoneal cavity.



Ectopic Pregnancy

https://www.youtube.com/channel/UCVSNqbibj9UWYaJdd_cn0PQ



https://www.youtube.com/@ProfDrYoussefHusseinAnatomy/playlists