

Implantation

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Anything written in red is from outside

1- Menstrual cycle (endometrial cycle)



Menstrual cycle

DEFINITION

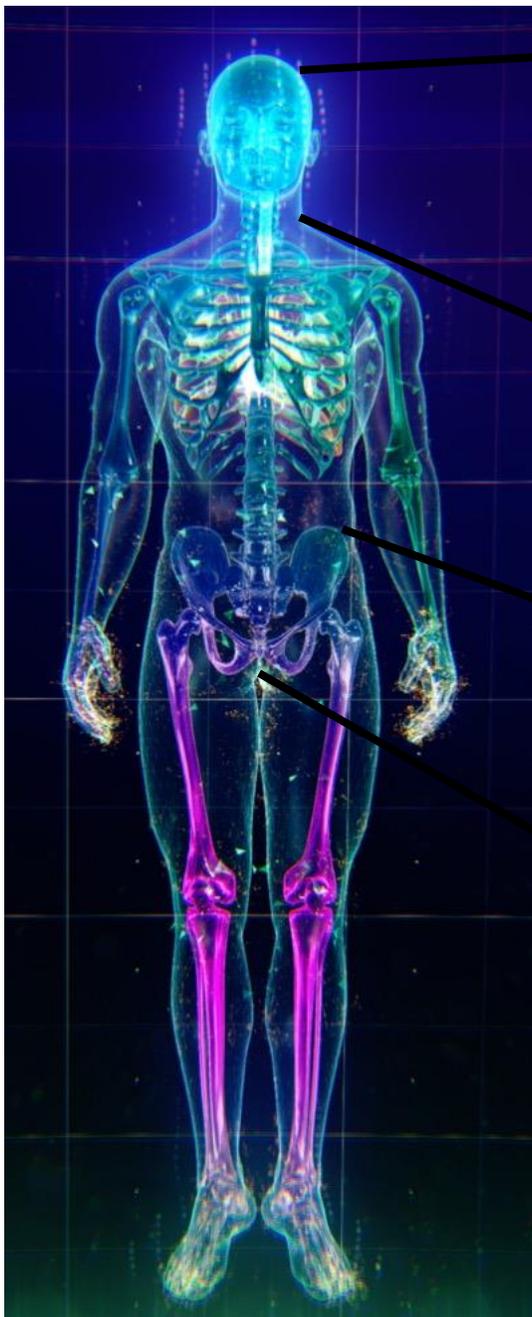
Rhythmical series of physiological changes that occur in fertile women

➤ The menstrual cycle averages **28 days**

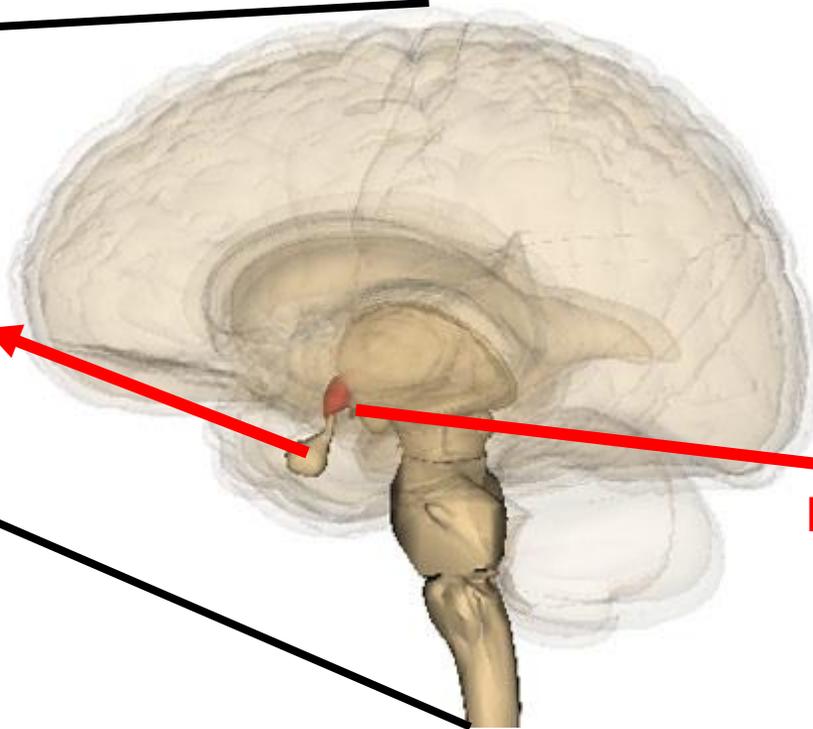
➤ **Variations** between **21 and 35** days are **normal**

➤ **Irregular** and **infrequent** cycles may occur for a few months after puberty and in the few years preceding **the menopause**

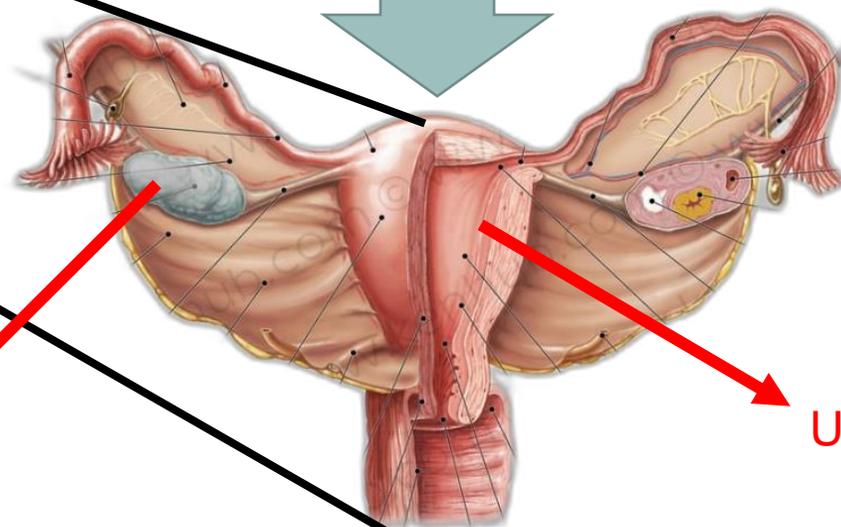




Pituitary gland
(secretes LH
& FSH)



Hypothalamus



Ovaries

Uterus



The endometrial cycle (menstrual cycle)

Menstrual cycle is under the control of the ovaries

➤ **Remember** that the primary, secondary and graafian follicles all contain theca interna and granulosa cells which secrete **estrogens** **under effect of FSH**

Also remember that the ovulated egg leaves behind it;

1-The cells of theca interna

2- Granulosa cells

attached to the walls of the ruptured follicle.

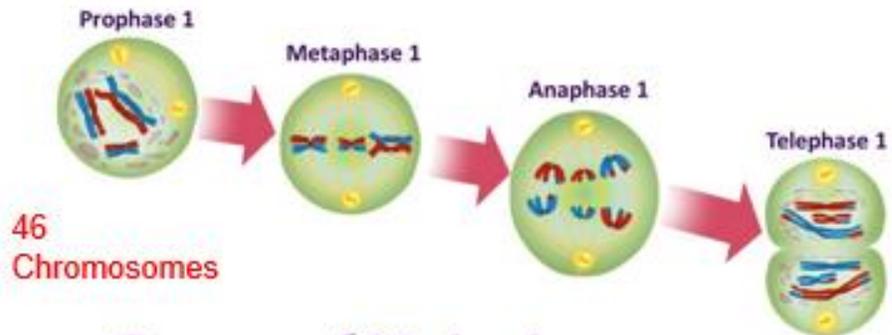
These cells become **vascularized** and under **the influence of LH hormone** they develop *a yellowish pigment and change into lutean cells*, which form **the corpus luteum**

Corpus luteum starts to secrete **estrogens** and **progesterone**

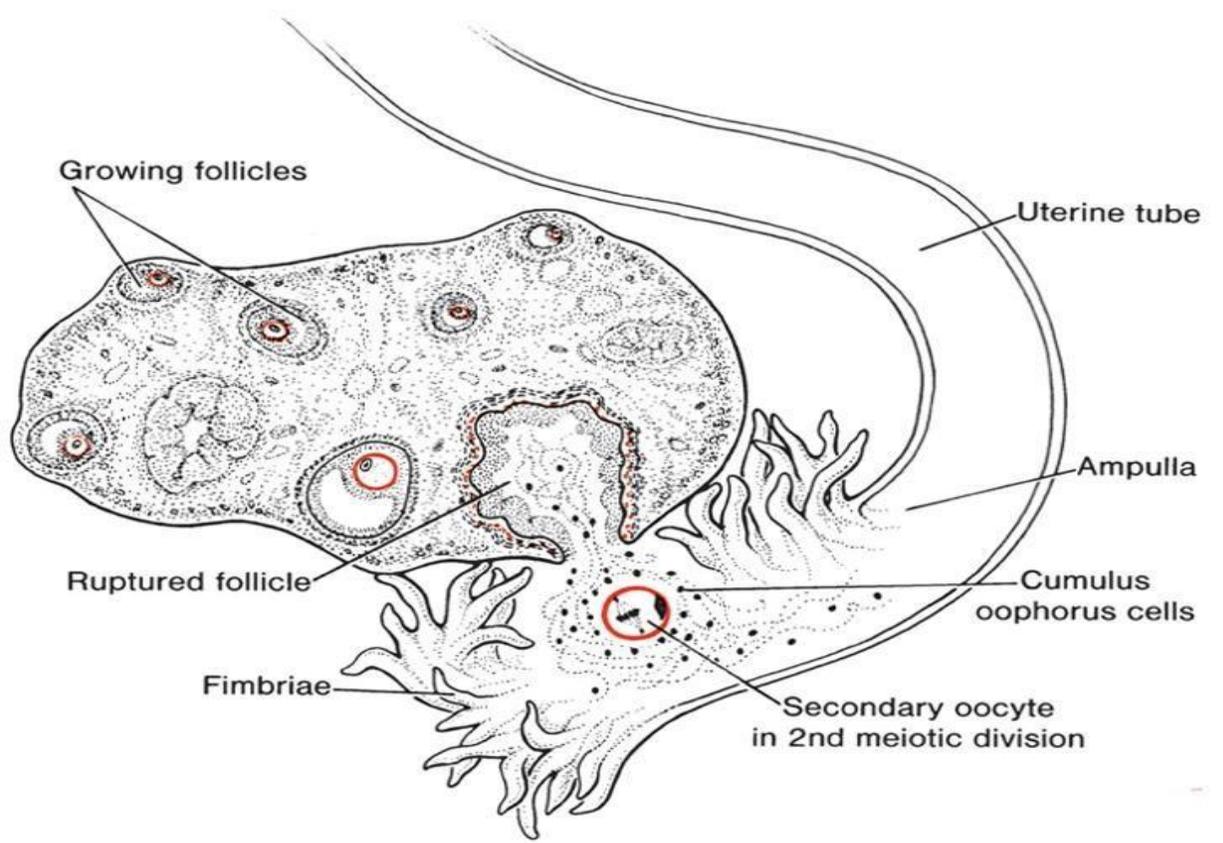
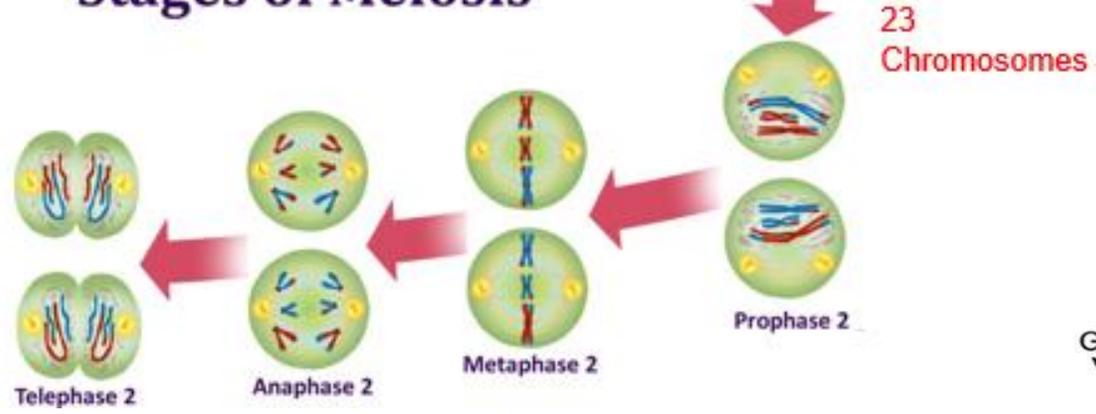


**Next three slides just to remind
you about previous lecture!**

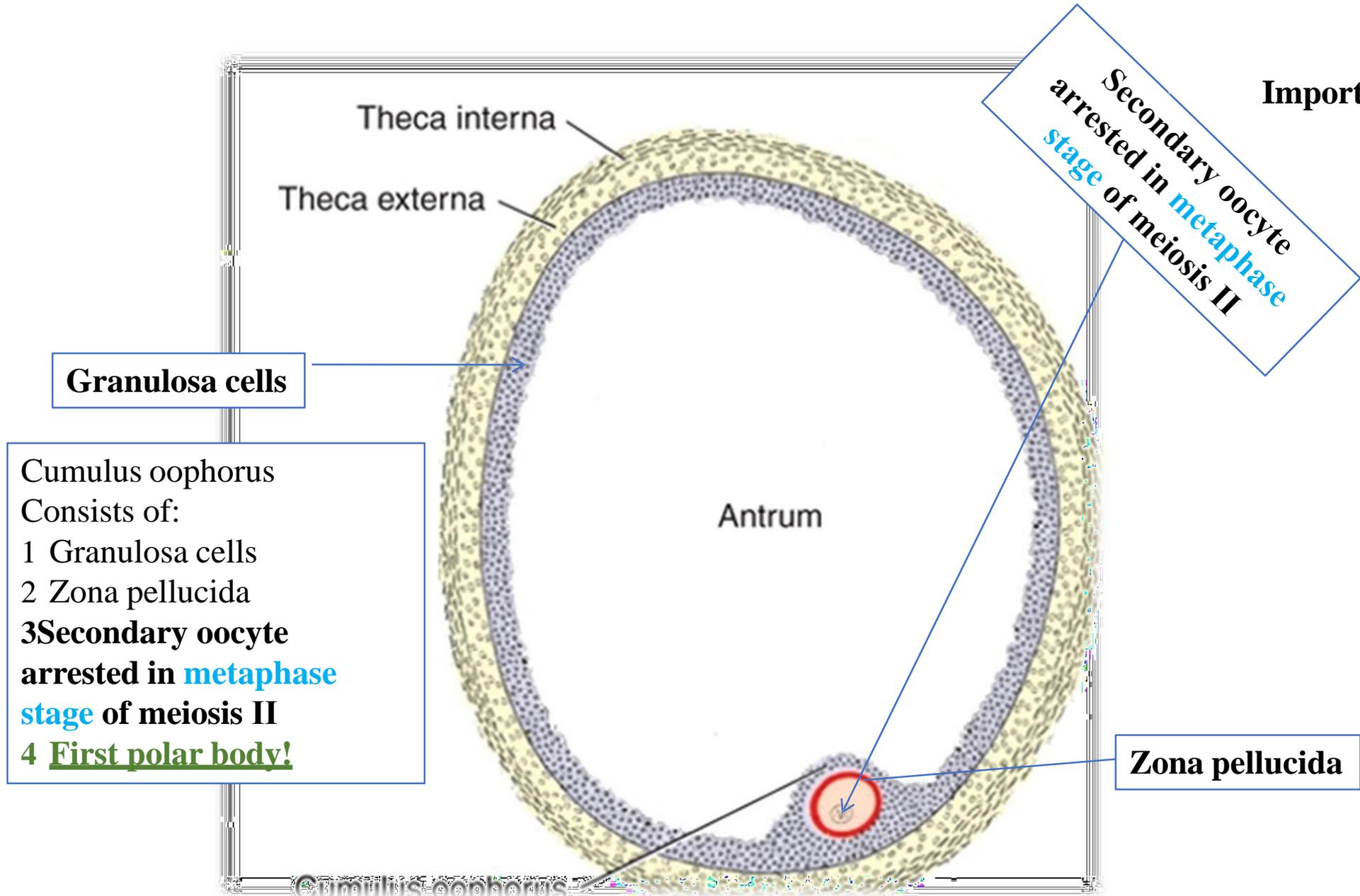




Stages of Meiosis



Important slide!



Granulosa cells

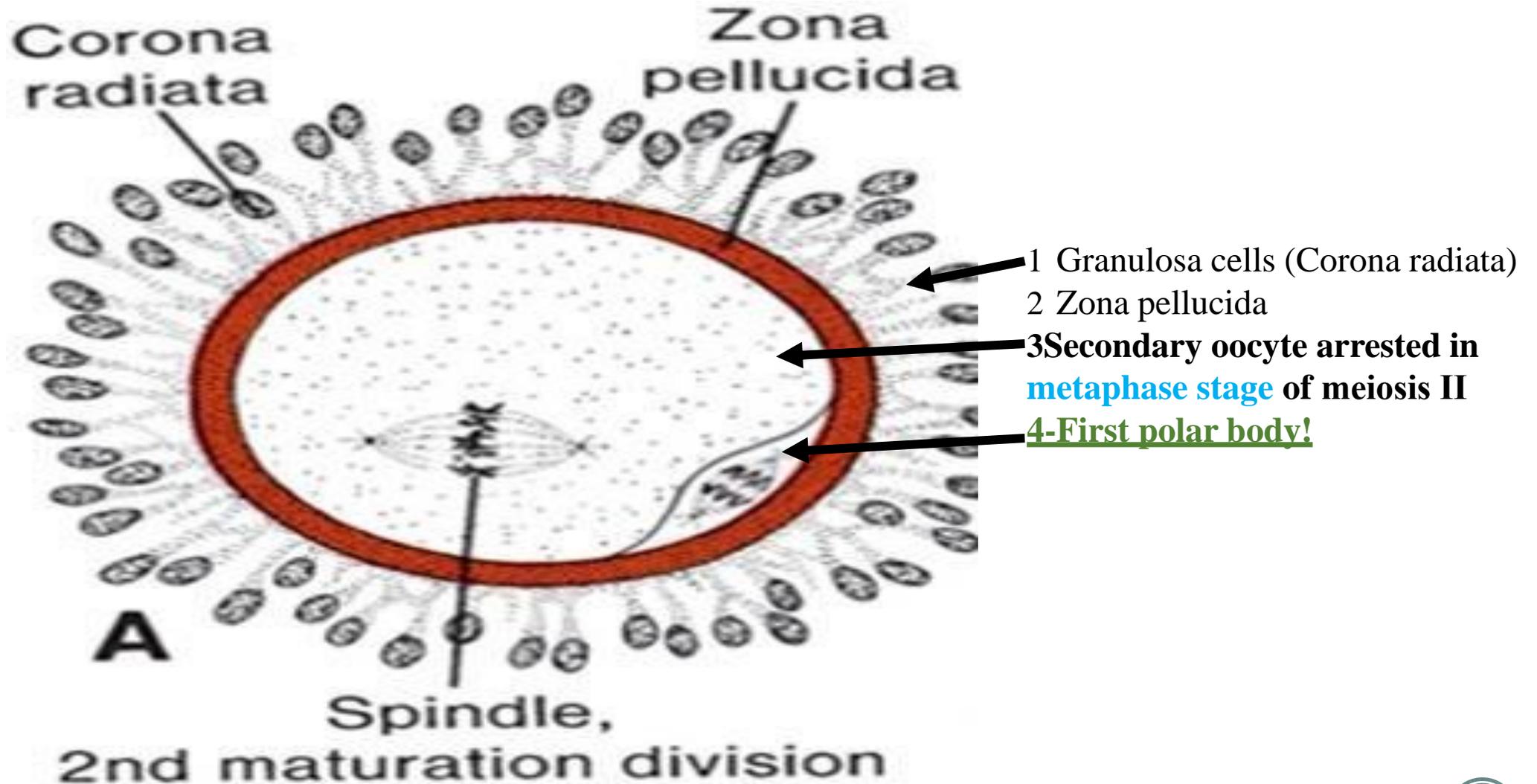
Cumulus oophorus
Consists of:
1 Granulosa cells
2 Zona pellucida
3 Secondary oocyte
arrested in **metaphase**
stage of meiosis II
4 **First polar body!**

Secondary oocyte
arrested in **metaphase**
stage of meiosis II

Zona pellucida



Some of the granulosa cells will arrange themselves around the zona pellucida to form **Corona radiata**



**Lets return to our lecture
now!**



Both **estrogen** and **progesterone** control and maintain the menstrual cycle

How?

Remember that:

The endometrium (**internal layer of uterus**) is made of two layers:

1- **Stratum basalis**: Adjacent to the myometrium

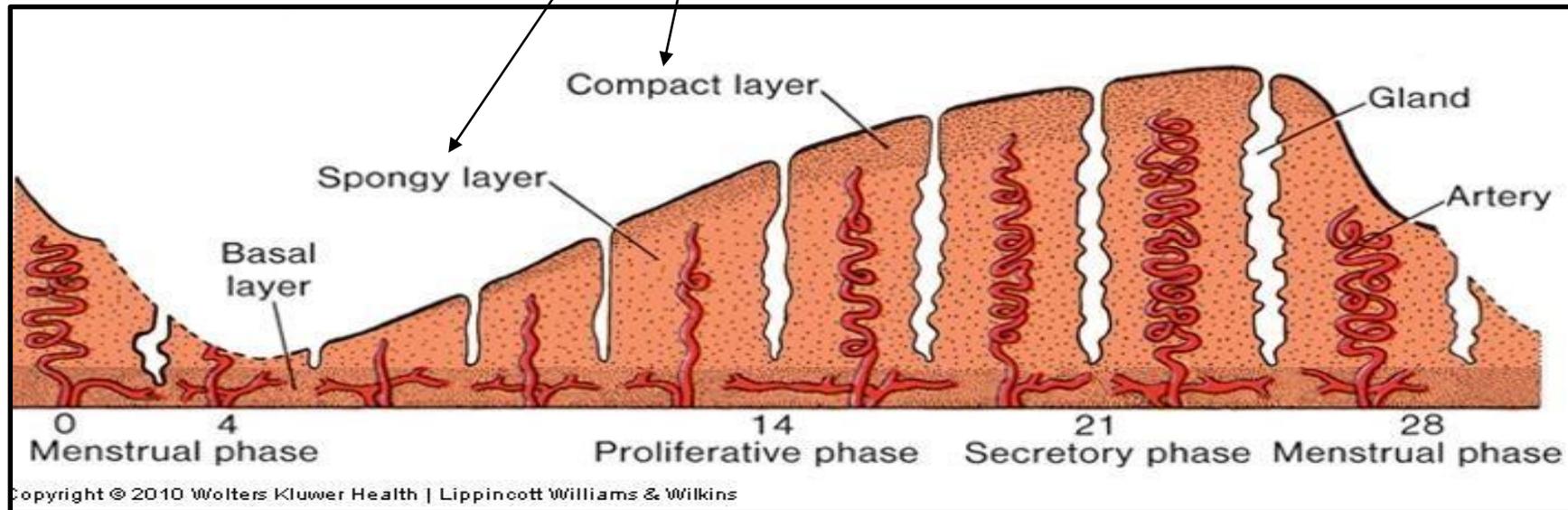
-Unresponsive to hormonal stimulation

-Remains intact throughout the menstrual cycle

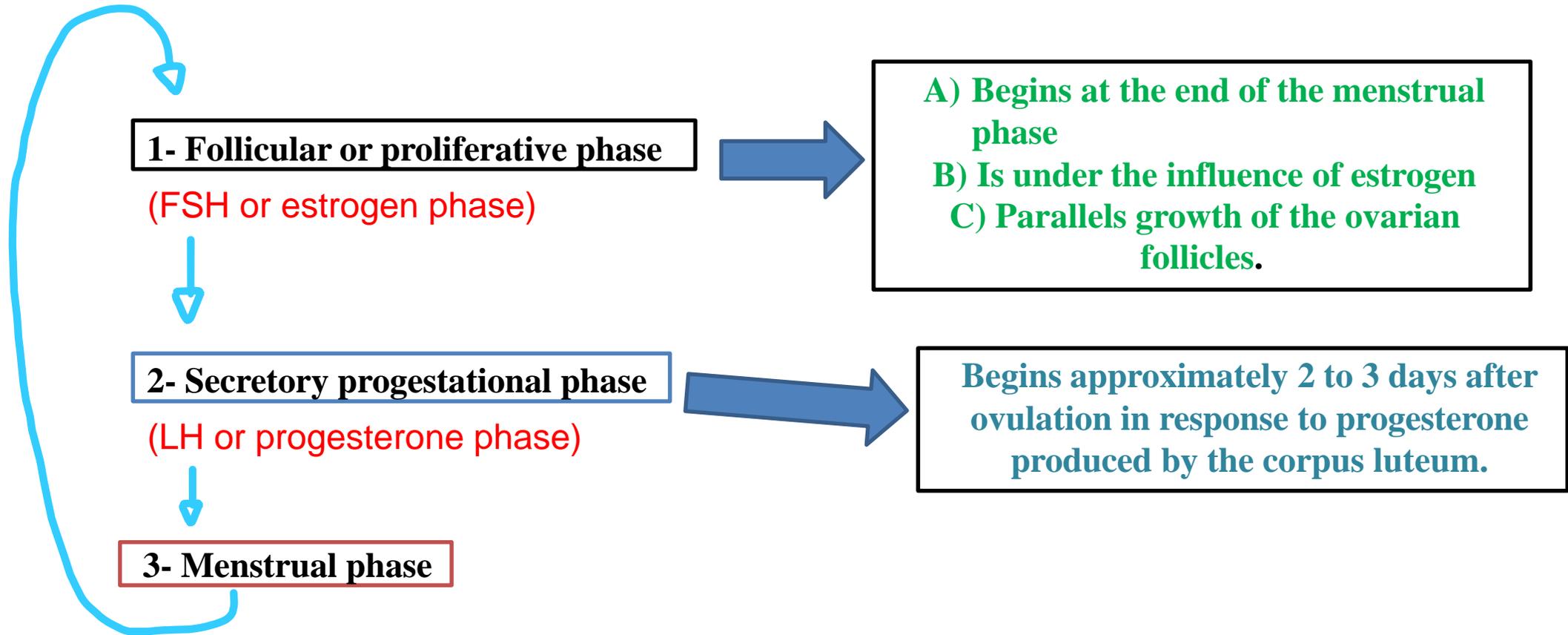
2- **Functional layer** made of **A) STRATUM SPONGIOSUM**

B) STRATUM COMPACTUM

→ The uterus has three layers: mucosa (endometrium), muscularis (myometrium) and serosa/adventitia (perimetrium).



Menstrual cycle consists of three phases;



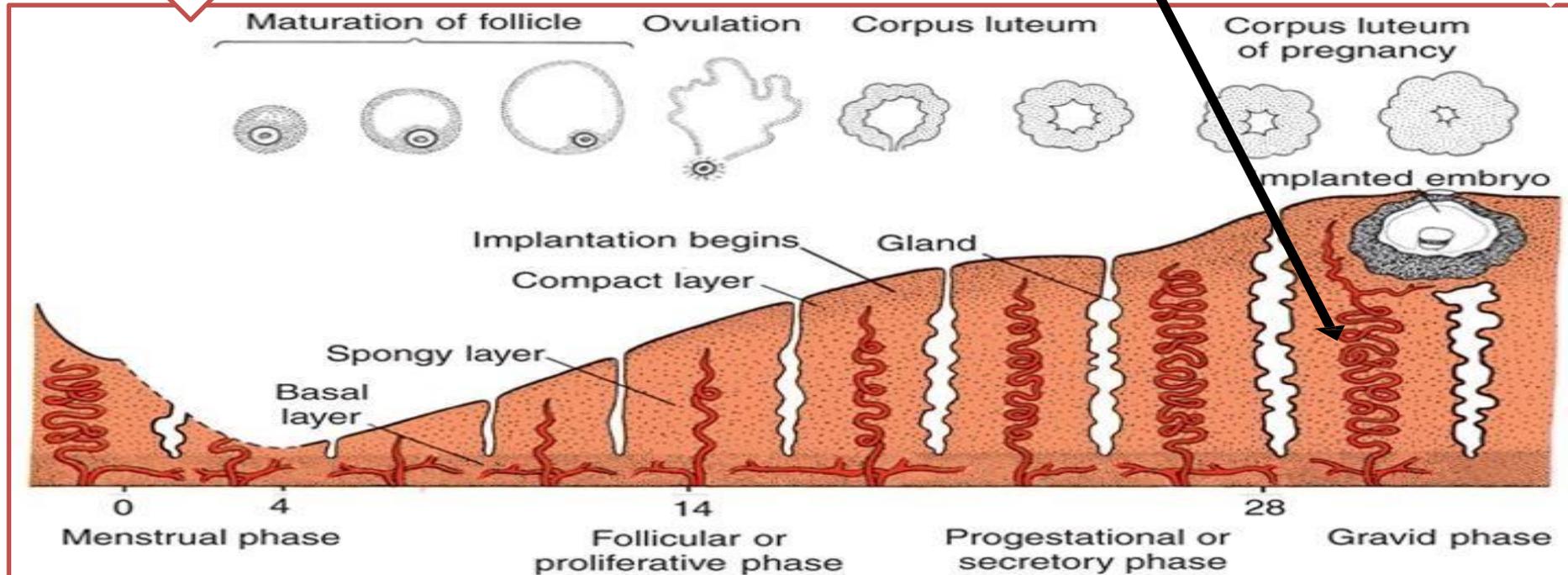
1-Follicular /proliferative phase

Estrogen ⇨ mitotic activity in the glands & stroma ⇨
↑endometrial thickness from 2 to 8 mm
(from basalis to opposed basalis layer)

2-Luteal /secretory phase

Progesterone ⇨- Mitotic activity is severely restricted

- Endometrial glands produce then secrete glycogen rich vacuoles
- Stromal edema
- Stromal cells enlargement
- Spiral arterioles develop, lengthen & coil**



3-MENSTRUATION

- Periodic desquamation of the endometrium
- The external hallmark of the menstrual cycle
- Just before menses the endometrium is infiltrated with leucocytes
- Prostaglandins are maximal in the endometrium just before menses
- Prostaglandins \Rightarrow constriction of the spiral arterioles
 \Rightarrow ischemia & desquamation

Followed by arteriolar relaxation, bleeding & tissue breakdown



**IMPLANTATION
AND
FIRST WEEK OF
DEVELOPMENT**



So ...

What we HAVE at the end of fertilization ?!

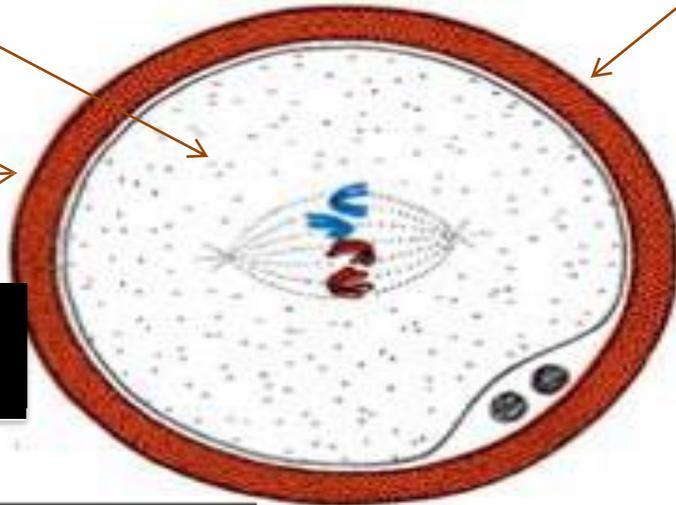


Fertilized Oocyte covered by Zona pellucida

THE ZYGOTE

Why does the zygote need zona pellucida?

To prevent early implantation. And ectopic pregnancy



The Zygote's Journey to the Uterus

➤ Takes approximately **3 to 4 day**

➤ In this journey the zygote undergoes a series of mitotic divisions called **Cleavage**, that results in an increase in cells number.

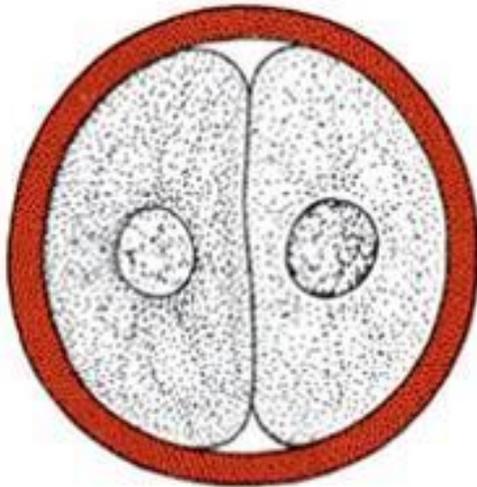
The two cellular stage. (two cells)

Four-cell stage

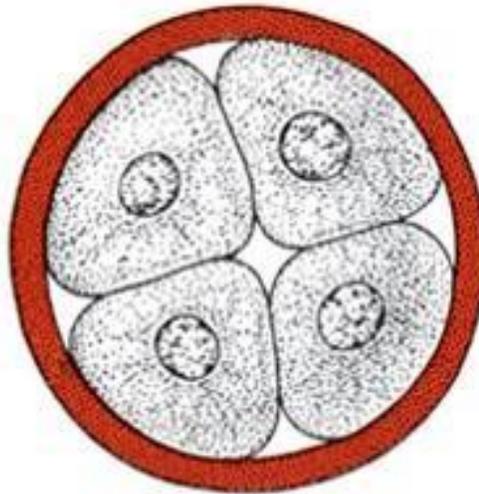
Eight-cell stage

These cells are called **Blastomeres**

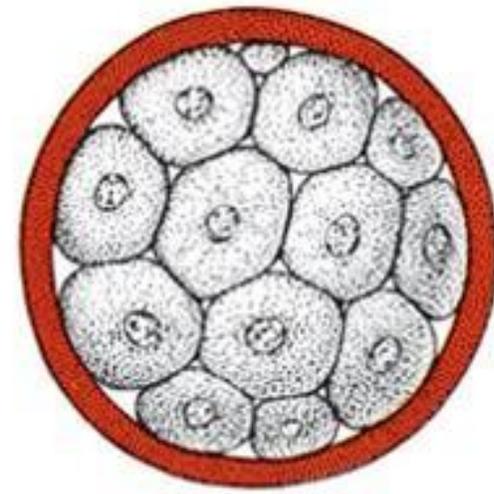
A bubble of cells represent all stages of division in this slide



Two-cell stage



Four-cell stage



Morula

Can be early (16) or late (32)



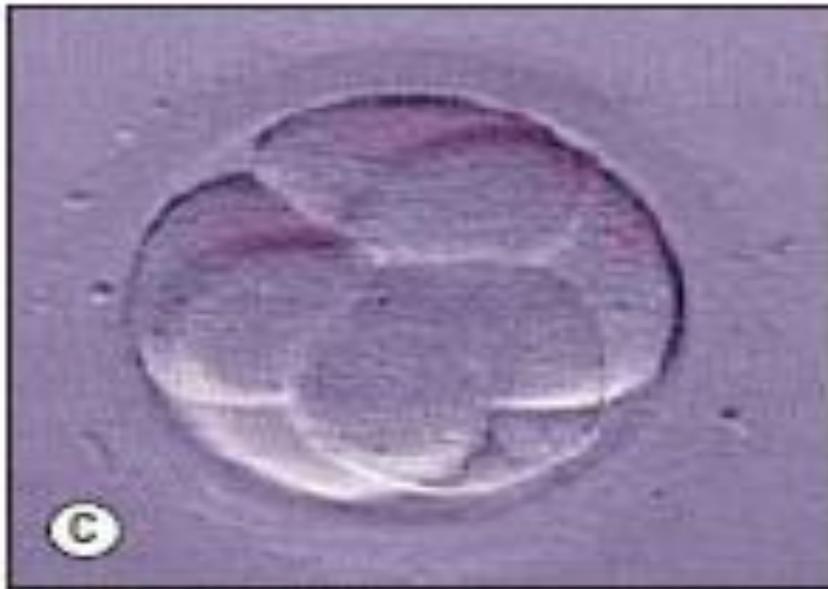
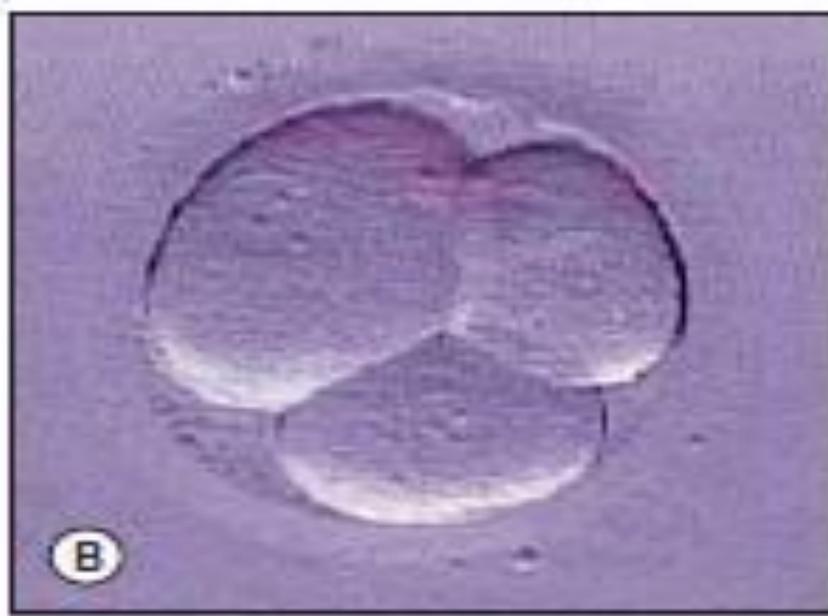


Fig. 8.6 Successive stages of cleavage of a human ootid. **A**, Two-cell stage; **B**, three-cell stage; **C**, five-cell stage; **D**, eight-cell stage.



➤ Approximately **3 days after fertilization**, the **Blastomeres** divide again to form a **16-cell morula (mulberry)**. ! (too many cells they push out the zona pellucida, zona pellucida bulges here and there and it becomes full of bulgings which look like **mulberry**, but we will call it **morula** from Latin.

➤ Inner cells of the morula constitute

the inner cell mass

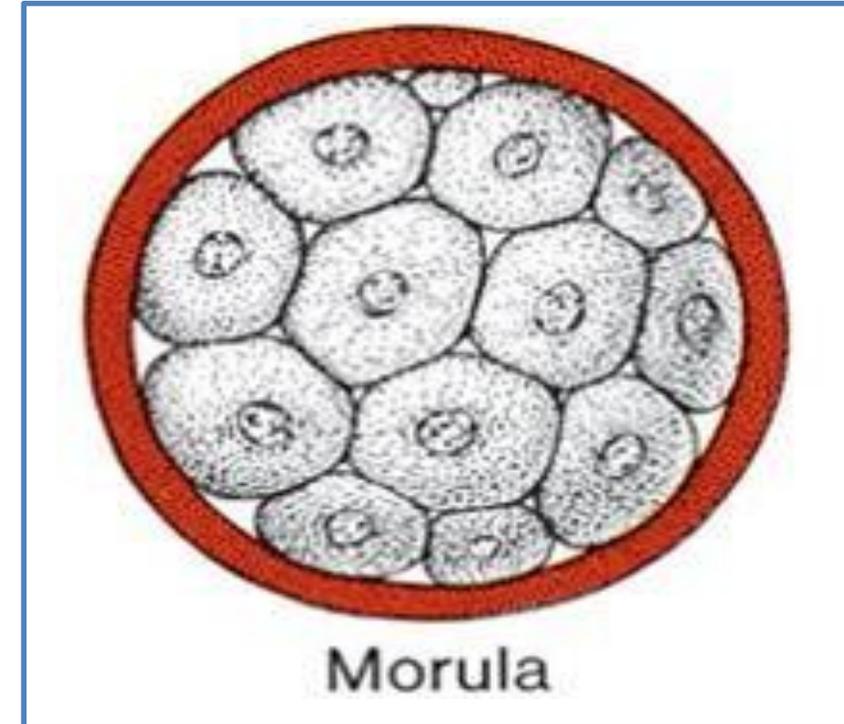
➤ The surrounding cells compose

the outer cell mass

➤ The inner cell mass gives rise to tissues of

the embryo proper

➤ The outer cell mass forms the **trophoblast**, which later contributes to the **placenta**.



The morula is heading to the uterus!

In which stage is the mucosa of the uterus?

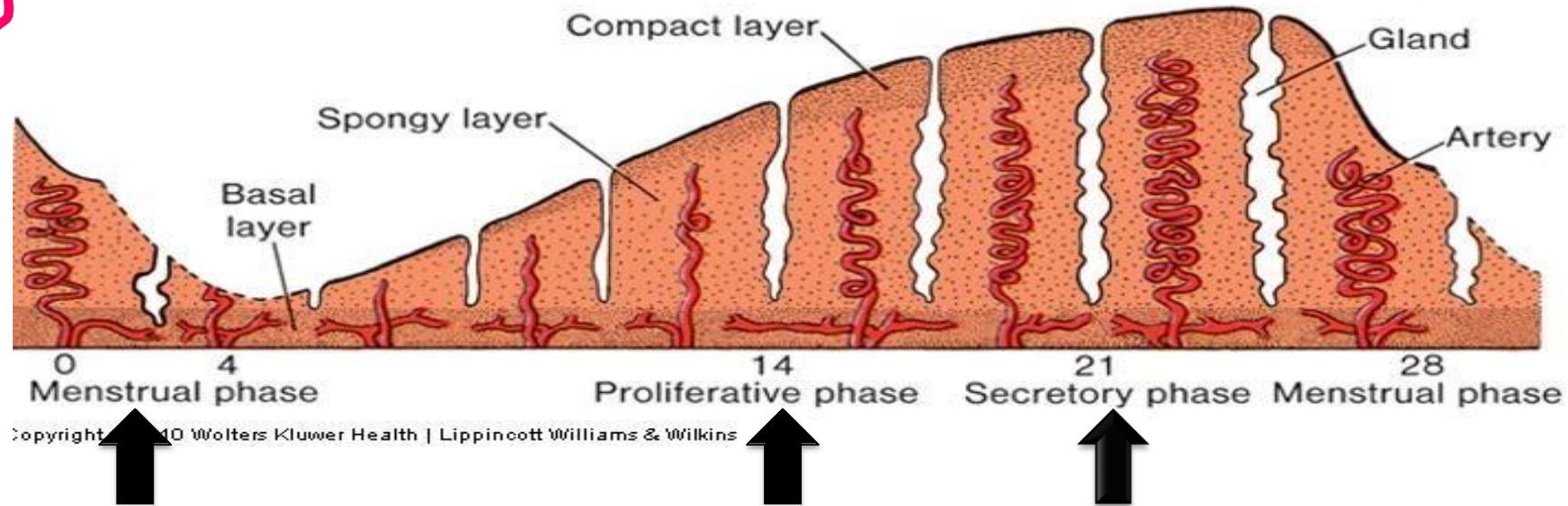
The endometrium is made of two layers

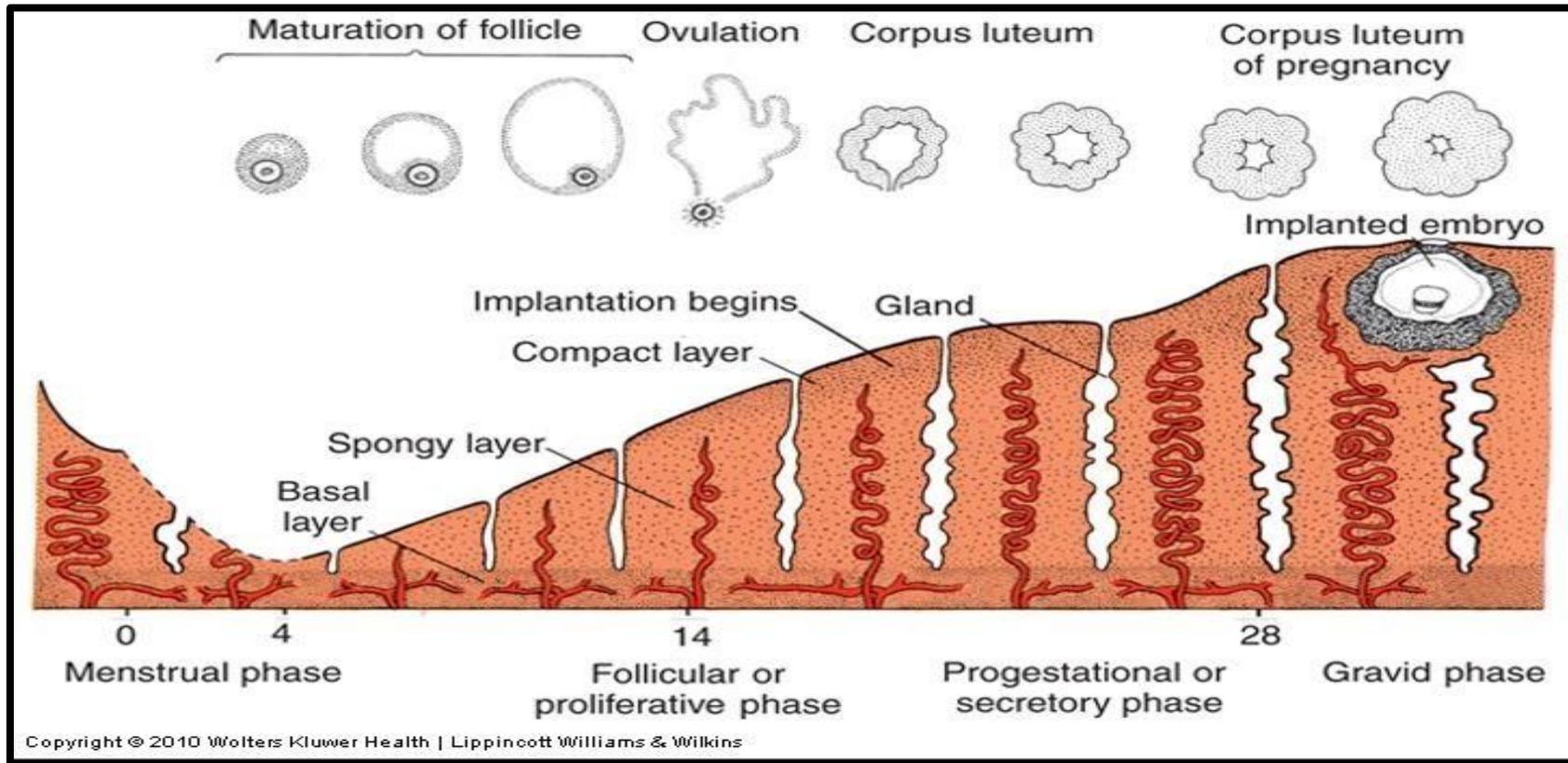
1- Stratum basalis

2- Functional layer made of A) STRATUM SPONGIOSUM

B) STRATUM COMPACTUM

سؤال
لسنوات
مكرر





At the time that the morula reaches the uterus, the **mucosa** of the uterus is in the **secretory phase** during which: **Uterine glands** and **Arteries** become **coiled** and the tissue become **succulent**.



The morula enters the uterine cavity

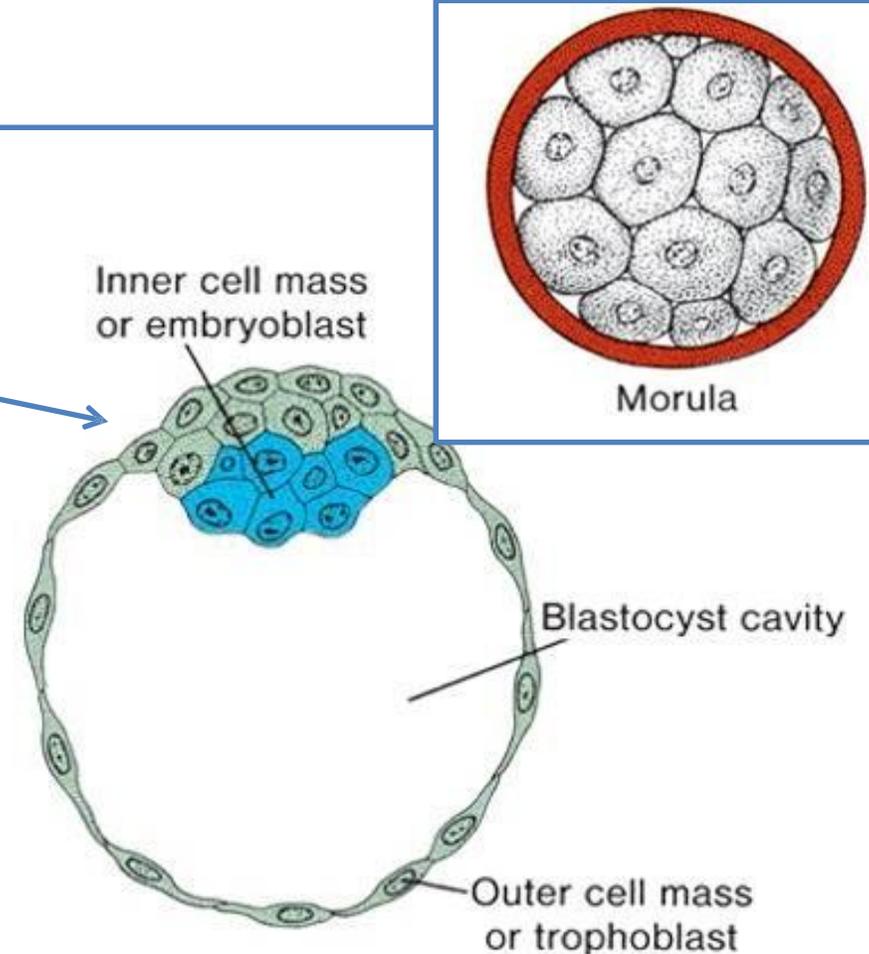
Day 4 after fertilization

- Uterine fluid begins to penetrate through **the zona pellucida** into the intercellular spaces of **the inner cell mass**.
- Gradually, the intercellular spaces become **confluent**, and a **single cavity, the blastocele**, forms.

➤ At this time, the embryo
is a blastocyst.

➤ Cells of the inner **cell mass**, now called the **embryoblast**, are at one pole, and those of the outer cell mass, or **trophoblast** flatten and form the **epithelial wall of the blastocyst**

➤ *The zona pellucida disappears to allow implantation*





Hatch from the zona pellucida



Fig. 8.7 Human embryos. Formation of a morula and blastocyst within the zona pellucida and blastocyst hatching from the zona pellucida. **A**, A ball of cells, the morula, with the cells undergoing compaction; **B**, the blastocyst cavity is developing and the inner cell mass can be seen on one side of the cavity; **C**, the blastocyst is beginning to hatch from the zona pellucida.





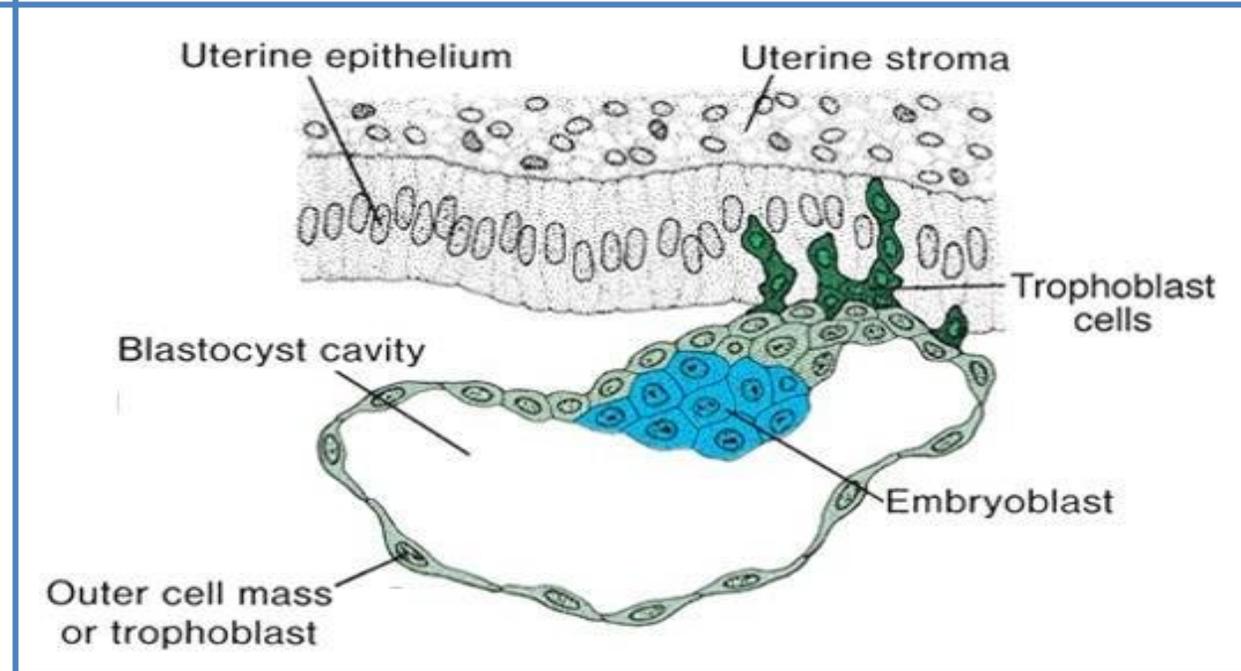
Fig. 8.8 Human blastocyst nearly completely hatched from the zona pellucida. The blastocyst can now expand to its full size.



Day 6 after fertilization

Trophoblastic cells over the embryoblast pole begin to *penetrate* between the epithelial cells of the *uterine mucosa* on about *the sixth day*

(Early implantation)



Pregnancy starts at *Day 6* when Blastocyst loosely attached to endometrium.



If fertilization does not occur, the **corpus luteum** reaches maximum development approximately 9 days after ovulation. Subsequently, the corpus luteum shrinks because of degeneration of luteal cells and forms a mass of fibrotic scar tissue, the **corpus albicans**.

If the oocyte is fertilized, degeneration of the corpus luteum is prevented by **human chorionic gonadotropin (hCG)**, a hormone secreted by the **syncytiotrophoblast of the developing embryo**. The corpus luteum continues to grow and forms the **corpus luteum of pregnancy (corpus luteum graviditatis)**.

By the end of the third month, this structure (**corpus luteum graviditatis**) may be one third to one half of the total size of the ovary. Yellowish luteal cells continue to secrete progesterone until **the end of the fourth month**; thereafter, they regress slowly as secretion of progesterone by the **trophoblastic component of the placenta becomes adequate** for maintenance of pregnancy.



Events during first week of development

