

# OVARIAN CYCLE

LOW ESTROGEN AT THE END OF MENSES



FOLLICULAR PHASE

ESTROGEN



SMACK!

OVULATION!

PROGESTERONE

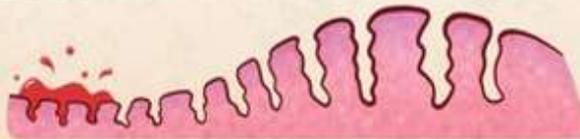
CORPUS LUTEUM

CORPUS ALBICANS

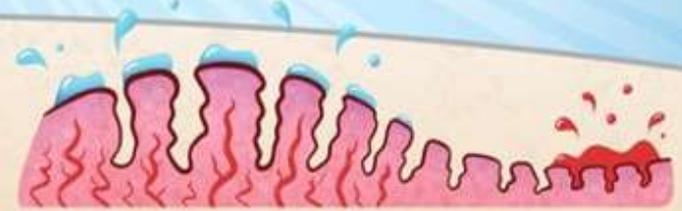
MENSES

LUTEAL PHASE

## UTERINE CYCLE

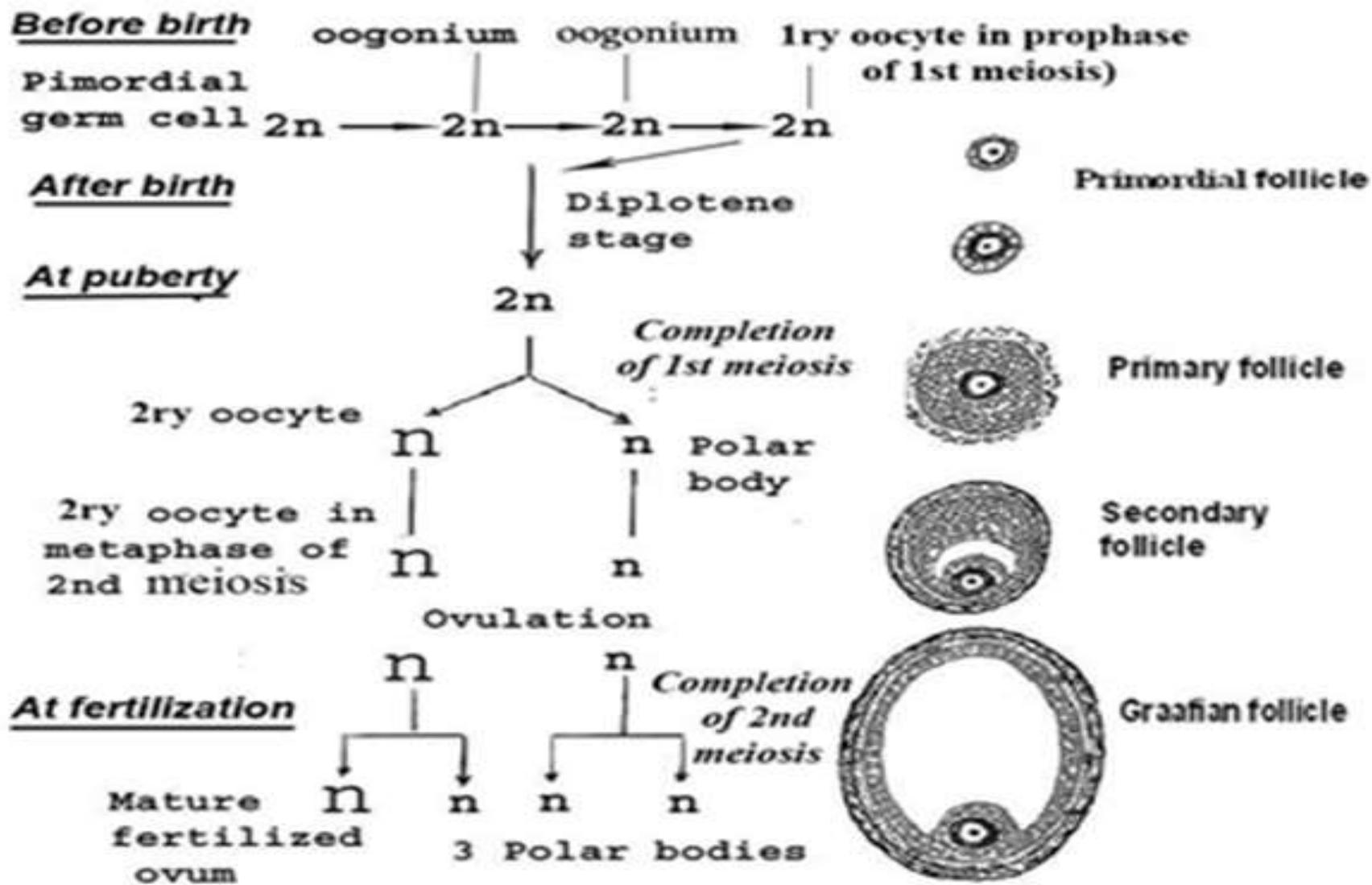


PROLIFERATIVE PHASE: INFLUENCED BY ESTROGEN, THE THICKNESS OF THE ENDOMETRIUM RAPIDLY INCREASES



SECRETORY PHASE: INFLUENCED BY PROGESTERONE, THE LINING BECOMES HIGHLY VASCULAR AND EDEMATOUS

**Cyclic changes in females**  
**DR DALIA M. BIRAM**



## O O G E N E S I S

## CYCLIC CHANGES IN FEMALES

These are changes which occur every month during the fertile period of the non pregnant female.

It starts at puberty (11-14yr) and stops at menopause (45-55yr).

These changes are controlled by the hypothalamus and the pituitary gland. They affect the uterus and the ovaries.

### A- THE OVARIAN CYCLE

It is the cyclic changes which occur in the **ovary** every 28 days during the fertile period of nonpregnant female.

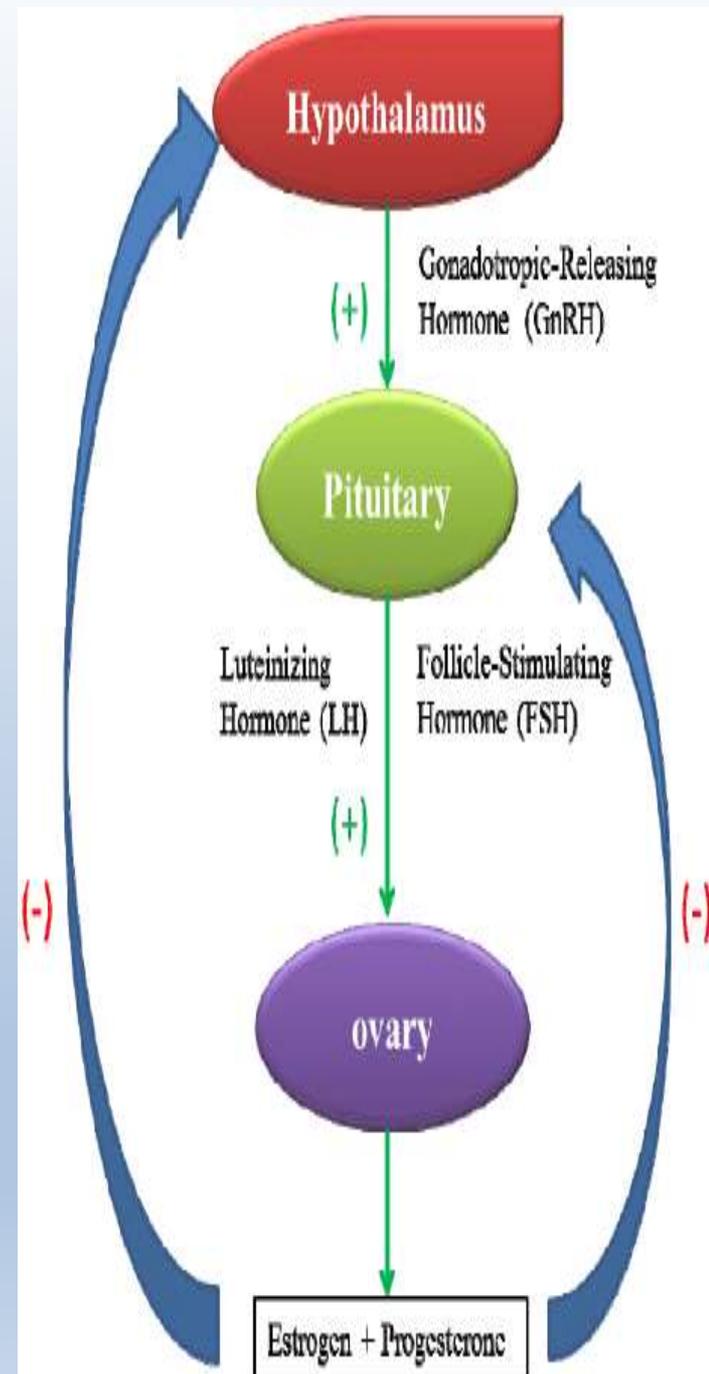
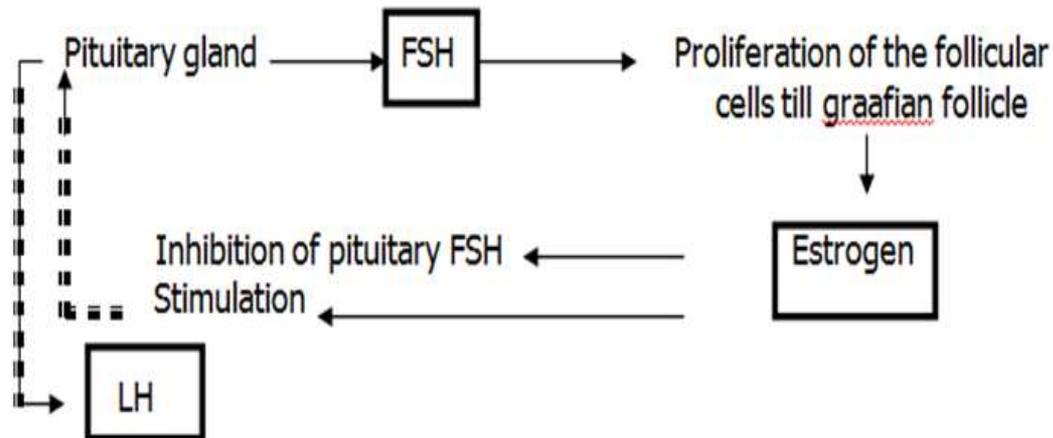
The ovarian cycle is divided into three phases:

**Preovulatory (follicular) phase.**

**Ovulation.**

**Postovulatory (Luteal phase).**

#### PREOVULATORY (FOLLICULAR) PHASE:



## At birth (In the cortex of ovary)

ovaries contain only primordial follicles

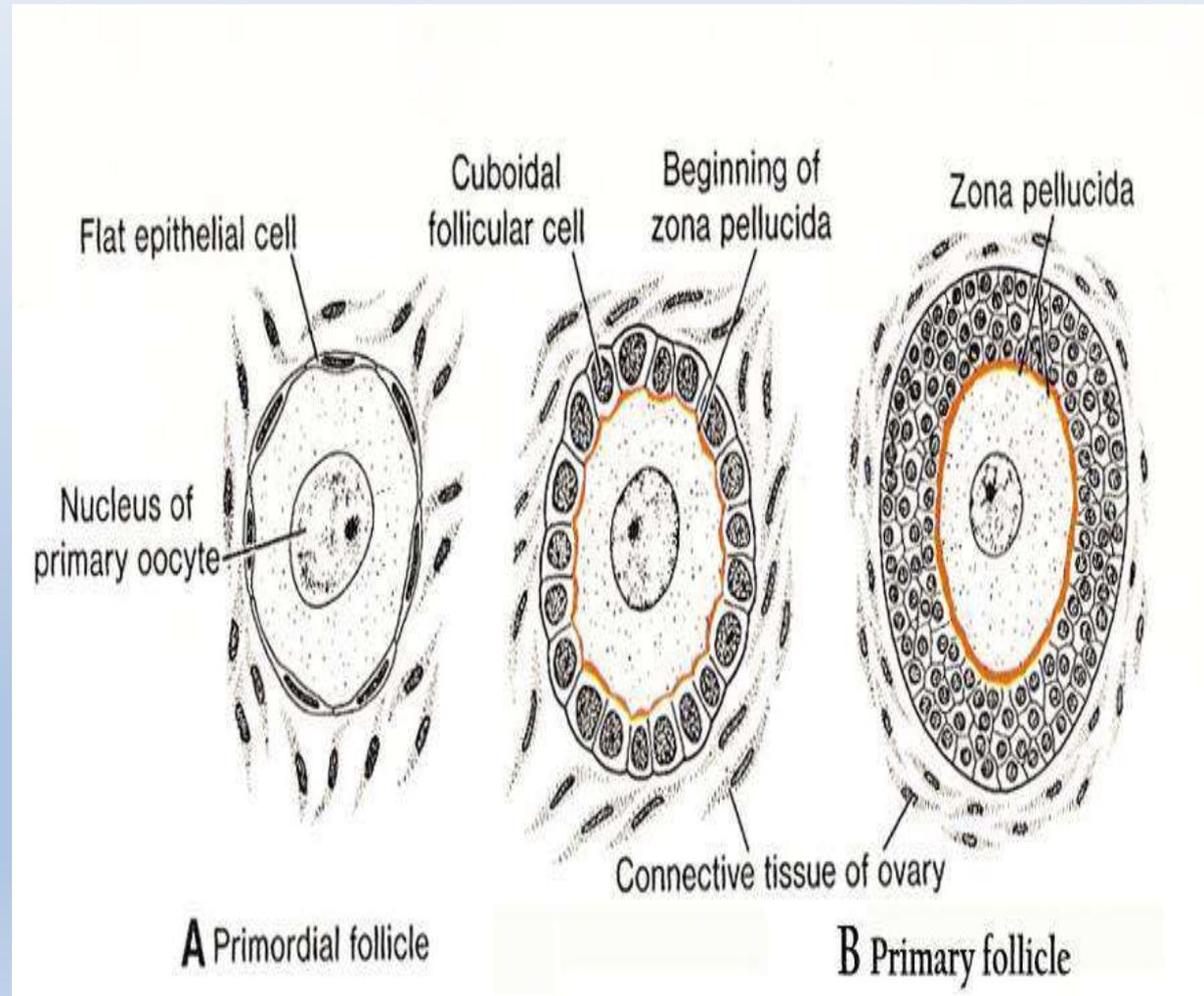
(primary oocytes arrested in prophase of 1st meiotic division) surrounded with a layer of flat follicular cells

- **MATURATION OF THE FOLLICULAR CELLS:(At puberty)**

- **The single layer of flat cells (follicular cells) around the primary oocytes change to cubical cells, they then proliferate to stratified (granulosa cells).**

- **Theca cells develop from the surrounding stromal cells of the ovary.**

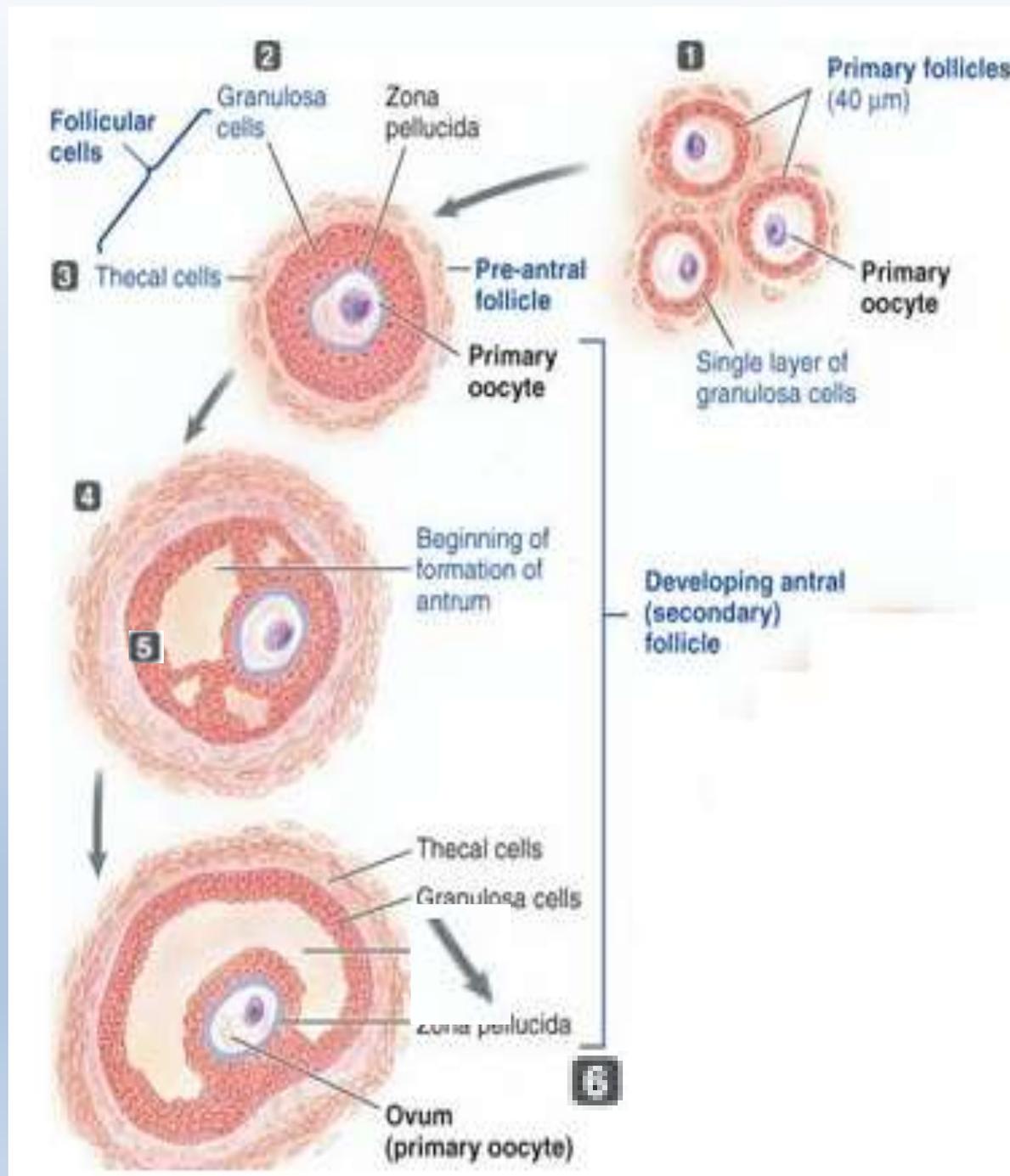
- **Zona pellucida (glycoprotein) secreted by the granulosa cells surrounds the ovum**



## Ovarian Cycle-

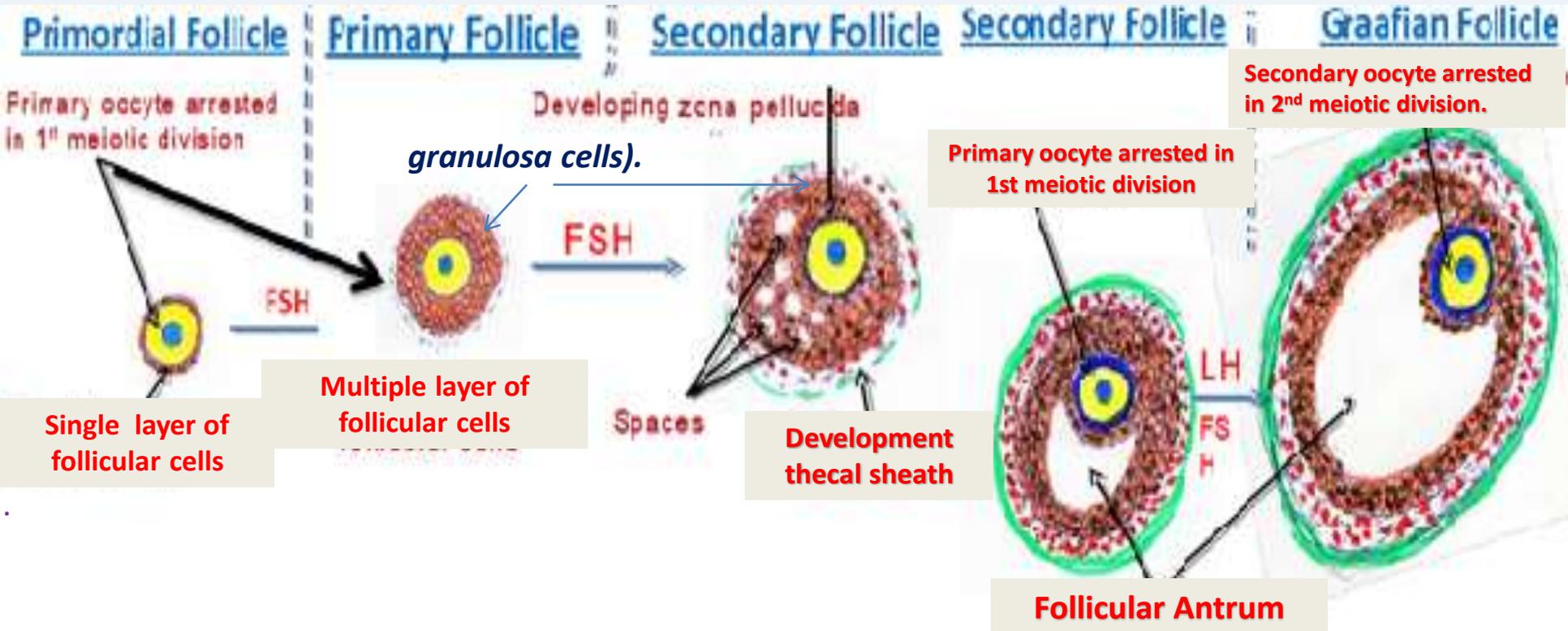
### 1-PRE-OVULATORY Follicular phase (1-14)

- At the beginning of each ovarian cycle, 5-15 primordial follicles begin to grow under the influence of FSH. one follicle reaches full maturity, and one oocyte is discharged. The other follicles degenerate and become atretic
- These changes occur in one ovary in one cycle while the other ovary is resting then alternation occurs in the next ovarian cycle.
- During growth of the follicle many follicular and thecal cells are formed and start to produce estrogen which is responsible for the changes in the endometrium in the proliferative phase and stimulate the pituitary gland to



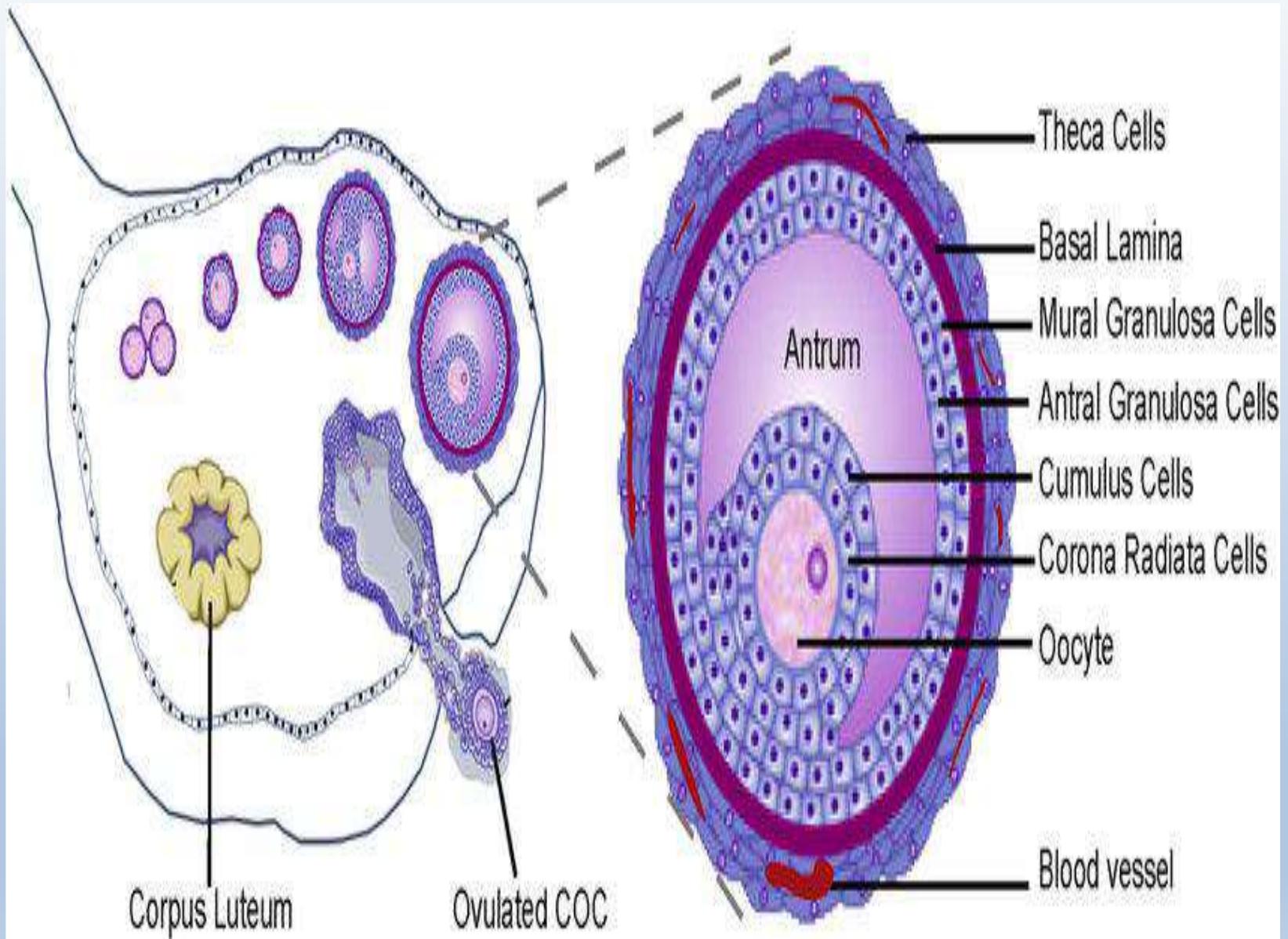
# Effects of FSH

- Formation of primary and secondary follicles from the primordial follicles.



## DEVELOPMENT OF THE FOLLICLE:

The primordial follicle is changed into the primary follicle after multiplication of follicular cells. The appearance of a cavity filled with fluid (antrum) within the granulosa cells and the formation of the theca cells which divide into theca interna (vascular layer) and theca externa (fibrous layer), change the primary follicle into secondary follicle. Enlargement of the secondary follicle changes it to Graafian follicle. At ovulation the secondary oocyte surrounded by the zona pellucida are liberated together with the corona radiata (cells from the cumulus oophorus).



## 2-Ovulation phase

- The Graafian follicle increases rapidly in size during the days before ovulation

(under the effect of FSH and LH). It expands to a diameter of 14 mm.

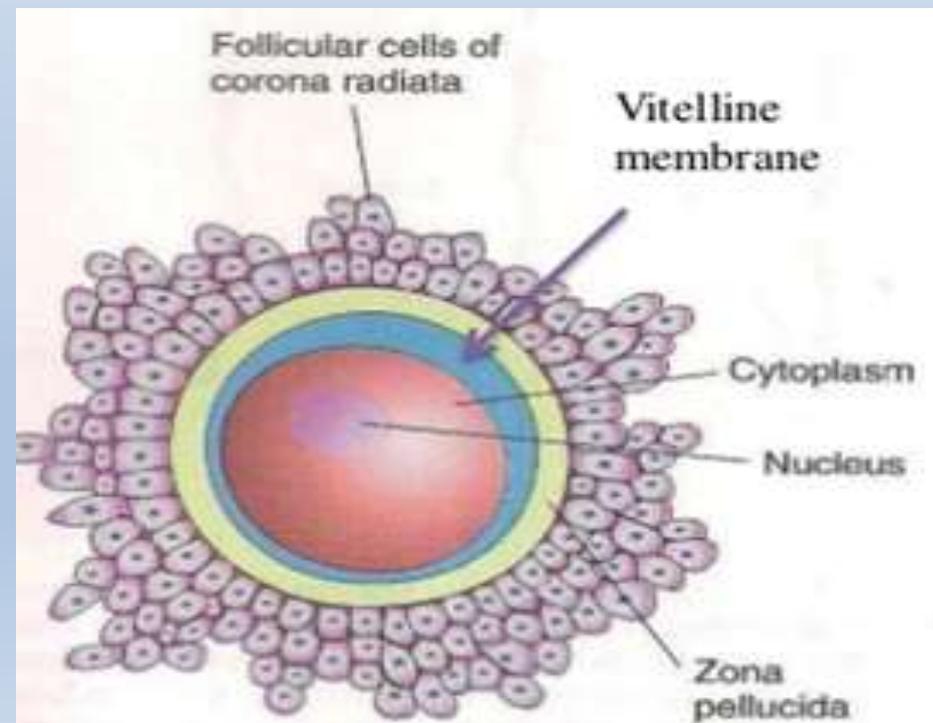
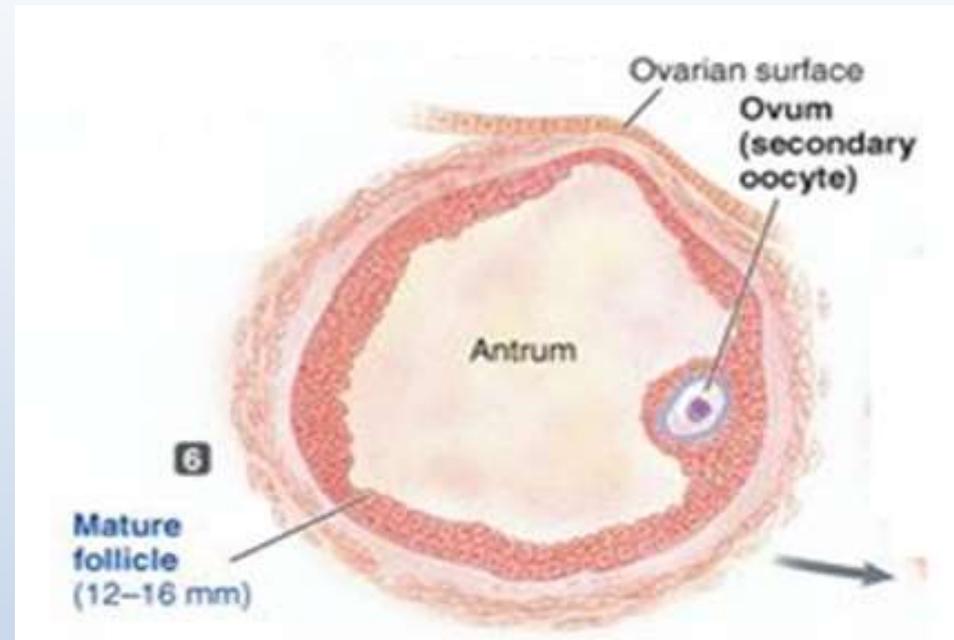
- The primary oocyte completes its first meiotic division and the secondary

oocyte (containing the haploid number of chromosomes i.e. 23 chromosomes)

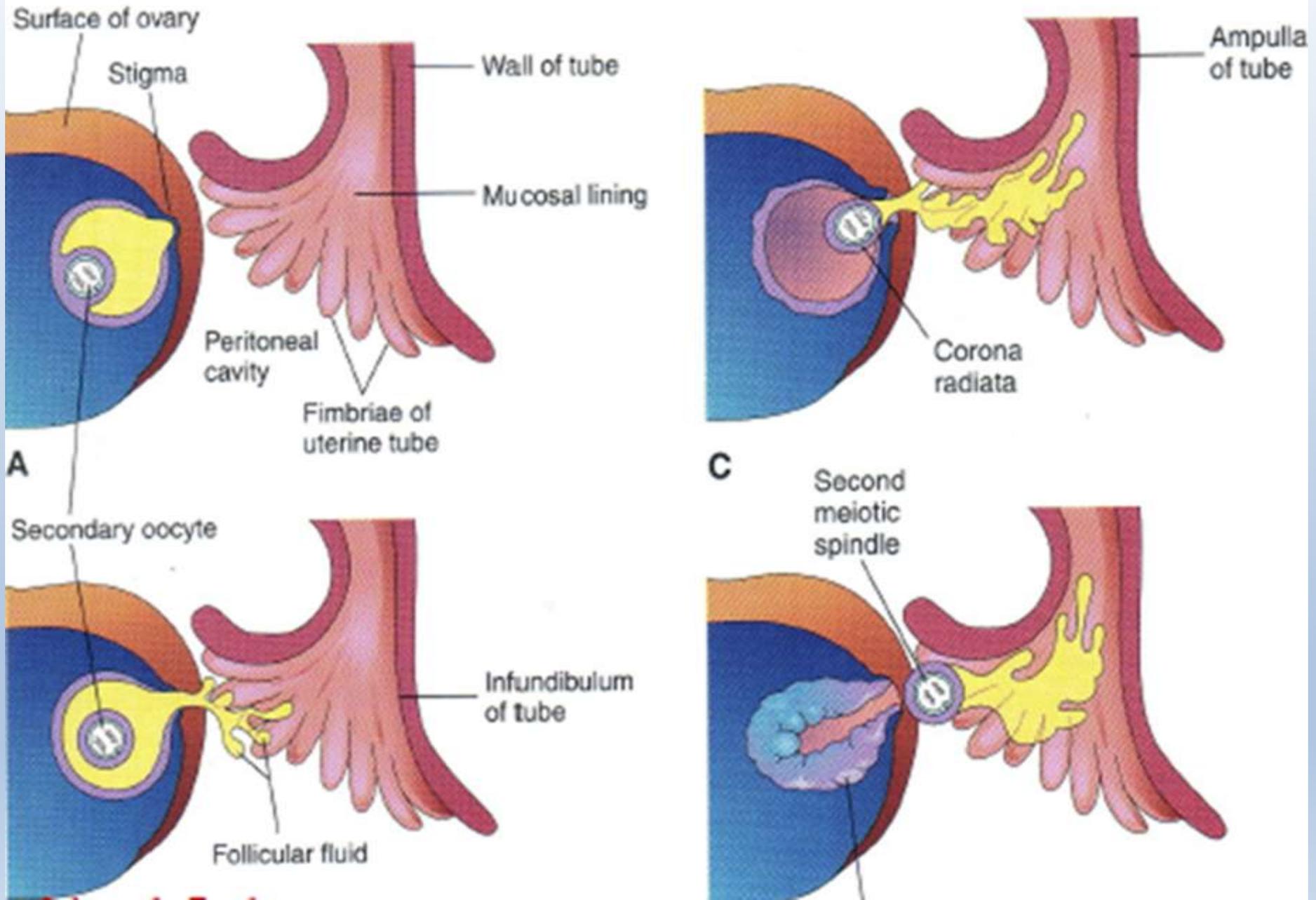
starts the second meiotic division.

- Ovulation means rupture of Graafian follicle with liberation of the secondary oocyte out of the ovary.

- Secondary oocyte together with the corona radiata and the zona pellucida float out of the ovary.



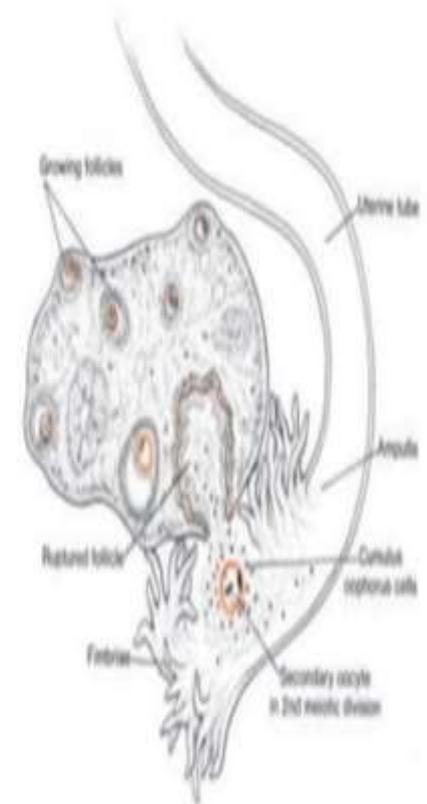
# OVULATION



**At the time of ovulation, the body temperature is slightly elevated, and the female feel pain in the iliac fossa ( mid-cycle pain ) . If this pain occurs on the right side , it may be miss diagnosed as acute appendicitis .**

**✦ Ovulation occur once every lunar month , approximately 14 days ( plus or minus one day ) before the beginning of next menstruation .**

**✦ Ovulation does not occur during pregnancy and occurs to less extend during lactation .**



## **Fate of Graafian follicle:**

Two important events occur to the Graafian follicle

1- Ovulation.

2- Formation of corpus luteum.

## **LH from pituitary will produce the following changes:**

1- Increases size of 2dry follicle to form Graafian follicle.

2- Stimulate collagenase enzyme resulting in digestion of collagen fibers surrounding the mature Graafian follicle.

3- Stimulate prostaglandins resulting in ovarian contraction.

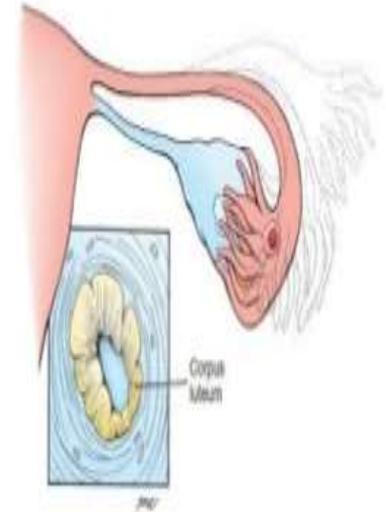
4- Complete 1st meiotic division of primary oocyte to form 2dry oocyte (23 ch) and 1st polar body and start 2nd meiotic division.

5- Ovulation.

6- Formation of corpus luteum inside the ovary from the ruptured Graafian follicle.

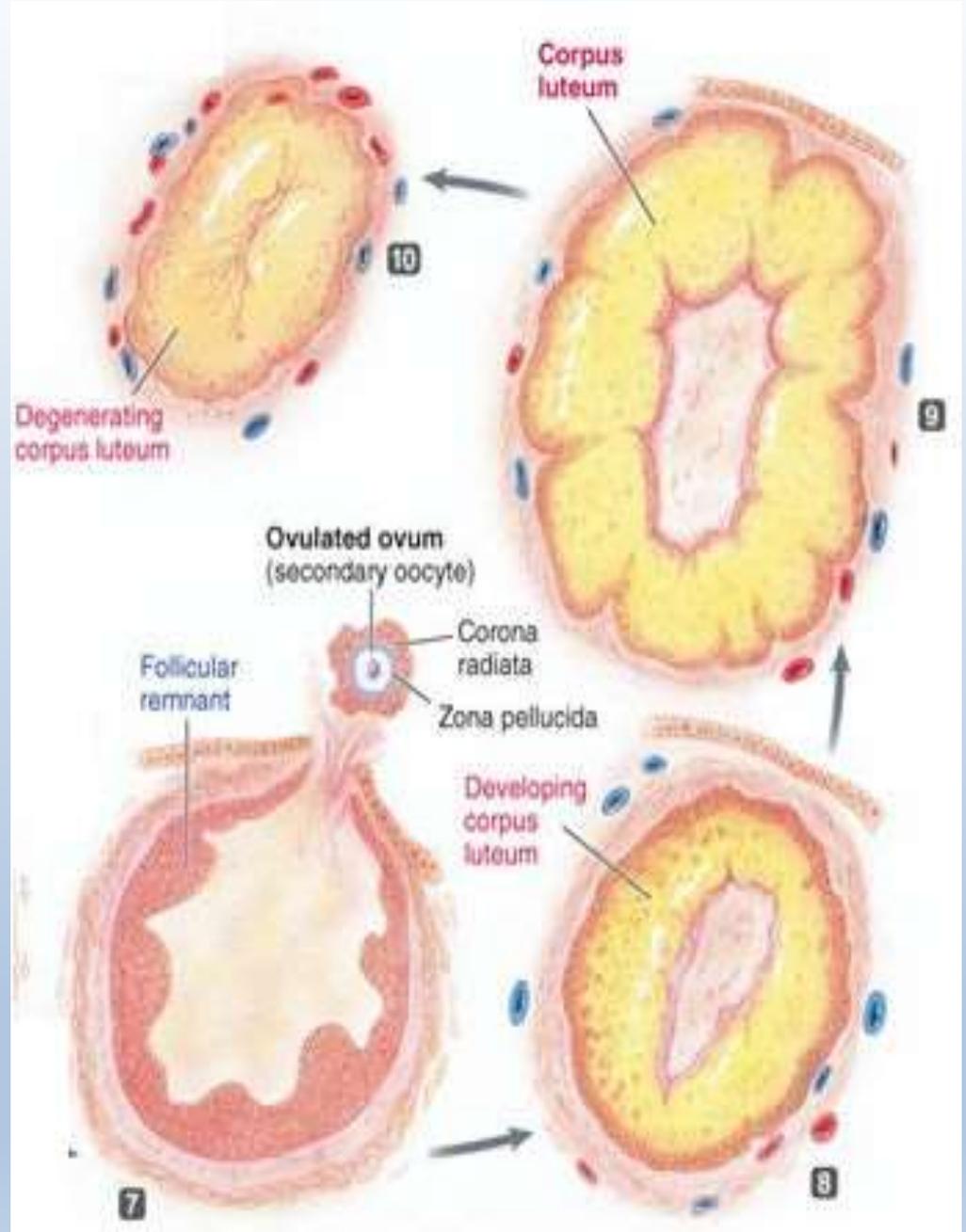
## Oocyte transport

- Fimbriae sweep over the surface of the ovary and catch the oocyte that are released from the ovary
- In the tube, the oocyte move towards the uterine cavity by the contraction of the tube and propelled by cilia
- Fertilized egg reach uterine lumen 3-4 days



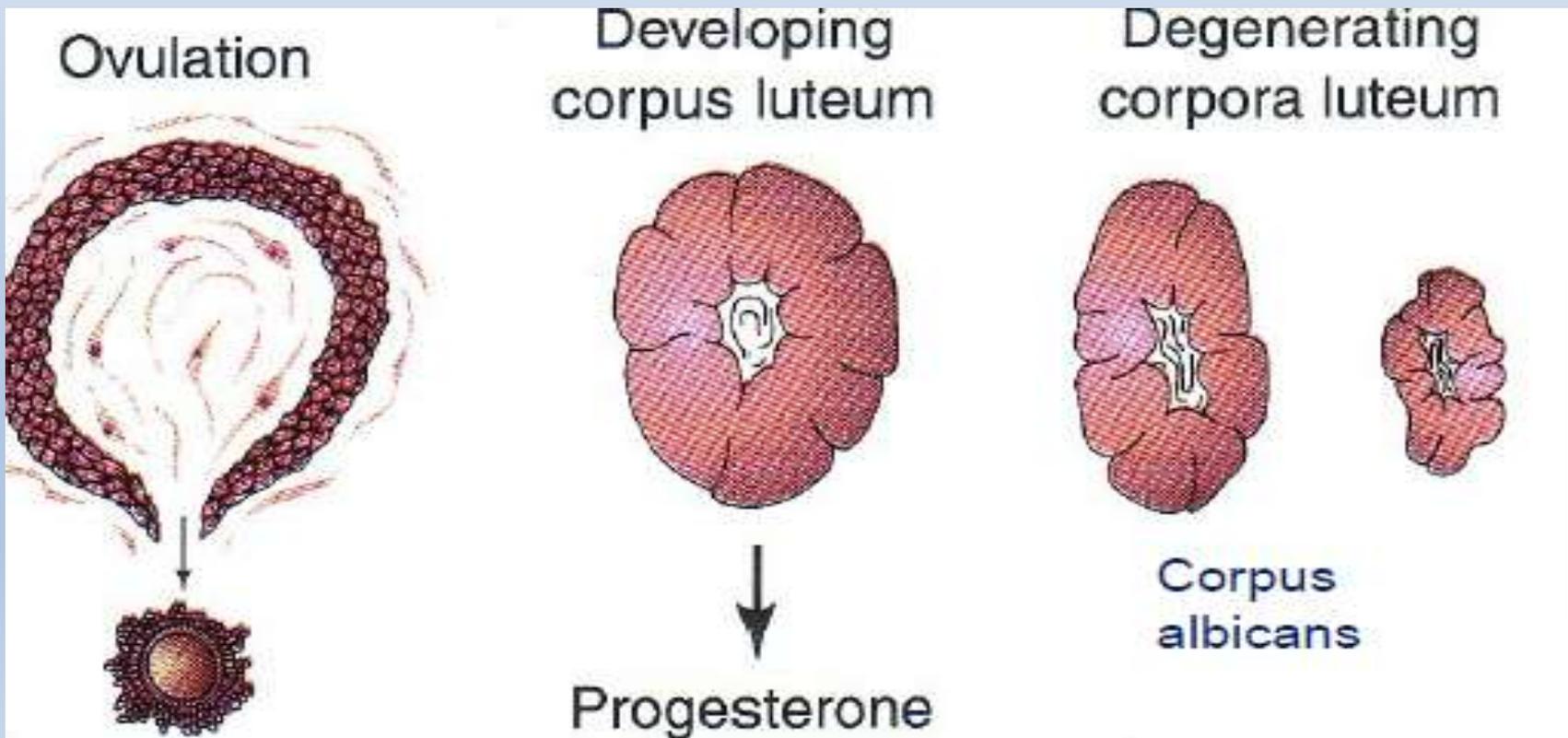
### **3-POST OVULATORY (LUTEAL) PHASE:**

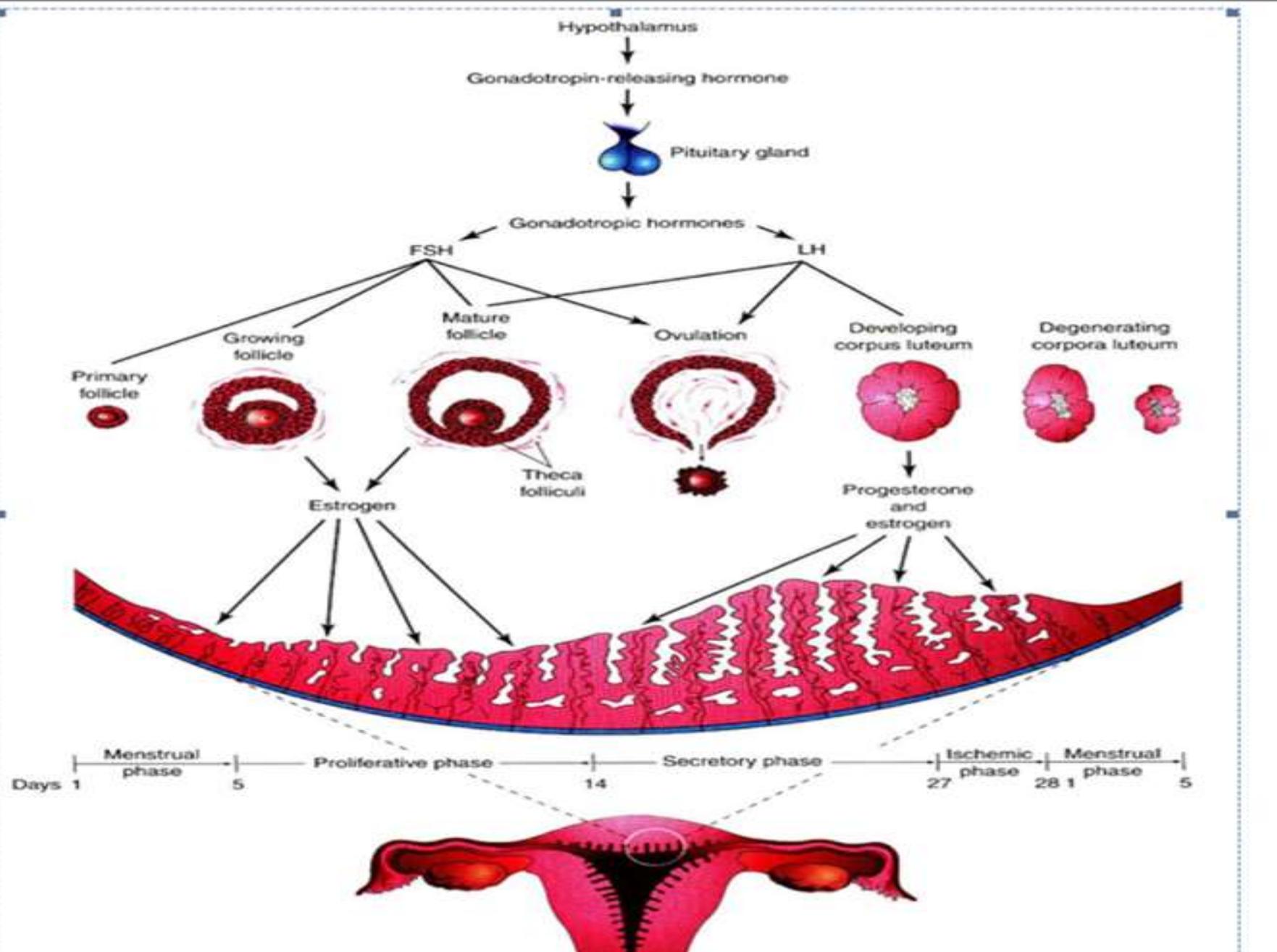
- Following ovulation, the granulosa cells of the ruptured follicle and the theca interna cells become polyhedral
- Under the effect of LH, these cells contain yellowish pigment and change into luteal cells forming the *corpus luteum* (corpu body & luteum = yellow).
- The corpus luteum secretes progesterone hormone mainly and little estrogen. Progesterone hormone causes the secretory phase of the menstrual cycle



## Corpus Luteum

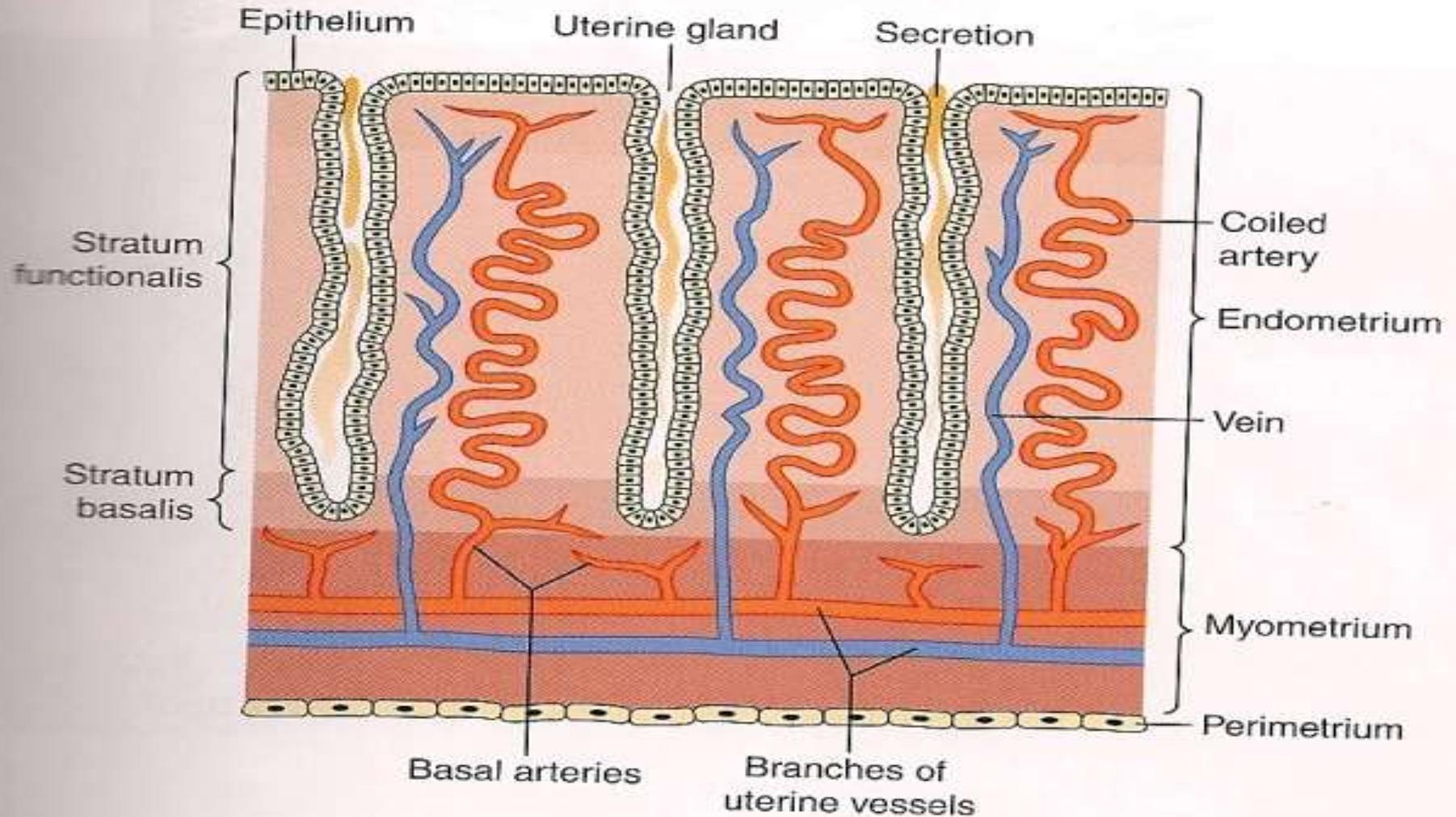
- It is the luteinized Graafian follicle under the effect of luteinizing hormone (L.H.). This occurs in the second half of ovarian cycle (luteal phase). Yellow pigments are deposited in granulosa and theca interna cells.
- Corpus luteum produces progesterone hormone which is responsible for secretory phase of uterine cycle.
- - **Fate of corpus luteum:**
  - **No fertilization**, it lives for 10 days and the transformed into fibrous tissue called corpus albicans and stop secreting progesterone.
  - **With fertilization**, it stays till the 4th month to keep endometrium intact. is under the effect of the human chorionic gonadotrophin (hCG) secreted by trophoblast of the developing embryo.





# Structure of the uterus

B



## **B- UTERINE (MENSTRUAL) CYCLE:**

It is the monthly changes which take place in the **endometrium** of the uterus from puberty till menopause in the non pregnant female.

It is repeated every 28 days.

It is affected by the ovarian cycle and the ovarian hormones.

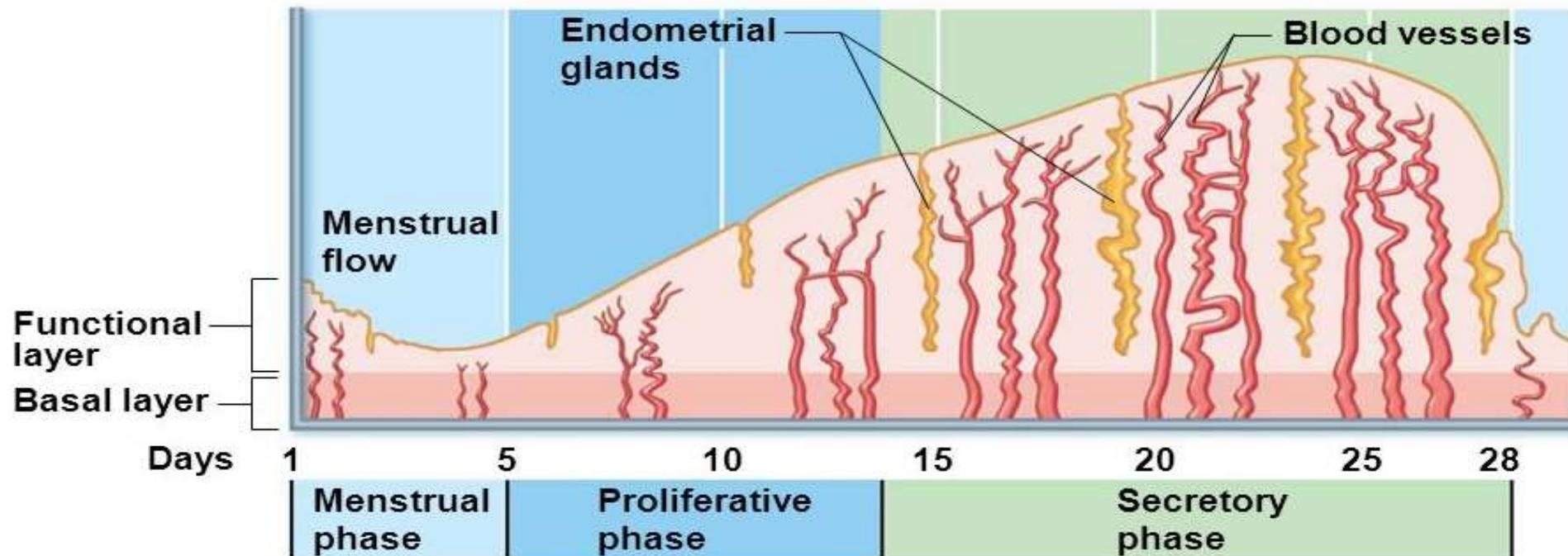
**It passes through three phases.**

### **1. Menstrual phase (4 days)**

It corresponds to the beginning of the pre-ovulatory phase of the ovarian cycle.

-1st day of the cycle is the 1st day of menstruation.-It is completed within 3 to 4 days.

-It occurs due to spasm of endometrial arterioles as a result of degeneration of corpus luteum and drop in level of progesterone



There is loss of (compact and spongy layers of endometrium).

- **Only the stratum basale is left because it is supplied by the basal arteries, and it is the site of endometrial regeneration.**

- **Contents of the menstrual flow**

- a. **Blood containing red and white blood cells.**

- **desquamated endometrium.**

- **Menstrual blood does not normally clot ( due to presence of proteolytic enzymes )except if there is severe bleeding.**

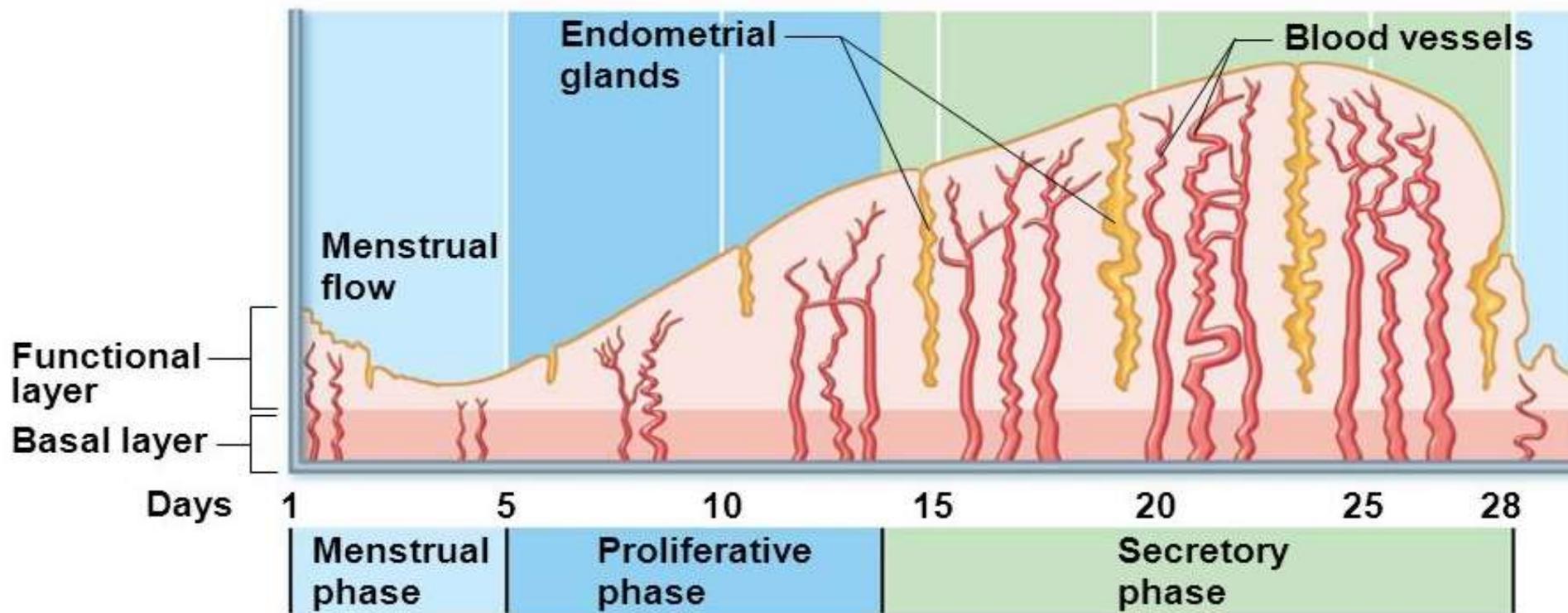
## 2. Proliferative (estrogenic) (postmenstrual) phase (10 days)

• It lasts for 10 days.

- It begins at the end of the menstrual phase. It is under the influence of estrogen hormone secreted by the Graafian follicle

It coincides with growth of the ovarian follicles.

- The endometrium increases in thickness (up to 3 mm) and its epithelium becomes columnar. The uterine glands become large and rich of mucin and glycogen therefore this phase is also called the phase of repair.



### 3. Secretory (premenstrual)

(progesterational) phase (14 days) It corresponds to the postovulatory phase of the ovarian cycle

-Blood vessels and glands become spiral.  
-mucous glands become long, tortuous & distended with secretion

-Endometrium becomes differentiated into superficial compact, middle spongy & basal layers

-This phase is under effect of progesterone and small amount of estrogen produced by corpus luteum.

-It lasts for 14 days.

These changes in the endometrium can be regarded as the preparation of the endometrium for the reception and nourishment of the suspected blastocyst if fertilization occurs.

• **If fertilization of the ovum does not occur:** the corpus luteum degenerates, progesterone levels fall, and the secretory endometrium enters an *ischemic phase* during the last day of the secretory phase and so menstruation occurs.

• **- If fertilization occurs** cleavage of the zygote and formation of the blastocyst follows. The fetus produces hCG (*human chorionic gonadotrophic hormone*) which keeps the corpus luteum secreting progesterone. As a result of progesterone secretion, the secretory phase continues as pregnancy. This is why menstruation does not occur.