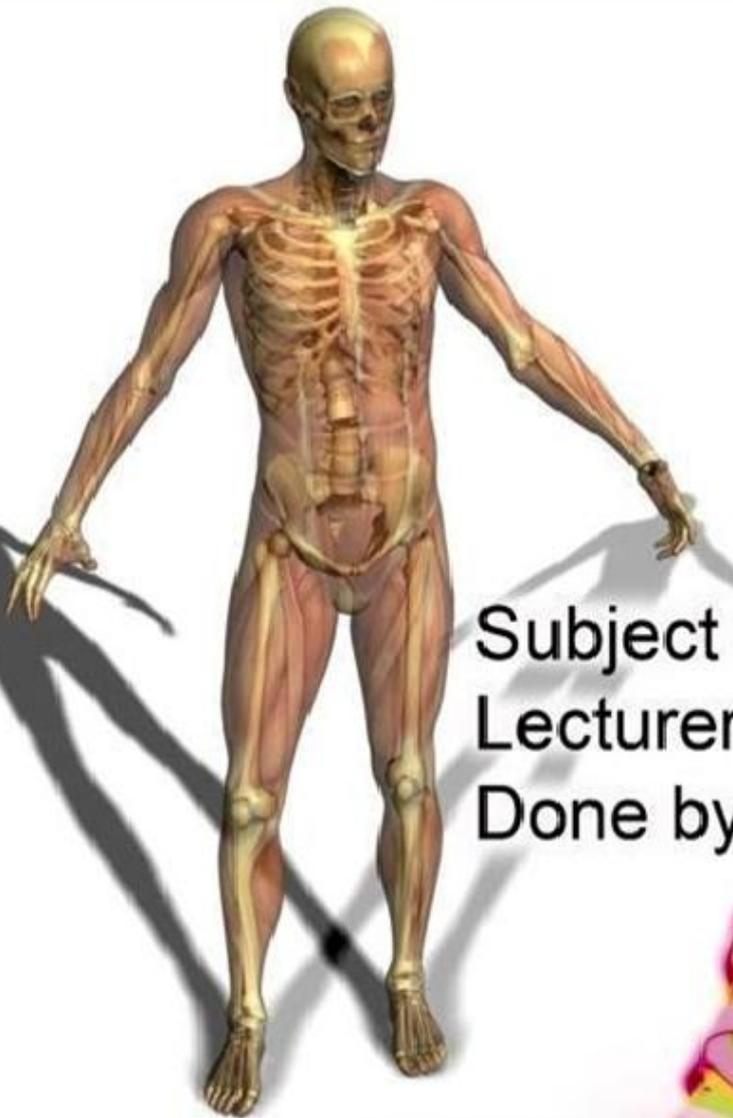




ANATOMY



Subject : Embryology
Lecturer : Dr. Maher Hadidi
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Embryology - Lecture # 4

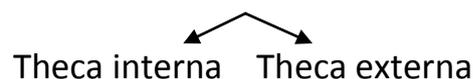
Quick Review:

• **Oogenesis :**

- **Oogonia** start appear in the ovary when the age of the fetus^١ is (5th week) .
- Then the **Oogonia** transformed into **1ry Oocyte** .
- **1ry Oocyte** is surrounded by a **follicle** (cover) .

Follicular development (follicular cycle) :

- 1) Oogonia → enlarge to 1ry Oocyte
 - (**growth of 1ry Oocyte**)
- 2) - Surrounding cells formed 1 layer of flat cells around the 1ry Oocyte (primordial follicle).
 - Become cuboidal cells which multiply to form granulosa cells.
 - (**proliferation^٢ of granulosa^٣ cells**)
- 3) •(**Formation of Zona pellucida^٤**)
- 4) Formation of the outer capsule
 - (**Formation of Theca**) ... which divides into two layers :



Growth of 1ry Oocyte → Proliferation of granulosa cells →
Formation of Zona pellucid → Formation of theca

* All this layers is important for the growth of the Oocyte .

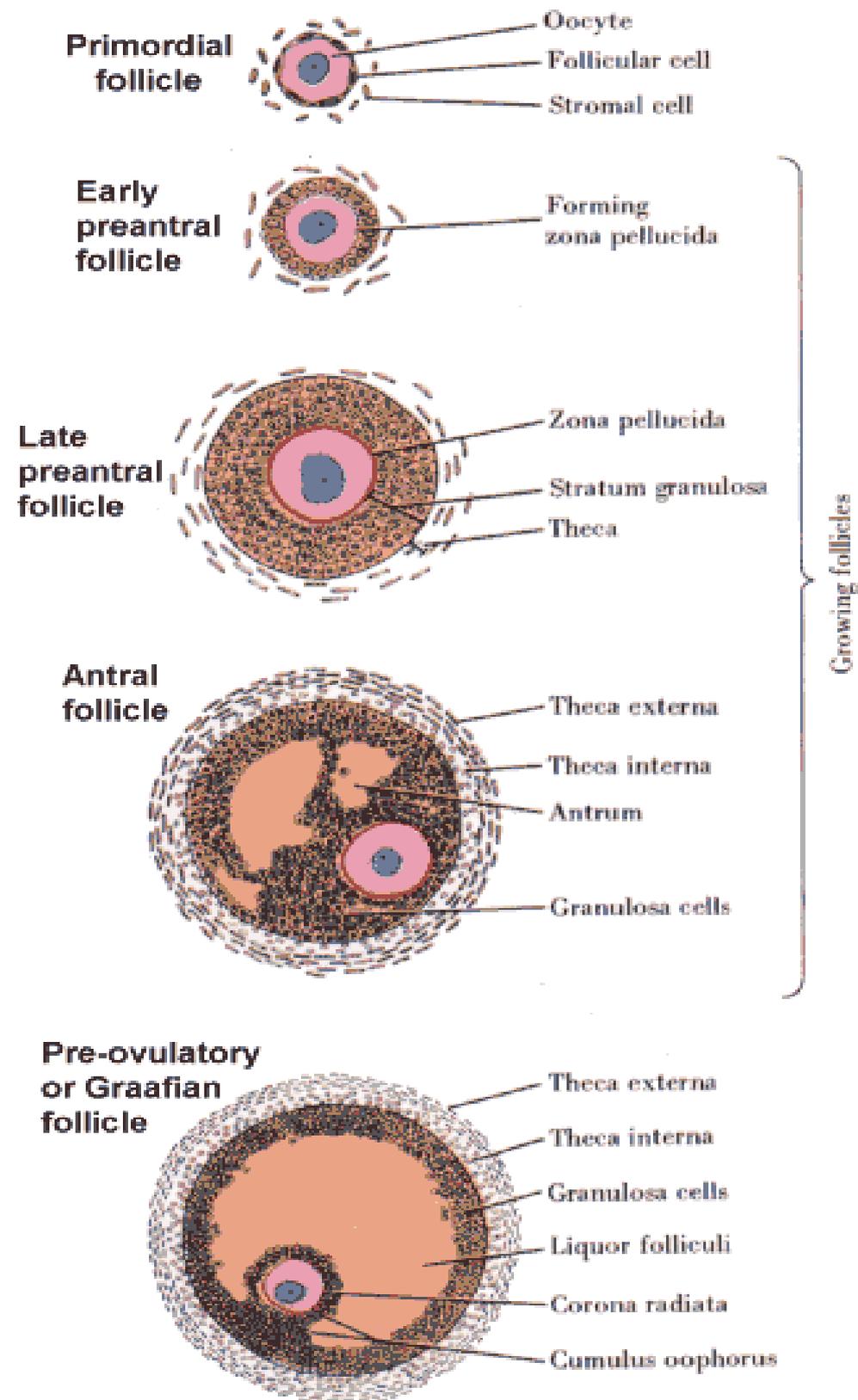
- Oocyte + uni layer of flat cells = primordial follicle .

- **Granulosa cells is important for the growth and nutrition of the ovum (1ry oocyte) .**

fetus: جنين^١
proliferation : تكاثر^٢
granulosa: المحببة^٣
zona pellucida: الطبقة الشفافة^٤

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- Oocyte is covered by zona pellucida then covered by part of granulosa cells.



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- Spaces : (Antrum)

*Because granulosa cells proliferated too much by mitosis → spaces are formed.

* These spaces unite and form 1 space called cave (**Antrum**) ... and the 1ry oocyte pushed laterally (to the sides).

- corona radiata:

* The part of the granulosa cells that surround the 1ry oocyte called **Corona Radiata**. (check the image in the previous page)

****these steps occurs at puberty****

- After these steps the structure is called:

Mature (Graafian) follicle

- Because of the enlargement and swelling of the Follicle there will be a bulge on the ovary ... the bulge over the external surface of the ovary will be thin ... at ovulation (mid time of the period) the oocyte will be expelled out of the ovary .

Then :

→Another group of cells will concentrate around the Oocyte (2ry) to form Corona Radiata which accompanied the Oocyte (2ry) when it leaves the ovary.

→ to meet the sperm (male gamete).

→ for fertilization.

→ to form a Zygote.

→ to have pregnancy .

* If pregnancy does not happen → uterus will bleed.

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Female reproductive cycle : (period)

- Females have a continuous repetitive cycle from puberty to menopause and it's only interrupted by pregnancy.

***Involves 4 structures : (1- 4)**

1) Hypothalamus gland : غدة تحت المهاد

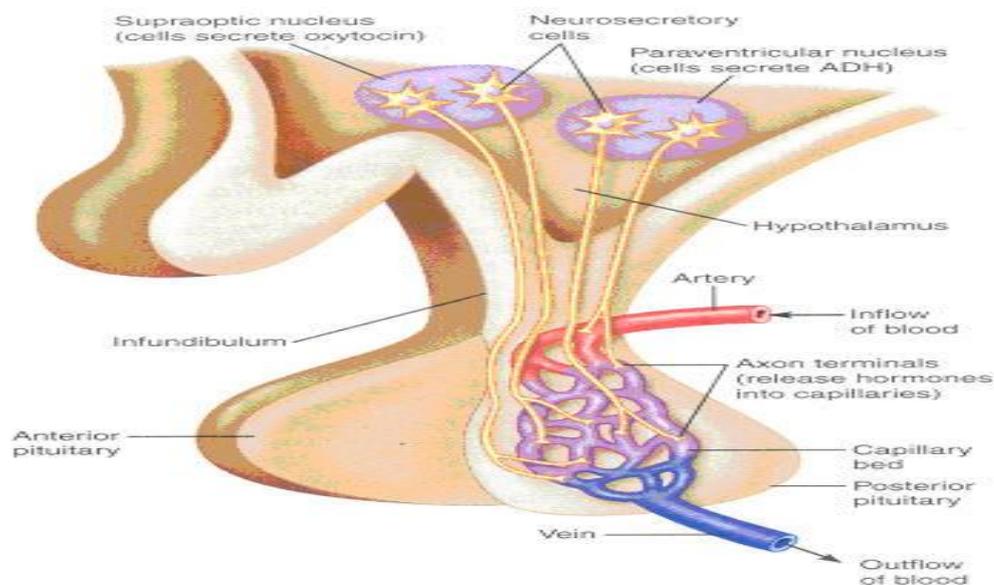
- secretes **Gonadotropin – Releasing hormone.**

2) Pituitary gland : الغدة النخامية

- secretes : **Gonadotropin H. :**

1) Follicle stimulating H. (FSH)

2) Lueinizing H. (LH)

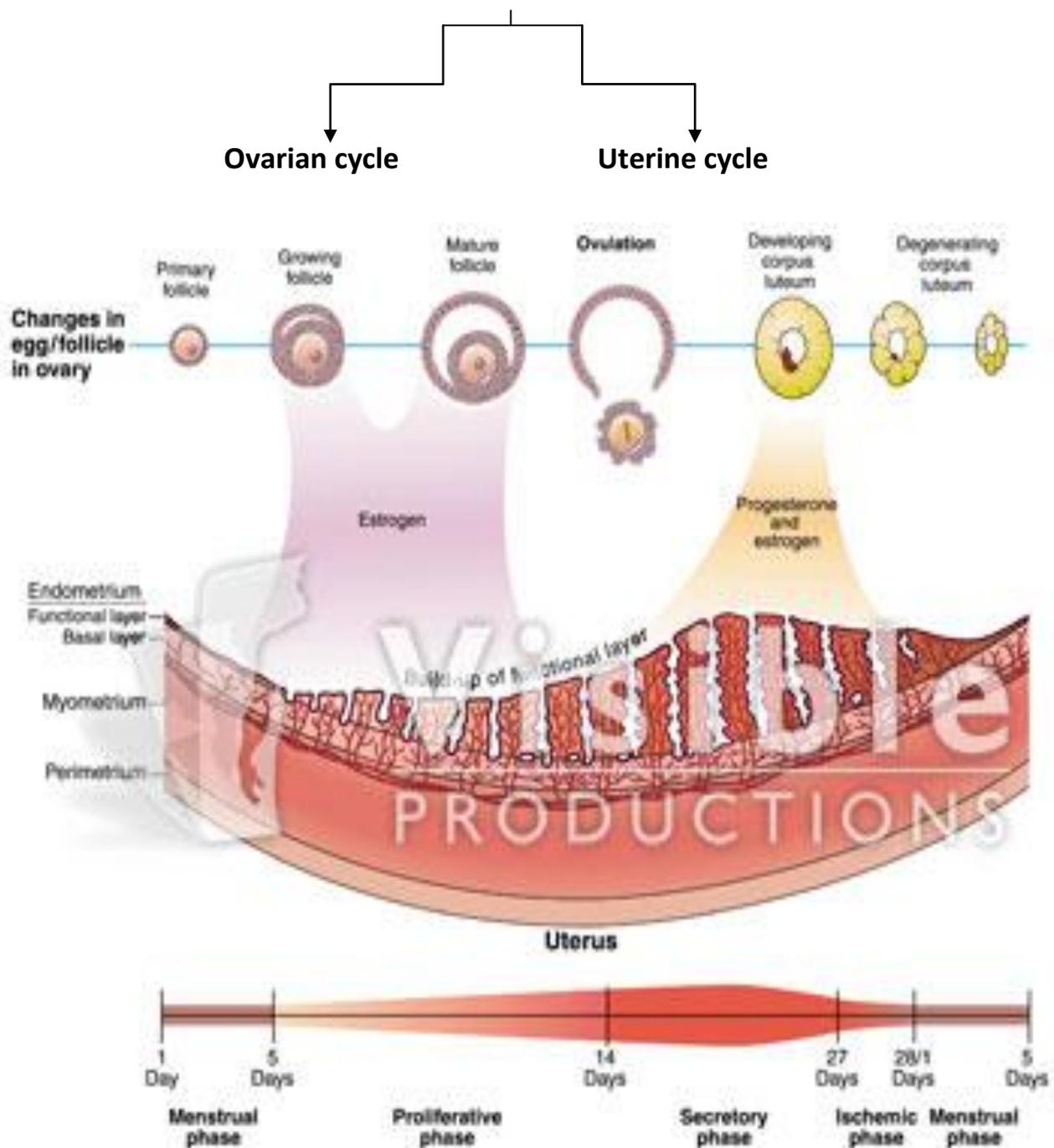


3) The ovary

4) The uterus

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Female reproductive cycle Divides into
2 cycles:



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(1) Ovarian cycle :

- occurs in the ovary .

What happens in this cycle :

• Hypothalamus role :

- At puberty the hypothalamus gives an **order** to secrete **Gonadotropin-Releasing Hormon.**
→through small capillaries (blood vessels) between hypothalamus & pituitary gland

Hormones secreted through the blood.

• Pituitary gland role :

- The order will be received by anterior **pituitary gland** and will regulate the secretion of **Gonadotropin H.**
→Gonadotropin H. stimulates the Gonads (sex organs).
- (FSH) Follicle Stimulating H. : affects follicles inside the ovary .
- (LH) Luteinizing H. : الهرمون الملوتن

• Period`s steps :

- Gonadotropin H. (FSH & LH) IMPORTANCE (1-3) :

(FSH) → 1) Growth & maturation of follicles (proliferated and multiply)

(LH) → 2) Ovulation

→ 3) Corpus Luteum formation

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1) Growth & maturation of follicles : (FSH)

- * Remember : that many 1ry Oocytes " begin the race" and only 1 will continue and form Mature (Graafian) follicle .
- The granulosa cells that surround the 1ry Oocyte(inside the Mature (Graafian) follicle) will secrete **Estrogen**.

Estrogen is responsible about **proliferative phase** in the endometrium of the uterus (uterine cycle) .

- * **LH** is important for maturation of **Graafian follicle** .

2) Ovulation : (LH)

- Occurs at the day 14 of the period .
- Large amount (surge) of **LH** secreted from the **anterior pituitary gland** to affect **Graafian follicle** to expel the 1ry Oocyte out of the follicle and be a 2ry Oocyte .

1ry Oocyte after ovulation → 2ry Oocyte

3) Corpus Luteum formation : (LH)

- After ovulation the remaining part of the follicle called **Corpus Luteum**.
- Granulosa cells and theca interna cells are highly vascularized by surrounding vessels affected by **LH** to :
 - Secrete a large amount of **blood** within the cavity and within the cells , and the blood inside will be fibroses forming a fibril .
- These cells will be accumulated as lipid-like substance (yellow in color) which is called **Luteal cells** that give the yellow color of the **Corpus L**.
- These luteal cells which form the **Corpus L**. secrete **Progesterone** .

Progesterone is responsible about **Secretory phase** (uterine cycle) .

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FSH	LH
growth & maturation of follicles	maturation of Graafian follicle
	Ovulation
	Corpus Luteum formation

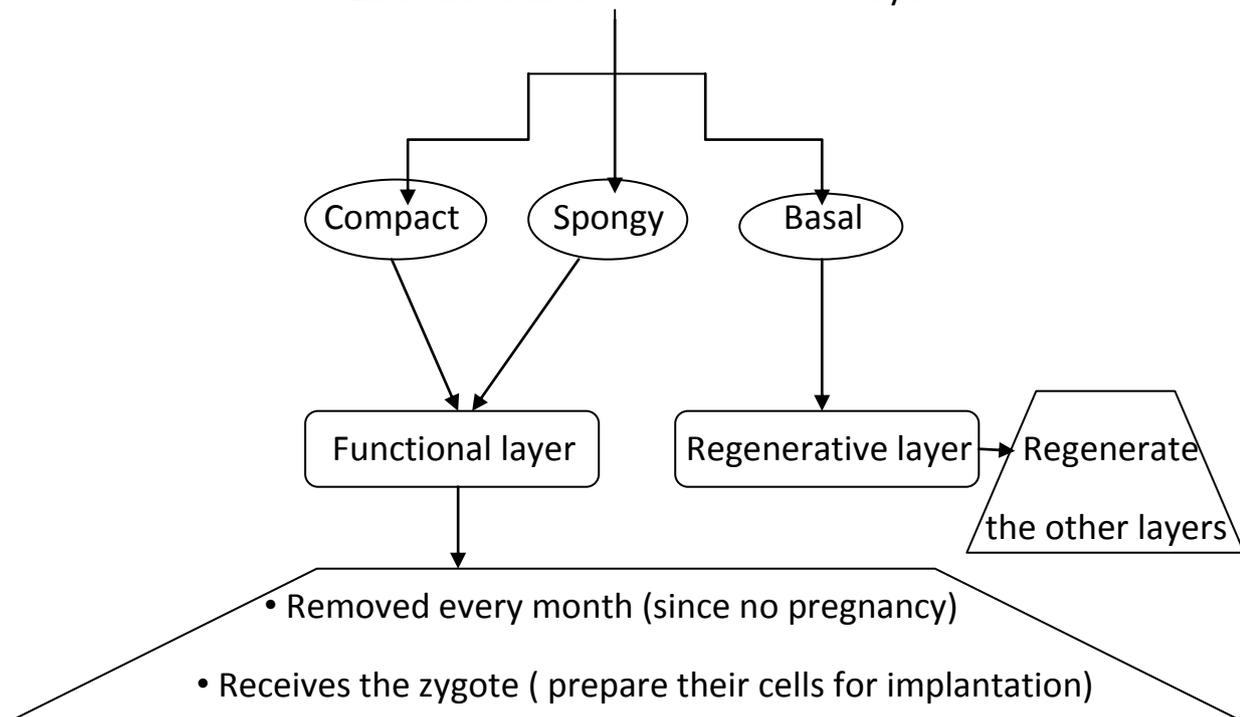
Estrogen	Progesterone
From Granulosa cells	From Luteal cells
Proliferative phase	Secretory phase

** ovarian hormones regulate uterine cycle **

(2) Uterine cycle :

- Occurs in the uterus .
- The uterus : the lining layer of it called ...

Endometrium which formed of 3 layers :



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- The period in females is 28 days (in average) ... may be (25-35).
- The bleeding continues the first 4 days (in average) ... may be (2-7).

What happens in this cycle :

1) Proliferative phase : (multiplication phase)

- From **the end of bleeding** until → **ovulation** (usually 9 days).
- Estrogen induce renewal of the functional layer(compact & spongy).
 - Functional layer (compact & spongy) removed , replaced and thickened (renew) .
 - Blood vessels grow.
 - Uterine glands start to form and enlarge (but not enlarge enough).

2) Secretory phase : (because of secretion of mucus)

- After **ovulation** until → **the start of bleeding** .
- Progesterone will trigger the functional layer(compact & spongy) to be thickened more .

- The functional layer(compact & spongy) will be thickened more .
- The blood vessels will grow more .
- The uterine glands will enlarge and secrete large amount of **mucus secretion** on the endometrial cells .

This will make the uterus a good medium to receive the zygote .

- the doctor said that : the zygote (baby) received at day 6 .

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- If fertilization did not occur :

- 1) The luteal cells will shut off the secretion of the progesterone .
- 2) Then the blood vessels will be constricted (because the progesterone will shut off).
- 3) Then the blood will come out from the walls , and will be collected between regenerative layer and functional layer.

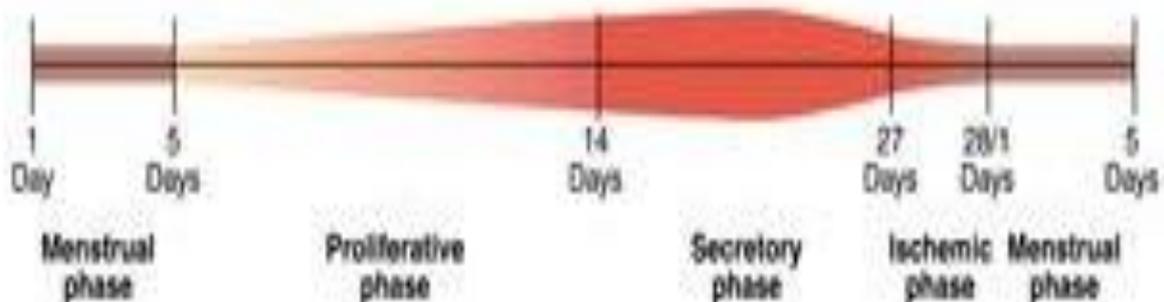
Ischemic phase (death of blood-cut blood supply)

3) Menstrual phase : (bleeding phase)

- From (1 - 4)
- Bleeding contains blood & functional layer (compact & spongy) so it is black in color .

Proliferative phase	Ovulation	Secretory phase	Ischemic phase	Menstrual phase
5-13	14	15-27	27~28	1-4
Estrogen	LH	Progesterone	—	—

*These numbers isn't accurate



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• Contraceptive Pills :

1) Contains Estrogen:

- As the doctor said :

"This will send a false message to the pituitary gland that there is no need to secrete Estrogen from granulosa cells (Graafian follicle) → ovulation will not occur ." (feedback mechanism)

No need for estrogen → no need for FSH → no ovulation

2) Contains Estrogen & Progesterone :

- these hormones will shut off (cut) FSH & LH.

• Infertile cases : العقم

1) FSH is low : we give her FSH by pills

- usually 1 follicle mature but when we give more than enough we will have more than 1 (twins , triplets etc).

Best of luck 😊