

Ovarian cycle

1. Follicular phase

Time: This phase starts with the 1ST of menstruation till ovulation (14 d).

Events:

1- Several (6-12) primordial follicles start to grow under the influence of FSH.

FSH causes:

proliferation of granulosa cells & stimulates them secrete Estrogen and Follicular fluid surrounding the ovum.

2- Then the growing follicles acquire 2 layers which are:

a) **Theca externa:** It is a fibrous layer form the capsule of developing follicle.

b) **Theca interna:** They secrete sex hormones (estrogen and progesterone). Mainly estrogen.

After a week of growth: only one follicle starts to grow rapidly a dominant follicle.

- While the other developing follicles **degenerate**.

- **The selection of the dominant follicle** is related to ability of its granulosa cells → to secrete large amount of **estrogen** which is required for its **maturation**.

2. Ovulatory phase:

Definition: It is the process of expulsion of the ovum from the graafian follicle.

Time: On 14th day in a woman who has a normal 28-day female menstrual cycle.

Mechanism of ovulation:

- 1) The mature graafian follicle is pushed towards the **periphery of the ovary**.
- 2) Then, the follicle ruptures and the ovum is **extruded**.

Cause:

When **estrogen** is secreted in high level by Graafian follicle a **positive feedback** on

LH secretion occurs more LH secretion (6-10 folds) reaching maximum **16 hours before ovulation** (LH surge).

Also, **FSH increase** (2-3 folds) (small FSH surge).

- This LH surge ovulation.

LH surge initiates ovulation as the following :

1. LH stimulate granulosa & theca cells of graafian follicle to secrete **progesterone**.

2. Progesterone stimulates theca externa to release **proteolytic enzymes** dissolution and weakening of wall of **follicle its rupture & discharge of ovum**.

3. Luteal phase:

- After expulsion of the ovum from the follicle, the remaining **granulosa & theca interna cells** change rapidly into yellow (lutein cells & from corpus luteum).

Corpus luteum secretes: Progesterone, Estrogen and Inhibin.

Fate of the corpus luteum:

A) If pregnancy does not occur:

Estrogen, progesterone, and inhibin cause **feedback inhibition** on LH and FSH secretion This causes the corpus luteum to degenerate and changes to fibrous tissue called **corpus albicans** decreasing **estrogen & progesterone** in blood leads to **Menstruation** begins, and a new ovarian cycle is then occurred.

B) If pregnancy occurs:

human chorionic gonadotropin (HCG) secreted from **chorionic cells** causes **corpus luteum continue to grow & secretes** large amount of estrogen & progesterone for about **4 months until mature placenta is formed**.

NB:

- **Estrogen** is the main hormone secreted from **ovary in first half of ovarian cycle**.

- **Progesterone and estrogen** are secreted in the **second half of the ovarian cycle**.

Estrogen has two peaks :

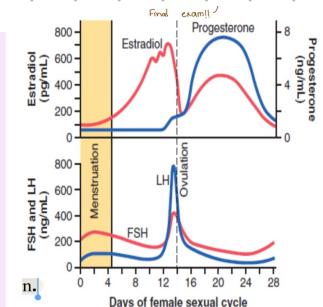
1. Just before ovulation (1-2 days).
2. At mid of luteal phase.

Progesterone has one peak:

- At mid of luteal phase.

LH and FSH has one peak:

- At mid of the cycle , just before ovulation.



Uterine cycle

It is a cyclic (monthly) changes in **endometrium** that coincides with the menstrual cycle and its **hormonal changes**.

1 .The menstrual phase:

Duration: It occurs at the first **3-5 days** of **follicular phase** of ovarian cycle.

Cause: Drop of **progesterone** & **estrogen** levels in **blood** due to degeneration of corpus luteum (when the ovum is not fertilized) .

Changes in endometrium:

1- severe **vasoconstriction** of endometrial arteries severe endometrial **ischemia** **necrosis** of **superficial layer of endometrium**.

2- Then shedding of necrotic endometrium & average of 3-5 days (**menstrual bleeding**).

2. The proliferative phase:

Duration: It starts from **5 till 14 day** of ovarian cycle.

Cause: It's under influence of **estrogen** secreted from **growing follicles**.

Changes in endometrium:

1. The stromal cells & epithelial cells proliferate rapidly.

2. The uterine glands become longer & tortuous (but have **minimal secretions**).

3. The blood vessels grow up & become spiral.

4. The endometrium becomes **3-5 mm thick**.

2. The secretory phase:

Duration: from 14 to 28 day.

Cause: By **progesterone** in presence of estrogen secreted by corpus luteum.

Changes in endometrium:

- The uterine glands become larger, more tortuous & **fuller of secretions**.

- The endometrial cells swell & accumulate large amounts of glycogen & lipids.

- The blood vessels become larger and tortuous .

- These changes **prepare endometrium** for possible **implantation** of fertilized ova.

Phases	Menstruation	Proliferative	Secretory
Onset	From 1 st day to 5 th day of ovarian cycle.	From 5 th to 14 th day of ovarian cycle.	From 14 th to 28 th day of ovarian cycle.
Cause	Marked drop of blood estrogen & progesterone. due to Corpus luteum degeneration .	By Estrogen secreted from follicles.	By Progesterone & estrogen from Corpus luteum.
Changes	Drop of progesterone & estrogen levels cause: Necrosis of superficial endometrium then shedding of necrotic endometrium & bleeding.	Estrogen causes: Proliferation & increased thickness of endometrium.	Progesterone causes: secretory changes in endometrium.