



# REBRODUCTIVE BLOCK



## LECTURE 4

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## UTERINE CYCLE

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HALFWAY THERE!  
THEODORE ROOSEVELT

# OBJECTIVES

- Describe the normal menstrual cycle
- Discuss the **structural changes** that occur in the endometrium during the menstrual cycle and explain how these changes are **hormonally** controlled
- Describe **phases** of the menstrual cycle
- Describe the **hormonal control** of the menstrual cycle
- Describe the major disorders of the menstrual cycle
- Describe the physiology of menopause

# MIND MAP

## Phases of menstrual cycle:

1. Proliferative phase
2. Secretory phase
3. Menstruation

## Menopause:

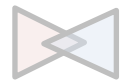
1. Definition of menopause
2. Physiological changes caused by loss of estrogen

## Disorders of menstrual cycle:

1. Amenorrhea
  2. Menorrhagia
  3. Hypomenorrhea
- Dysmenorrhea



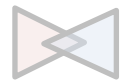
<http://education-portal.com/academy/lesson/the-hpg-axis-hormone-level-changes-in-hypothalamus-and-ovaries.html>



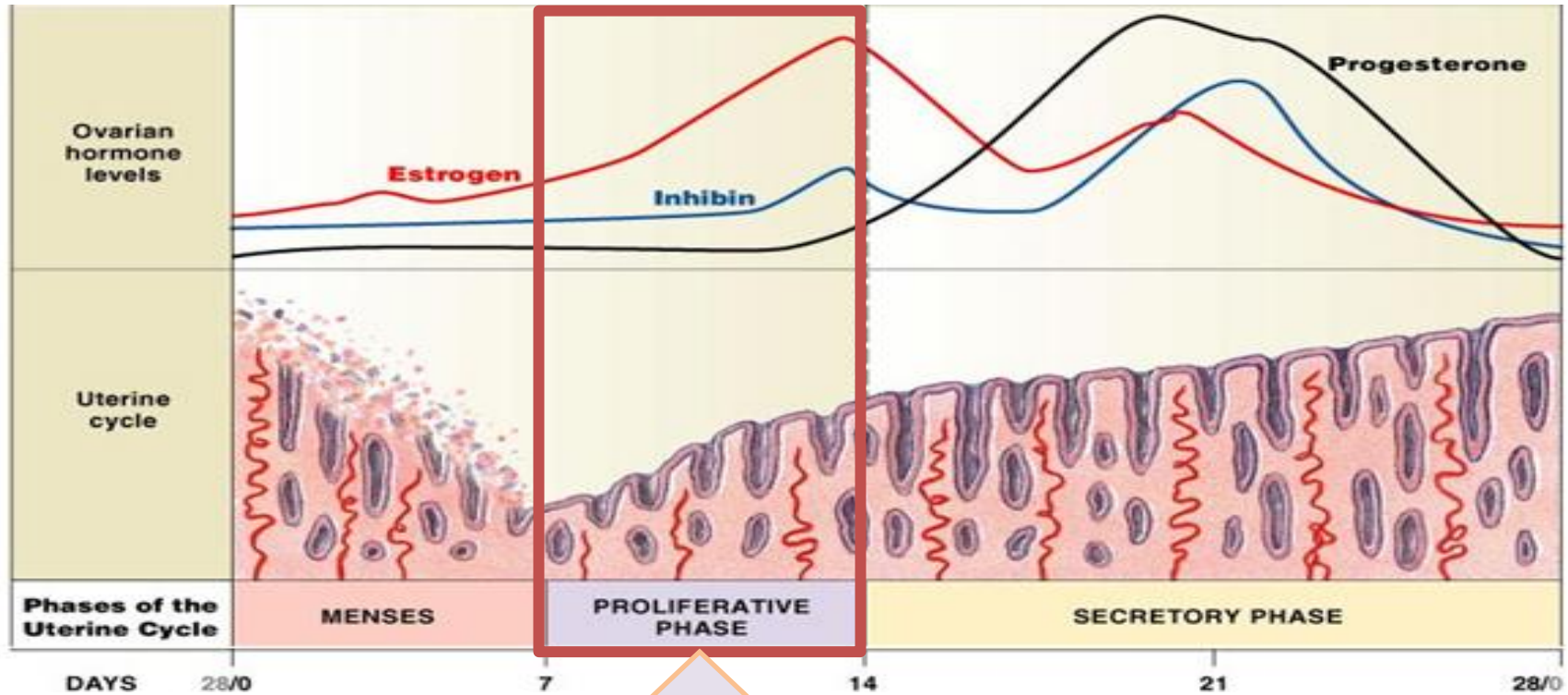
- Monthly endometrial cycle and menstruation Associated with monthly cyclical production of estrogens & progesterone by the ovaries the endometrial lining of the uterus pass through the following stages:

## 1- Proliferative phase (estrogen phase) occurring before ovulation:

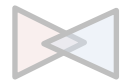
- At the beginning of each cycle, most of the endometrium has been desquamated by menstruation. After menstruation only a thin layer of the endometrial stroma remains & the deeper portions of the glands & crypts of the endometrium under the influence of estrogens, secreted in large quantities by the ovaries, the stromal cells & epithelial cells proliferate rapidly.
- The endometrial surface is **re-epithelialized** within 4-7 days after the beginning of menstruation. **Before ovulation, endometrial thickness increases** due to the increase in numbers of stromal cells & progressive growth of the glands & new blood vessels.
- At the time of ovulation, the endometrium is 3-5 mm thick. The endometrial glands & cervical region secrete a thin, stringy mucus which help to guide sperm in the proper direction from the vagina into the uterus **to help the fertilization process**



# Menstrual cycle

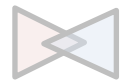


- You can see that estrogen is very high in this phase (the dominant hormone)
- You can also see the re-epithelization of the endometrial surface and increase in its thickness. Also the formation of new glands & blood vessels



## 2- Secretory phase (progestational phase), occurring after ovulation

- After ovulation, estrogen & progesterone are secreted in the later part of the monthly cycle by the corpus luteum. **Estrogen cause slight proliferation in the endometrium & progesterone causes marked swelling & secretory development of the endometrium.** The glands increase in **tortuosity**, excess secretory substances accumulate in the glands.
- Stromal cells cytoplasm increase lipid & glycogen deposits in the cells & blood supply to the endometrium increases and become more tortuous. 1 week after ovulation, endometrium thickness is 5-6 mm.
- The secretory changes prepared the endometrium (stored nutrients) **for implantation of the fertilized ovum**. Uterine secretions called “uterine milk” provide nutrition for the diving ovum. The trophoblastic cells on the surface of the implanted ovum begin to digest the endometrium & absorbed endometrial stored substances.

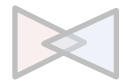


## 3- Menstruation:

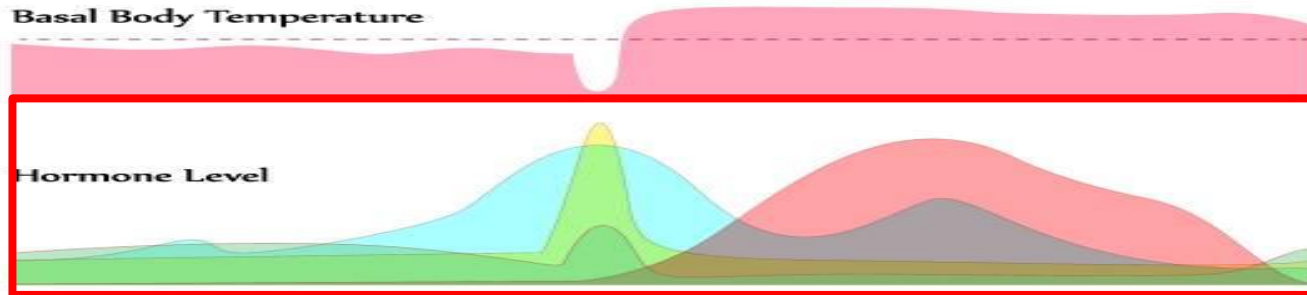
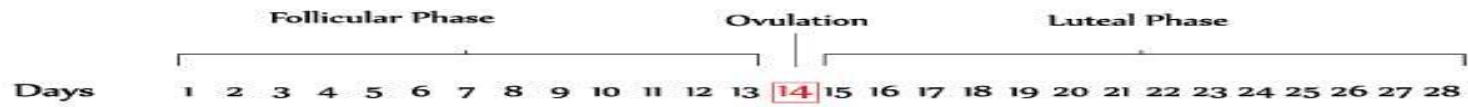
- If the **ovum is not fertilized**, about 2 days before the end of the monthly cycle, the corpus luteum involutes & **estrogens & progesterone decrease to low levels of secretion**. Due to decrease estrogen & progesterone at the end of the monthly cycle, there is decrease stimulation of the endometrium, followed by involution of the endometrium about 65% of its previous thickness.
- During the 24 hrs preceding the menstruation, there is **vasospasm** of the tortuous blood vessels & **release of vasoconstrictor prostaglandins**.

### There is:

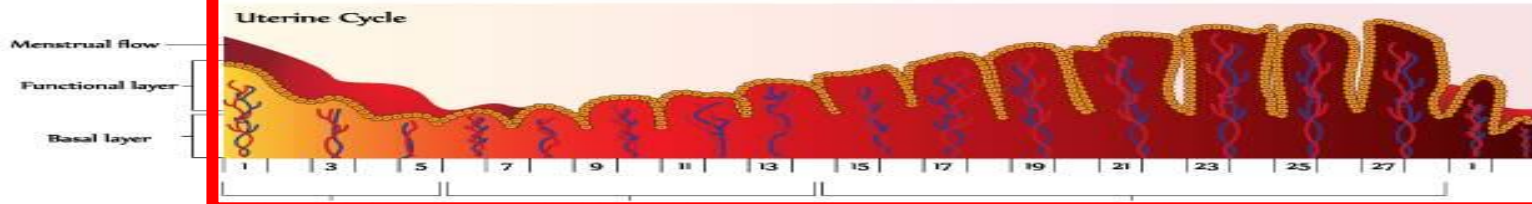
1. **Vasospasm & release of prostaglandin,**
  2. **Decrease nutrients to the endometrium,**
  3. **Loss of the hormonal stimulation, all initiate necrosis in the endometrium blood vessels.** There is gradual necrosis of the outer layer of the endometrium separate from the uterus at the site of the hemorrhages within 48 hrs, all the superficial layers of the endometrium desquamated in the uterine cavity.
- **The mass of desquamated tissue & blood plus the contractile effects of prostaglandins all initiate contractions which expel the uterine contents.**



# Menstrual cycle



- LH
- FSH
- Estrogen
- Progesterone



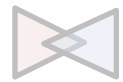
SLIDES

IMPORTANT

FEMALES' NOTES

EXPLANATION

MALES' NOTES

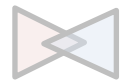


- In normal menstruation, about 40 ml of blood + 35 ml of serous fluid are lost. The menstrual blood is normally **non-clotting due to the presence of fibrinolysin**.
- Within 4 to 7 days after menstruation, the loss of blood ceases & the endometrium become re-epithelialized.

## Leukorrhea during menstruation:

- During menstruation, leukocytes are released with the necrotic material & blood so the uterus is **highly resistant to infection** during menstruation as protective mechanism.



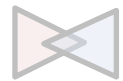


## Positive feedback effect of estrogen before ovulation – the pre-ovulatory LH surge:

- AP secretes increased amount of LH beginning 24 to 48 hrs before ovulation. FSH surge is much smaller in the pre-ovulatory than LH surge.

## The possible causes of LH secretion could be:

- estrogen has special **positive feedback effect** of stimulating pituitary secretion of LH & to a lesser extent FSH
- the granulosa cells of the follicle begin to secrete small increasing amount of progesterone about 1 day before ovulation which stimulate LH secretion



## Postovulatory secretion of the ovarian hormones, and depression of the pituitary gonadotropins:

- During the **postovulatory** phase (between ovulation & beginning of menstruation) the corpus luteum secrete **large quantities of both progesterone & estrogen & inhibin** which all together cause negative feedback effect on AP & hypothalamus **to inhibit both FSH & LH** secretion. (lowest level 3-4 days before the onset of menstruation)

## Follicular growth phase:

- 2 to 3 days before menstruation, the corpus luteum regresses & secretion of **estrogen, progesterone & inhibin decreases**.
- This decrease **removes the negative feedback** effect on AP hormones. Therefore a day after menstruation FSH secretion begins to increase (2 folds) while LH secretion is only slightly increased. These hormones causes growth of the follicle. During the first 11 to 12 days of this follicle growth the rate of secretion of FSH & LH decrease slightly because of the negative feedback effect of estrogen on the AP.

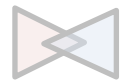
## Pre ovulatory surge of LH & FSH causes ovulation:

- About 12 days of the monthly cycle, the high secretion of FSH & LH start to increase due to high level of estrogens causes positive feedback on the anterior pituitary which leads to pre-ovulatory LH surge & FSH surge.

- At the age of 40 to 50 years, the sexual cycle becomes irregular, ovulation fails to occur & the cycle ceases.
- With advanced age the ovaries become unresponsive (decline in the number of primordial follicles) to gonadotropins, and their function declines so that sexual cycles disappear (menopause). The **ovaries no longer secrete estrogen and progesterone**. The uterus and vagina atrophy. Due to **removal of the negative feedback** effect there is **increased secretion of FSH and LH**.
- **Definition of menopause:** The period during which the cycle ceases & the female sex hormones diminish to almost none. When estrogens production falls below the critical value, estrogens no longer inhibit the production of gonadotropins FSH & LH. The production of FSH & LH after menopause in large amount.

## The loss of estrogens causes marked physiological changes in the function of the body including;

1	Hot flushes; characterized by extreme flushing of the skin	2	psychic sensations and dyspnea
3	Irritability.	4	fatigue.
5	anxiety	6	occasionally various psychotic states
7	decreased strength and calcification of bones throughout the body. Their bones can be fractured easily		



## Amenorrhea

Is absence of menstrual period either;

- Primary amenorrhea in which menstrual bleeding has never occurred.
- Secondary amenorrhea cessation of cycles in a woman with previously normal periods, causes:
  - **Pregnancy** (most common cause)
  - **Emotional stimuli** and changes in the environment.
  - Hypothalamic diseases ( $\downarrow$  GnRH pulses)
  - Pituitary disorders
  - Primary ovarian disorders and various systemic disease

## Menorrhagia

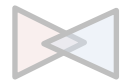
- Refer to abnormally profuse flow during regular periods.

## Hypomenorrhea

- Refer to scanty flow (small quantities).

## Dysmenorrhea

- Painful menstruation (cramps due to accumulation of prostaglandins in the uterus and **treatment with inhibitors of prostaglandin synthesis**).

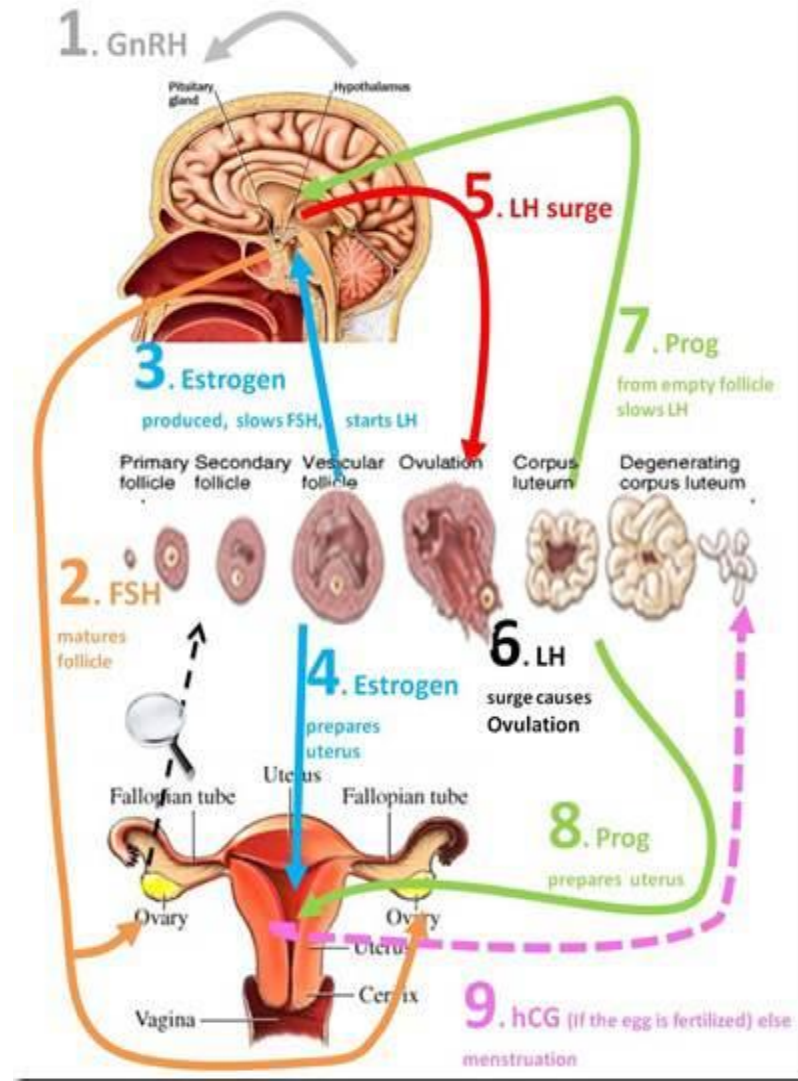
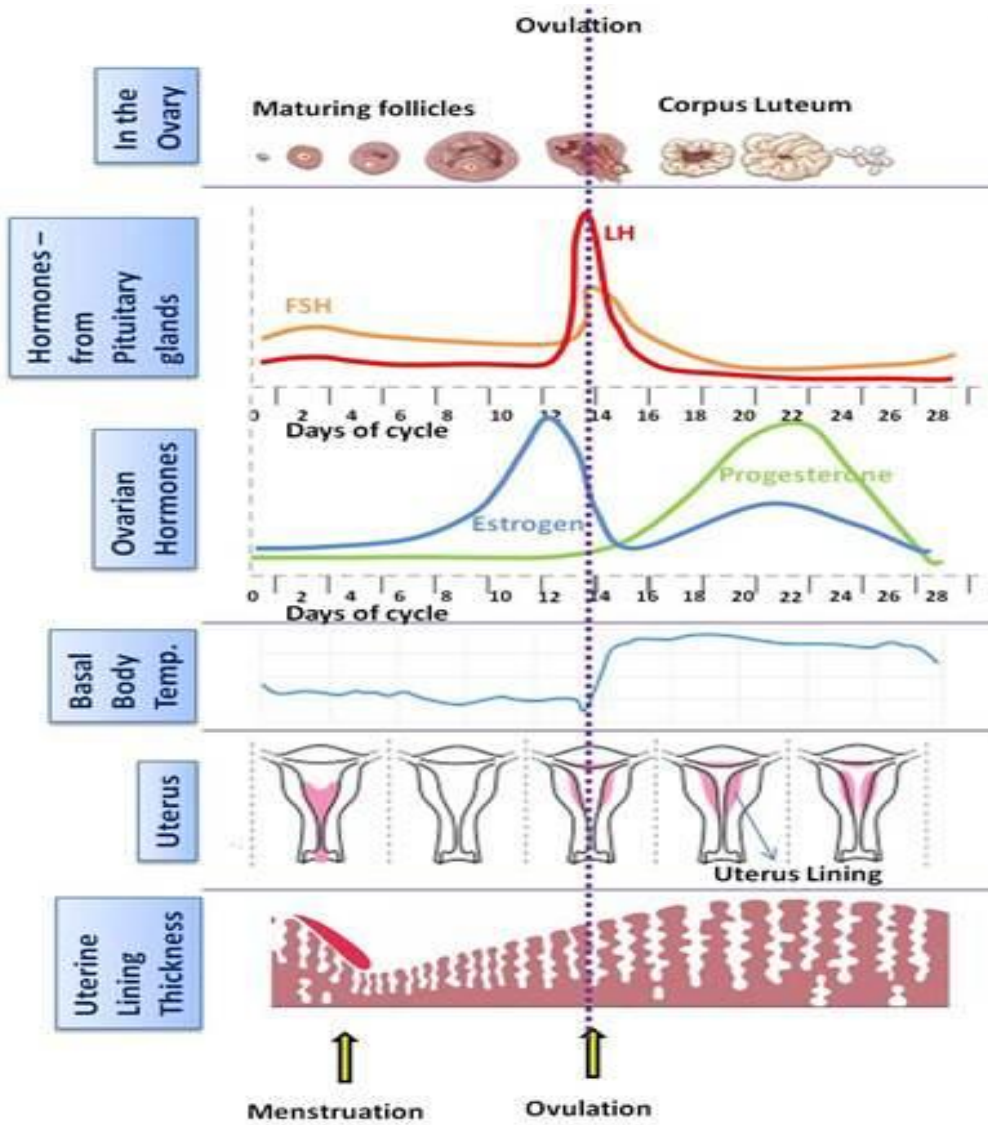


# SUMMARY



	Proliferative phase	Secretory phase	Menstruation
Time	<ul style="list-style-type: none"> <li>• Before ovulation</li> </ul>	<ul style="list-style-type: none"> <li>• After ovulation</li> </ul>	<ul style="list-style-type: none"> <li>• Before ovulation</li> </ul>
Hormones	<ul style="list-style-type: none"> <li>• High levels of estrogen</li> </ul>	<ul style="list-style-type: none"> <li>• High level of progesterone (dominant hormone)</li> <li>• Estrogen</li> </ul>	<ul style="list-style-type: none"> <li>• Low level of estrogen &amp; progesterone</li> </ul>
Changes	<ul style="list-style-type: none"> <li>• Re-epithlization</li> <li>• Increase in the endometrial thickening</li> </ul>	<ul style="list-style-type: none"> <li>• Swelling in the endometrium</li> <li>• The glands become tortuous</li> <li>• Lipid &amp; glycogen deposition</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease in stimulation the endometrium, therefore decrease in its thickening</li> <li>• Vasospasm and release of prostaglandin (vasoconstrictor)</li> </ul>

# SUMMARY



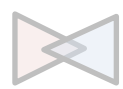
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# QUESTIONS

**1. What is the most common cause of 2ry Amenorrhea:**

- A) pregnancy
- B) Emotional
- C) Pituitary disorder
- D) Hypothalamic disease

**2. During menstruation, which one of the following is true:**

- A) High level of estrogen and low level of progesterone
- B) Low level of estrogen and high level of progesterone
- C) Low level of both estrogen & progesterone

**3. Regarding menopause, which one of the following physiological changes happens commonly**

- A) Hot flushes
- B) Psychosis
- C) Edema

**4. In which phase, the changing will prepare the endometrium for implantation:**

- A) Proliferative
- B) Secretary
- C) Menstruation

**5. What is the dominant hormone in secretary phase:**

- A) Estrogen
- B) Progesterone
- C) Inhibin

1	A
2	C
3	A
4	B
5	B

**THE END**

**IF THERE ARE ANY PROBLEMS OR  
SUGGESTIONS,  
FEEL FREE TO CONTACT US:**

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**THANK YOU**



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