

ENDOMETRIAL CYCLE

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- Also known as **MENSTRUAL CYCLE** or **UTERINE CYCLE**
- It refers to the cyclic changes occurring in the endometrium during active reproductive period (menarche to menopause) in females leading to recurrent monthly bleeding per vaginum (menstruation).
- These cyclic changes are under control of the endocrine system.
- It is necessary for reproduction
- Average length: 28 days (21 to 35 days)

- Menarche: beginning of the cycle of menstruation
typically occurs between ages 11 and 16 years (average
13 years)
occurrence depends on overall health and diet
- Menopause: the period during which the menstrual cycle ceases and
the female sex hormones diminish to almost none
occurs between age 45 and 55

PHASES OF ENDOMETRIAL CYCLE

- Menstrual phase: 1st – 6th day
- Proliferative phase: 7th – 14th day
- Secretory phase: 15th – 28th day

CYCLE	PRE-OVULATION		OVULATION	POST-OVULATION	
<i>Ovarian cycle</i>	<i>FOLLICULAR PHASE</i>			<i>LUTEAL PHASE</i>	
<i>Uterine cycle</i>	PERIOD	PROLIFERATIVE		SECRETORY	

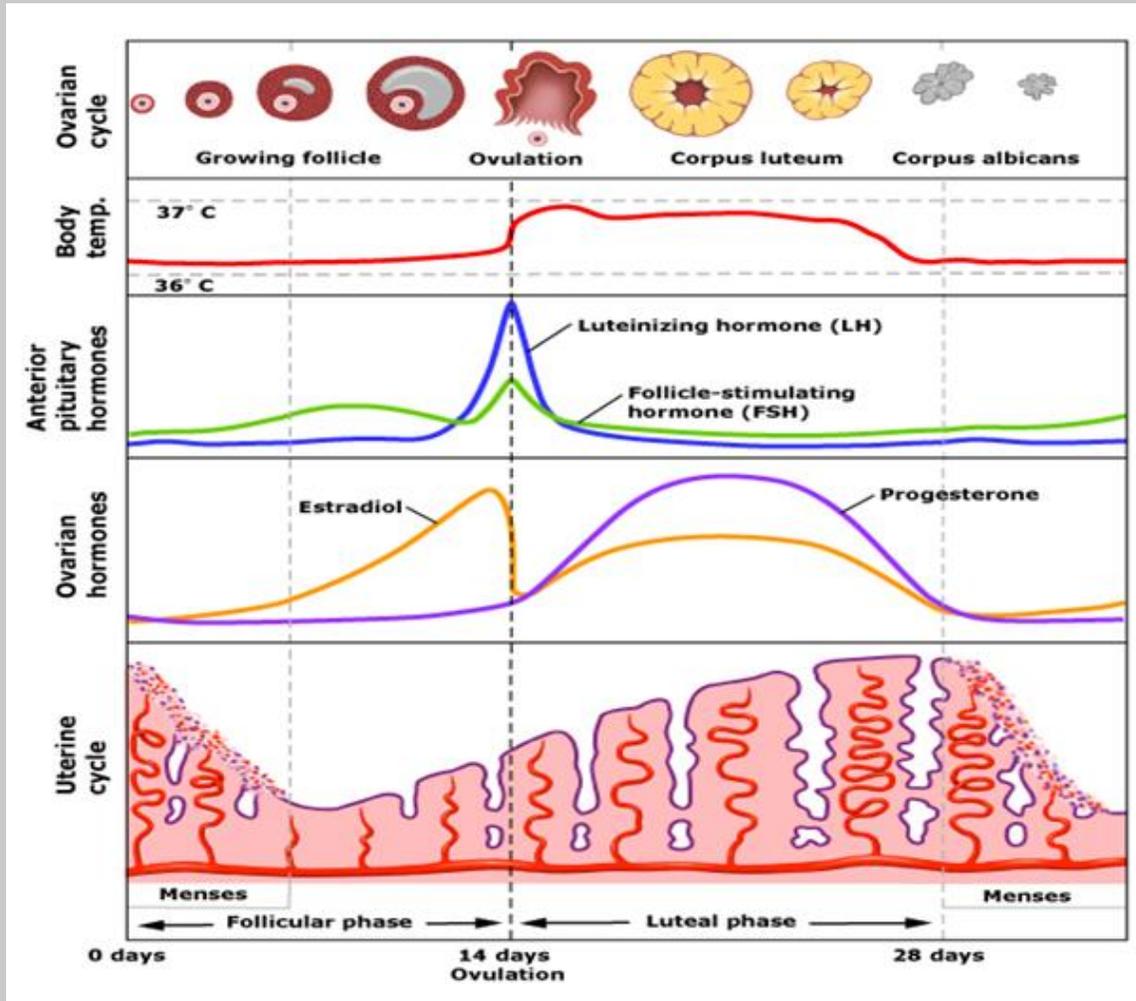
DAYS

1

6

14

28



PROLIFERATIVE PHASE

- After menstruation only a thin layer of endometrial stroma remains, and the epithelial cells left are those located in the deeper portions of the glands and crypts of endometrium.
- In the first part of the monthly ovarian cycle, ie. Follicular phase, **estrogens** (secreted by the granulosa cells and theca interna) causes increased mitotic activity in the glands and stroma.
- The endometrial surface is reepithelialized within 4 to 7 days after the beginning of menstruation.

Changes in endometrium during proliferative phase:

Hormone responsible: estrogens

- ✓ Thickness of endometrium, which is less than 1 mm at the end of menstrual phase, increases to 3 – 4 mm at the end of proliferative phase
- ✓ Angiogenesis in the stratum functionale leads to proliferation of blood vessels, which become spiral arterioles
- ✓ Endometrial glands are stimulated to grow. They contain glycogen but they are non-secretory

SECRETORY PHASE

- After ovulation, estrogen and progesterone both are secreted in large quantities by the corpus luteum
- Secretory phase of endometrial cycle coincides with the luteal phase of ovarian cycle
- Estrogen cause slight additional cellular proliferation in the endometrium during this phase
- Progesterone causes marked swelling and secretory development of the endometrium

Changes in endometrium during secretory phase:

Hormone responsible: estrogen and progesterone

- ✓ There is elongation and coiling of the endometrial mucous glands (corkscrew-shaped glands). These glands secrete thick viscous fluid containing glycogen
- ✓ Blood supply of endometrium further increases as progesterone promotes spiraling of blood vessels
- ✓ Thickness of endometrium increases to 5-6 mm at the end of this phase

Thus the thickened endometrium with large amounts of nutrients is ready to provide appropriate conditions for implantation of a fertilized ovum

MENSTRUAL PHASE

- If fertilization does not , the corpus luteum in the ovary involutes to form corpus albicans and on Day 26th of the endometrial cycle the levels of estrogens and progesterone fall suddenly, marking the end of secretory phase. Menstruation follows.

Sequence of events occurring during menstrual phase:

Menstruation is caused by reduction of estrogens and progesterone, especially progesterone, at the end of monthly ovarian cycle

- ✓ Intense spasm of spiral arteries, mediated via local production of leucotrienes and prostaglandins, leads to hypoxia and ischemia
- ✓ Ischemia leads to necrosis of stratum functionale of the endometrium and of the walls of the spiral arteries
- ✓ Blood vessels get opened up due to necrosis of their wall resulting in seepage of blood into the surrounding endometrial necrotic tissue
- ✓ Separation of necrotic tissue starts gradually from the underlying viable stratum basale and ultimately sloughed off. The necrosis and sloughing does not occur simultaneously in the whole uterus. Rather it occurs in patches and is completed in 3 – 5 days

- ❖ Endometrial debris contains sloughed off necrosed tissue, blood, serous fluid and a large amount of prostaglandins and fibrolyns
- ❖ The average blood loss during menstruation is 35 milliliters with 10–80 ml considered normal
- ❖ The menstrual fluid is normally nonclotting because of presence of fibrolyns along with the debris
- ❖ If excessive bleeding occurs, the quantity of fibrolyns may not be sufficient to prevent clotting
- ❖ Within 4 – 7 days after menstruation starts, the loss of blood ceases due to reepithelialization of the endometrium
- ❖ During menstrual phase, about two-thirds of the superficial endometrium is sloughed off and only a thin basal layer (1mm thick) is left behind

CYCLIC CHANGES IN CERVIX

- During menstrual phase, the mucosa of cervix is not shed off
- During proliferative phase, the secretions of mucosal cells of the endocervix become thin watery and alkaline. At the time of ovulation, the cervical mucus is thinnest and its elasticity is maximum. It can be stretched like a long, thin elastic thread up to 8 – 12 cm (spinbarkeit effect). The mucus also produces a fern-like pattern when spread on glass slide and allowed to dry (fern test).
- Fern test: presence of fern pattern of cervical mucus in the proliferative phase and its disappearance in the secretory phase is indicative of ovulatory cycle, whereas persistence of fern pattern throughout the cycle indicates anovulatory cycle
- The mucus strings actually align themselves along the length of the cervical canal, forming channels that help guide sperm in the proper direction from the vagina into the uterus

- During secretory phase, under the influence of progesterone, cervical secretions decrease in quantity and become thick, tenacious and cellular, and the fern pattern is lost. These changes make a plug and prevent entry of sperm through cervical canal

ABNORMALITIES OF MENSTRUATION

- Anovulatory cycles: menstrual cycles occur at normal intervals, but ovulation does not occur
- Amenorrhoea: absence of menstrual bleeding. It is of two types:
 - Primary amenorrhoea: menstrual bleeding has never occurred. it occurs due to failure of sexual maturation
 - Secondary amenorrhoea: cessation of menstrual cycles in a woman who previously had normal and regular cycles. Pregnancy is the most common cause.
- Hypomenorrhoea: scanty menstrual bleeding
- Oligomenorrhoea: infrequent and reduced frequency of menstruation

- Menorrhagia: abnormally profuse bleeding during normal regular cycles
- Metrorrhagia: occurrence of uterine bleeding in between the periods
- Dysmenorrhoea: painful menstruation
- Pre-menstrual syndrome: about 7 – 10 days before menstruation some women experience symptoms like irritability, lack of concentration, depression, heaviness, headache and constipation which is called pre-menstrual syndrome

Assignment

Name:

Roll No.:

Attempt all questions

1. At which stage in the endometrial cycle does the secretory phase occur?
 - a) days 1 – 5
 - b) days 5 – 14
 - c) days 14 – 28
 - d) days 4 – 10

2. At which point in the menstrual cycle is a woman most fertile?
- a) days 1 – 5
 - b) days 9 – 14
 - c) days 17 – 21
 - d) days 22 -28
3. Which of the following statement is true about menstruation?
- a) in a normal 28 day menstrual cycle you would expect menstruation to last approximately 6 – 8 days
 - b) during menstruation the entire endometrium is shed
 - c) only stratum functionale is shed
 - d) absence of menstruation also indicates an active pregnancy

4. Which of the following are effects of increased levels of oestrogen in the follicular phase of the menstrual cycle?

- a) thinning of hair
- b) thinning of endometrium
- c) thinning of cervical mucus
- d) thickening of cervical mucus

5. Which hormone is responsible for producing symptoms of premenstrual syndrome?

- a) estrogen
- b) progesterone
- c) FSH
- d) LH

6. Some women feel pain in the abdomen or pelvis during ovulation when an ovum is released from the ovary. This usually happens midway between menstrual cycles. The medical term for this is:

- a) menarche
- b) metrorrhagia
- c) mittelschmerz
- d) menopause

7. During the menstrual cycle, progesterone levels are at their highest during the:

- a) proliferative phase
- b) ovulation
- c) secretory phase
- d) menstrual phase

8. The term for painful menstruation is:

- a) oligomenorrhoea
- b) polymenorrhoea
- c) dysmenorrhoea
- d) menorrhagia

9. Which of the following is not a cause of secondary amenorrhoea?

- a) delayed puberty
- b) hyperprolactinemia
- c) polycystic ovary syndrome
- d) premature menopause

10. Which hormone causes the regrowth of the endometrial lining of the uterus?

a) FSH

b) LH

c) estrogen

d) progesterone