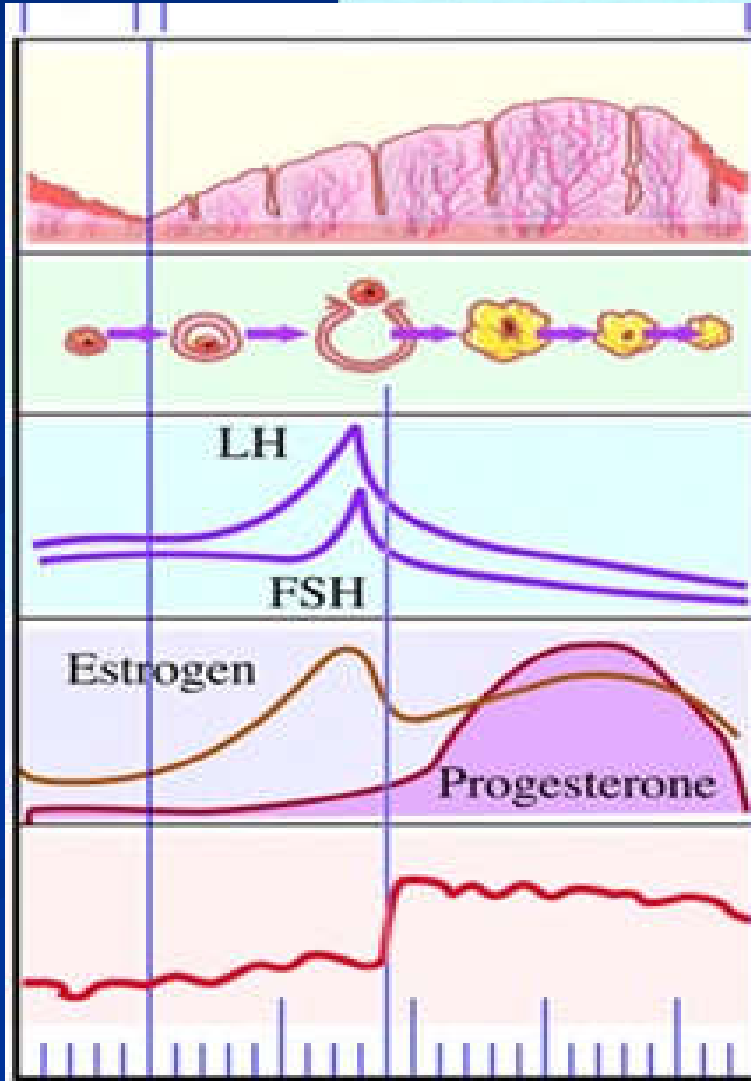


Physiology of Menstruation



Learning objectives:

By the end of this lecture the students should be able to:

- **Define menstruation.**
- **List the Characters of normal menstruation**
- **Enumerate Components of normal menstrual cycle.**
- **Describe each of these components.**

Menstruation:

- It is the **cyclic, visible, predictable** bleeding caused by endometrial shedding.
- It occurs **in the childbearing period** (between menarche & menopause).

Characters of normal menstruation:

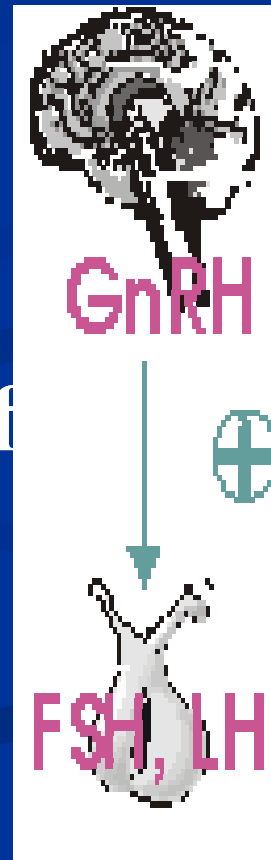
- **Menarche** :10-16 yrs.
- **Duration of the period:** 3-7 (5) days.
- **Length of the cycle:** 3-5 (4) weeks
- **Amount** : 30-80 ml.
- **Menstrual blood:** doesn't coagulate.
- **May be preceded by menstrual molimina**

Components of normal menstruation:

- **hypothalamo-hypophyseal axis.**
- **Ovarian Cycle.**
- **Endometrial cycle**
- **Cervical cycle**
- **Vaginal cycle**
- **Breast cycle.**

The hypothalamo-hypophyseal axis:

- **The hypothalamus secretes:**
 1. **GnRH in pulsatile manner (every 60-90 min).**
- **GnRH stimulates the production of FSH and LH from the anterior pituitary.**



Ovarian Cycle:

Follicular phase:

- **Recruitment:** starts 4-5 days before menstruation, as **cohort of follicles**; caused by the relative high level of FSH.
- **Selection & dominance:** the **leading follicle** is selected within the 1st 7 days of the cycle; with atresia of the others; due to gradually **increasing estrogen** level with gradually **decreasing FSH** with **different sensitivities** of the follicles to this low level of FSH with **low threshold in the dominant follicle** than the atretic ones.

Ovarian Cycle (cont.):

Follicular phase (cont):

- **Growth & development of the dominant Follicle:** from the 7th day till ovulation under the **effect of FSH** with production of **rising estrogen**.

Ovarian Cycle (cont.):

Ovulatory phase: caused by estrogen-provoked LH surge which causes:

- **1st meiotic division.**

- **Follicular rupture & extrusion:** caused by

1. **Enzymatic: ↑ plasmin.**

2. **Prostaglandins.**

3. **↑ antral pressure.**

4. **Ovarian contractility**

- **Luteinization.**

Ovarian Cycle (cont.):

- **Luteal phase:** from ovulation till either **nidation** or **menstruation**:
 - 14±2 days.
 - Corpus luteum formation with production of estrogen and progesterone which produce:
 1. ↑ Basal body temp.
 2. Secretory end.
 3. Cervical mucus changes.
 4. -ve feedback: → ↓ FSH & LH

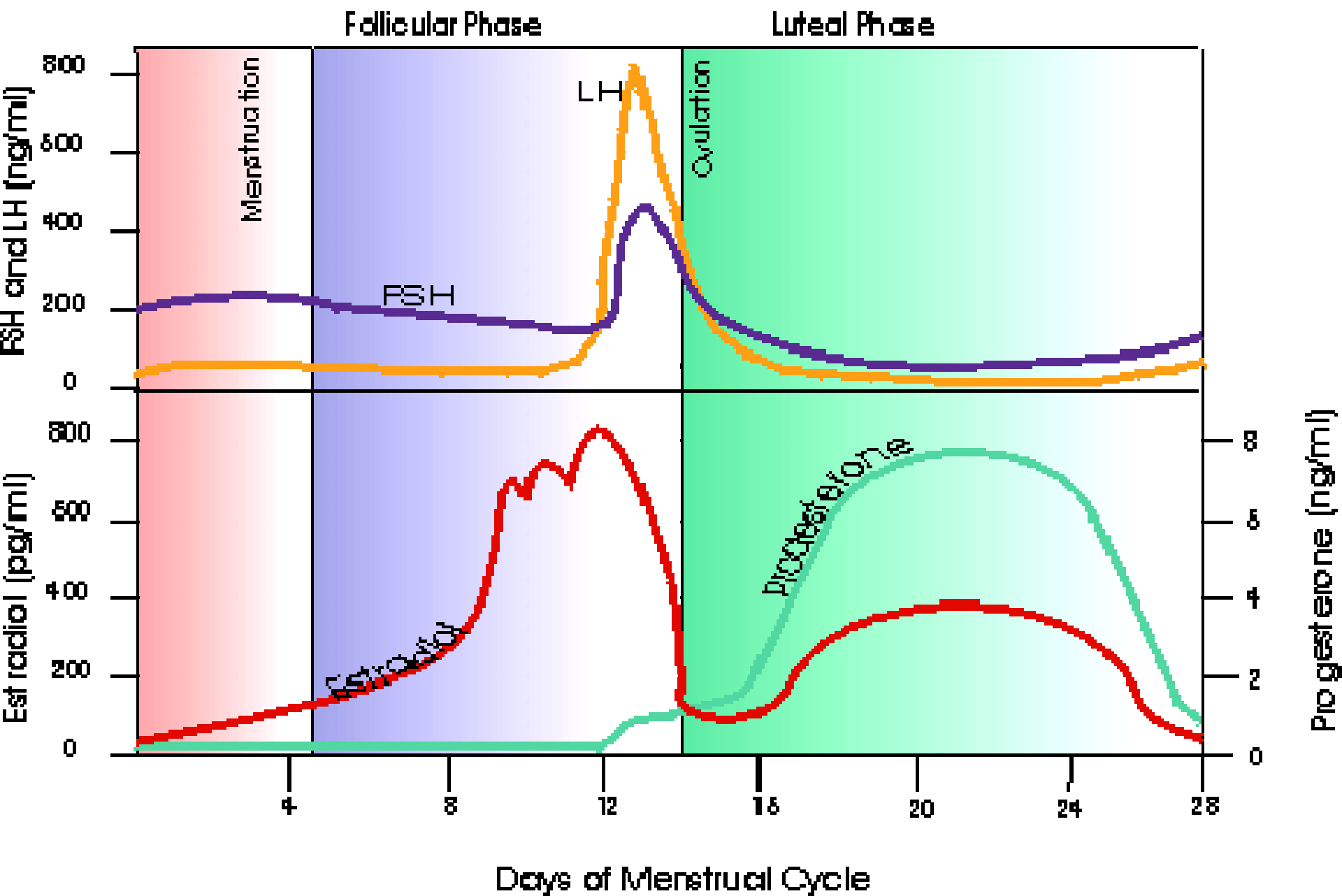
Ovarian Cycle (cont.):

■ Luteal phase (cont):

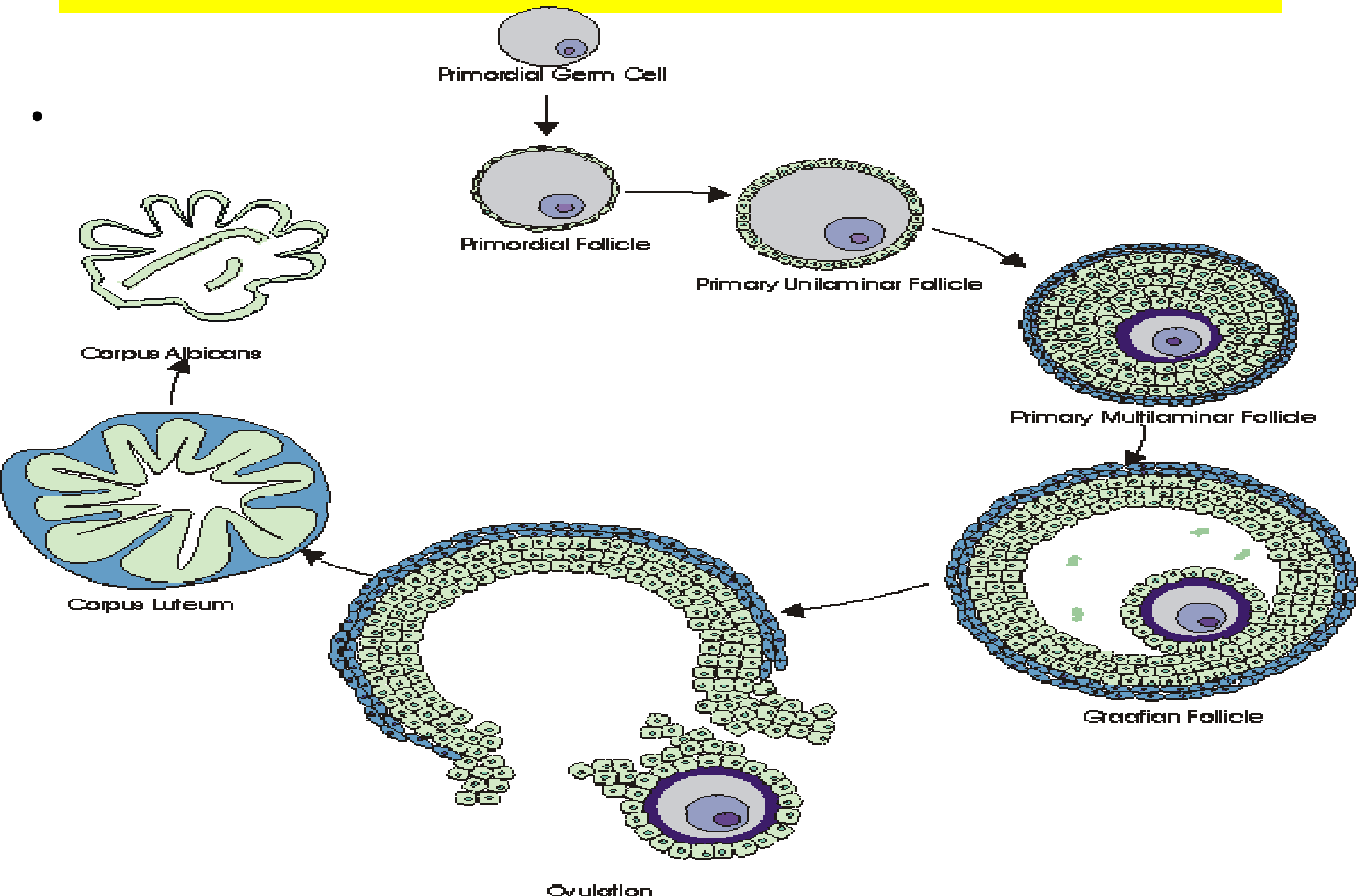
■ Fate of CL:

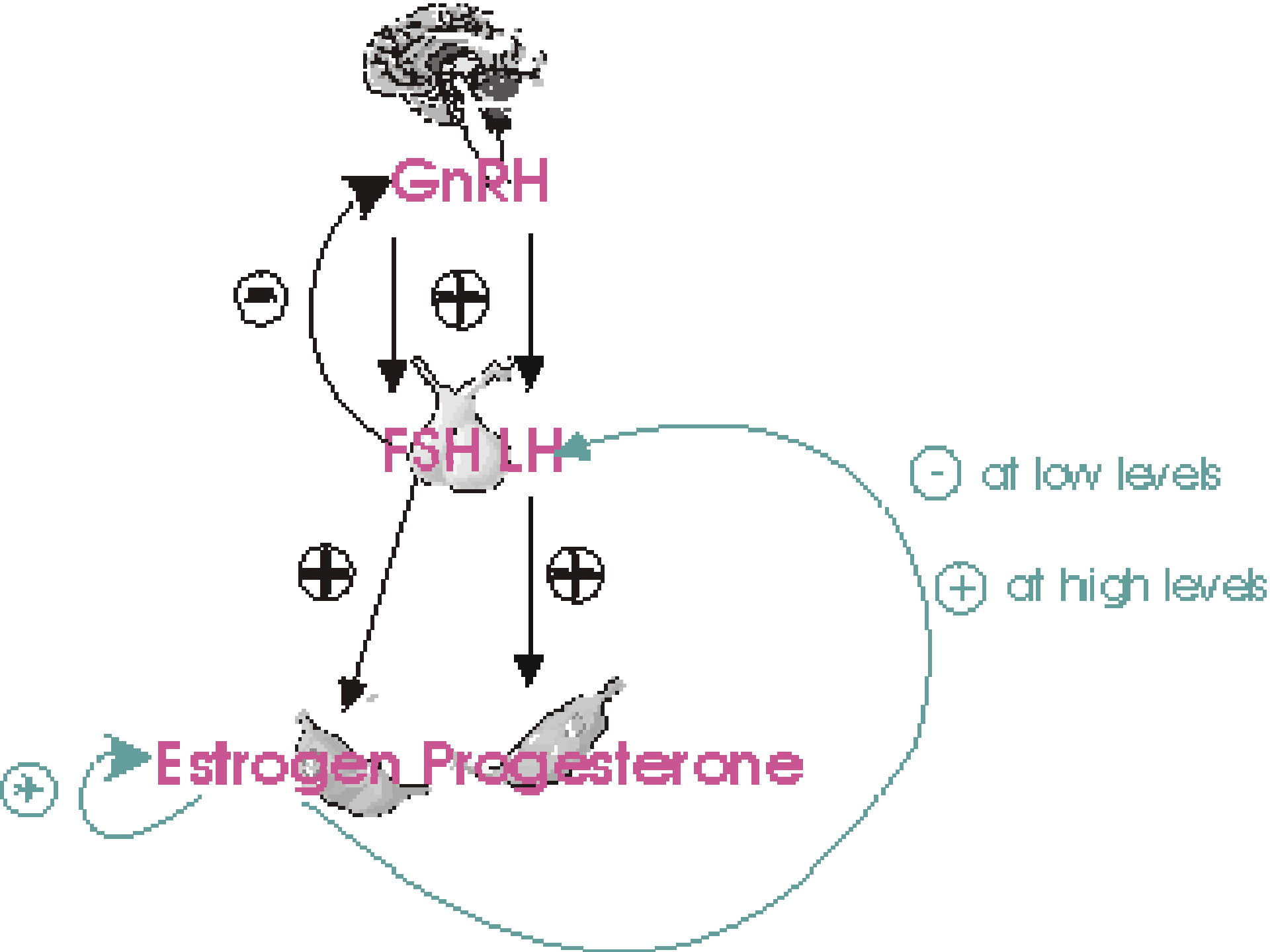
1. **Nidation** : hCG appears by the 9th day post ovulatory & **maintains CL**
2. **No nidation** : the corpus luteum **degenerates** by the 10th day post ovulatory → **corpus albicans** with ↓ estrogen and progesterone levels →:
 - separation of the endometrium and menstruation.
 - Premenstrual ↑FSH → new follicular recruitment

Approximate Concentrations of Pituitary and Ovarian Hormones During Menstrual Cycle



Ovarian Cycle:





Endometrial cycle:

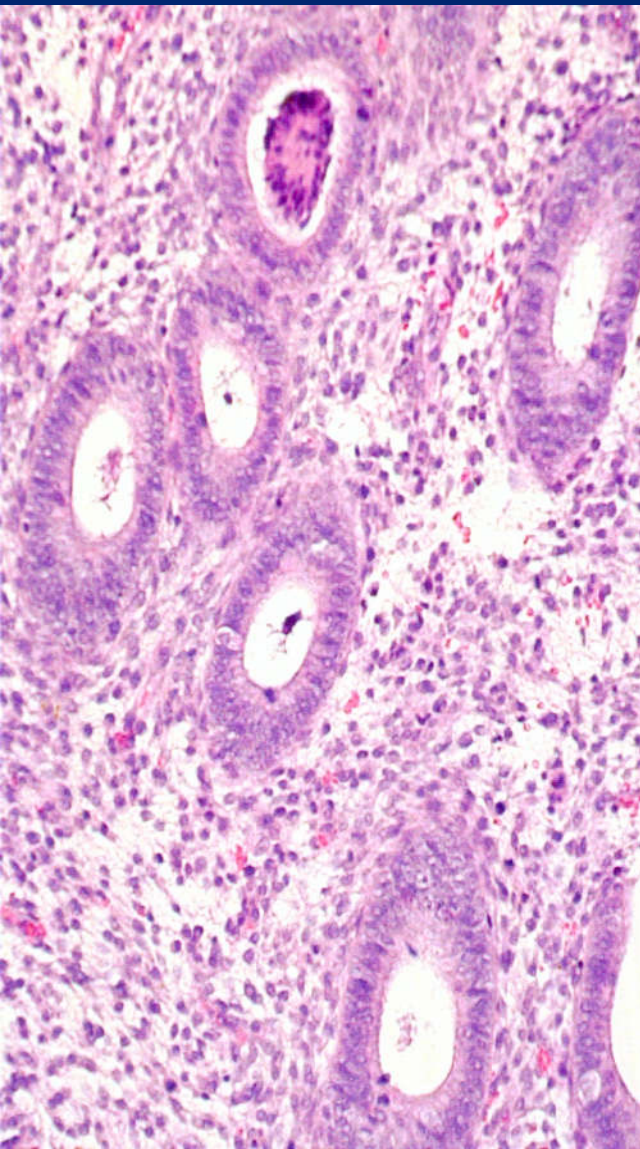
- Menstrual phase:
 - 3-7 (5) days, the time of bleeding.
- Proliferative phase:
 - 9-10 days.
 - **Microscopically;** Characterized by
 1. **Endometrial thickness** 3-4 mm
 2. **Glands** starting to ↑ in number and length.
 3. **Stromal cell** starting to ↑ in size.
 4. **Vascularity** increases.

Endometrial cycle:

- Secretory phase:
 - 14±2 days.
 - **Microscopically;** Characterized by:
 1. **Endometrial thickness:** 6-8 mm.
 2. **Glands:** continue to grow, become tortuous
 3. **Stromal cell:** ↑ in size, forming 3 layers: **superficial** compact layer, **middle** spongy layer and **deep** compact layer.
 4. **Vascularity:** ↑ forming 2 types: **basal** arterioles , **spiral** arterioles.

Endometrial cycle:

Proliferative phase



Secretory phase

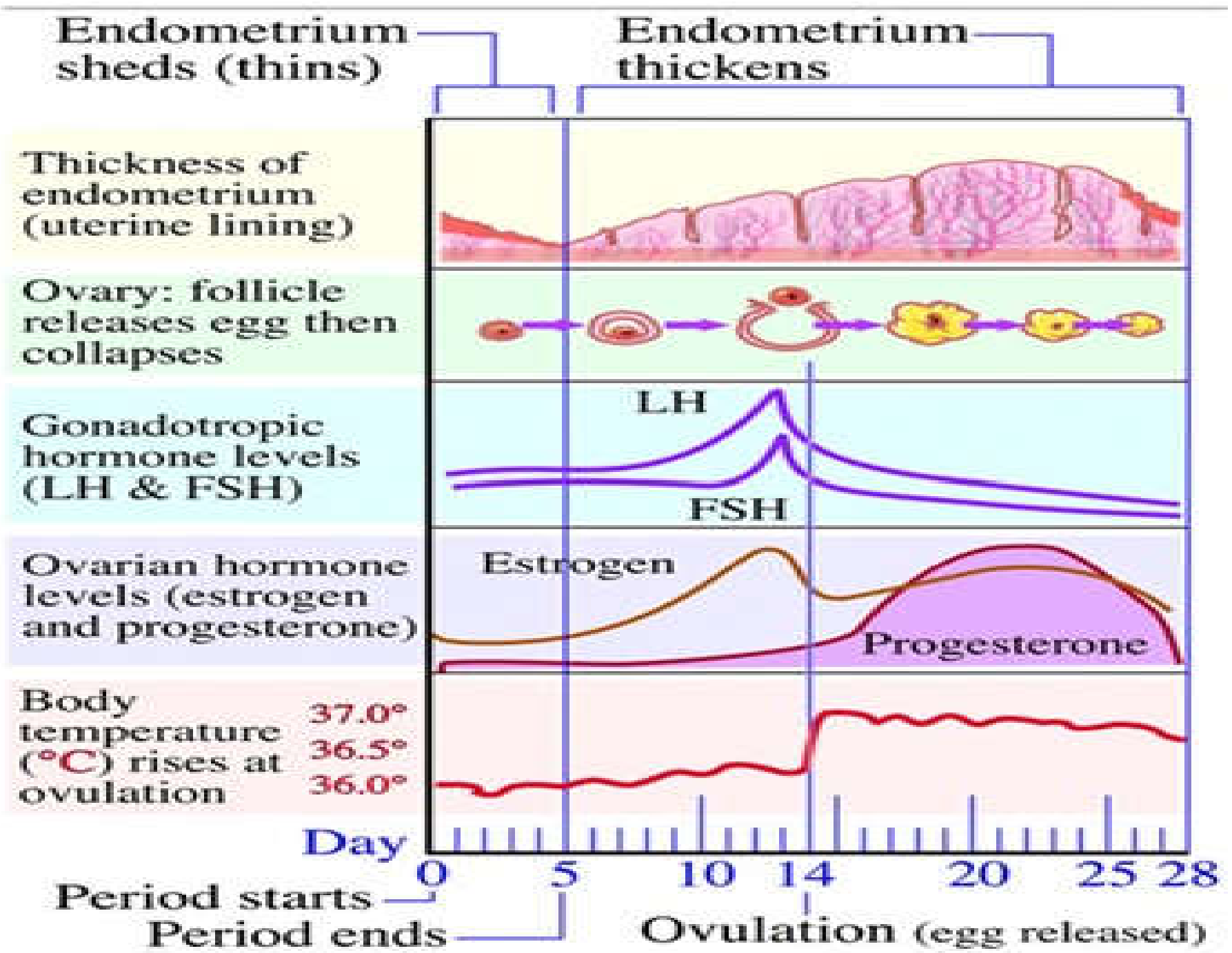


Menstrual phase



Mechanism of menstruation :

- Corpus luteum degenerates leads to drop in estrogen and progesterone.
- Leads to edema and shrinkage of the endometrium, ↑ coiling of spiral arterioles , ischemia & necrosis of superficial and middle layers of endometrium.
- Necrotic area separate leading to bleeding.
- Basal layer not involved because it is supplied by basal arterioles.



Cervical Cycle:



Day 3

Day 6

Day 14

Day 22

- still
menstruating

- firm,
- closed os
- no cervical
fluid

- soft,
- opened os,
- stretchy CF
like egg
white,
probably
about to
ovulate

- firmer
-closed os,
-viscid
mucus

Vaginal cycle

	1 st half	2 nd half
•Epithelium	cornified	proliferated
•Smears	Cornified cells	leukocytes infiltration
•Discharges	watery	thick mucus

Breast cycle

	Estrogen	Progesterone
Histologically	proliferation of mammary ducts	growth of lobules and alveoli
Clinically	Nearly free	breast swelling, tenderness and pain 10 days preceding menstruation