



REPRODUCTION SYSTEM MODULE

SESSION :2, LECTURE: 2

DURATION: 1hr

THE MENSTRUAL CYCLE

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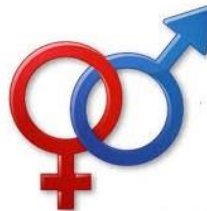
Dr Nesreen Muhsin Jar alla



Guyton, A.C., Human Physiology and Mechanisms of Disease, 13th Edition,
W.B. Saunders, 2016, ISBN: 978-1-4557-7005-2.



For more discussion, questions or cases need help please post to the session group



Menstrual cycle

(L07)

Follicular Phase

- Stimulates the development of a follicle in the ovary.
- Uterus is prepared for sperm transport and implantation of the conceptus.

Pre-Ovulation

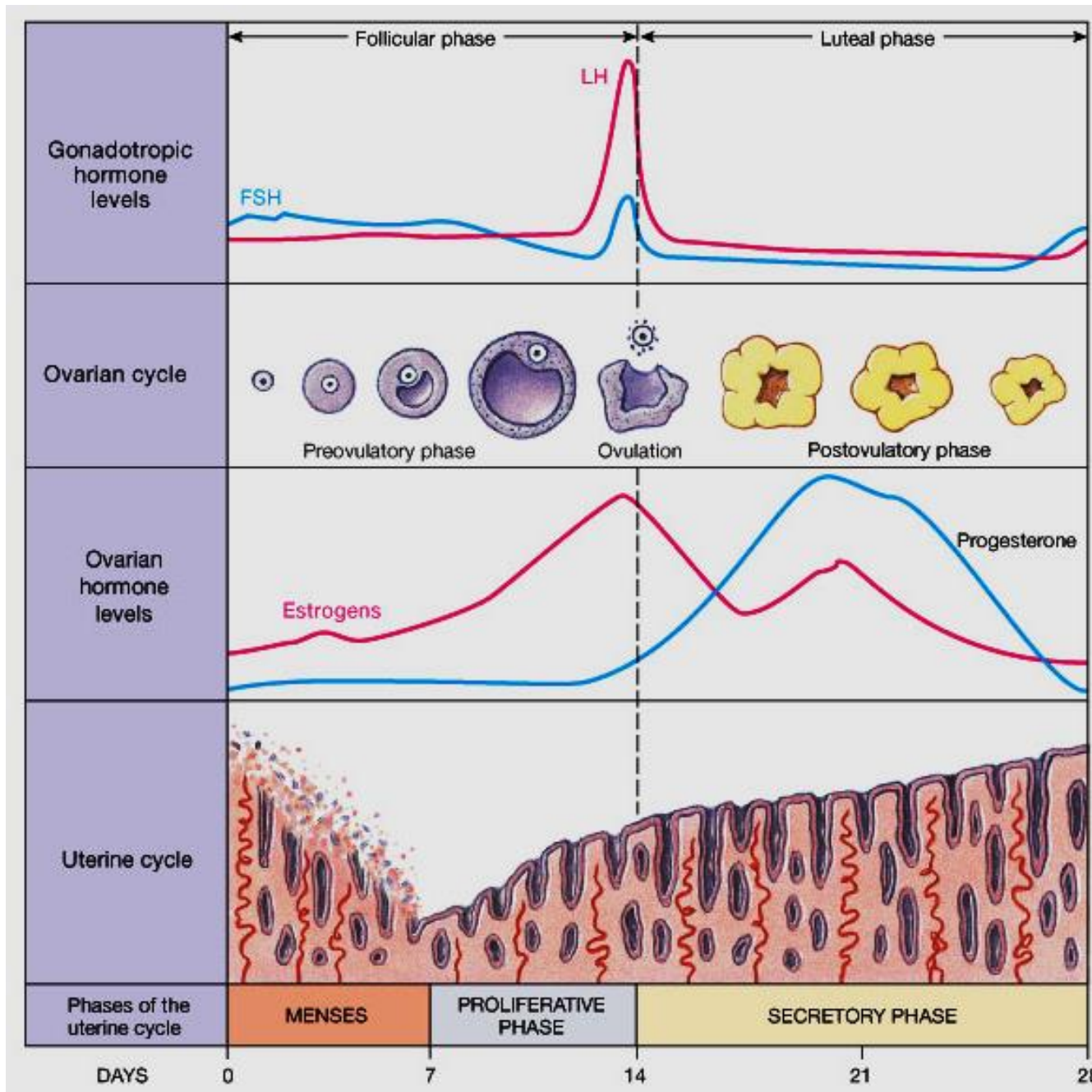
- LH Surge causes ovulation (on day 14th).
- Short period of fertility.
- Corpus luteum forms due to high of LH.

Luteal Phase

- LH maintains corpus luteum in the ovary, it secretes estrogen and progesterone.

If egg is not fertilized, corpus luteum starts to degenerate (low LH)





OVARIAN CYCLE

THE MENSTRUAL CYCLE

LOW ESTROGEN AT THE END OF MENSES



FOLLICULAR PHASE



SMACK!



OVULATION!

PROGESTERONE



LUTEAL PHASE

CORPUS LUTEUM



CORPUS ALBICANS



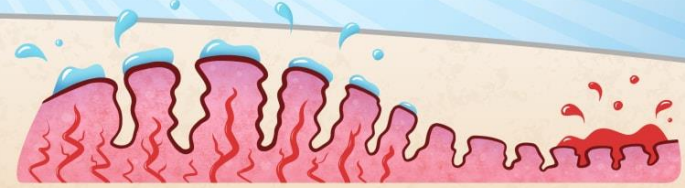
MENSES



UTERINE CYCLE



PROLIFERATIVE PHASE: INFLUENCED BY ESTROGEN, THE THICKNESS OF THE ENDOMETRIUM RAPIDLY INCREASES



SECRETORY PHASE: INFLUENCED BY PROGESTERONE, THE LINING BECOMES HIGHLY VASCULAR AND EDEMATOUS

Changes occurring in the ovary during the ovarian cycle and the changes in the endometrium (LO6)

1- Follicular phase (steadily ↑ titres of oestrogen)

- **Fallopian Tube**
↑ Secretion, motility, cilia
- **Myometrium**
↑ Growth, motility
- **Endometrium**
↑ Thickness, glandular invaginations
Secrete a watery fluid, conductive to sperm
- **↑ Cervical Mucus**
Thin, alkaline, conductive to sperm
- **Vaginal Epithelium**
↑ Mitosis
- **Stimulate mildly anabolic metabolic changes**
- **Effects on CVS**



2- Luteal phase

Actions of progesterone on oestrogen primed cells

- **Fallopian Tube**

↓ Motility, secretion, cilia

- **Myometrium**

Further thickening, ↓ motility

- **Endometrium**

Further thickening, ↑ secretion

Development of spiral arteries

- **Cervical Mucus**

Thickening & acidification → inhibits sperm transport

- **Mildly Catabolic**

- **Elevates basal body temperature**

- **Electrolyte changes**

Change in Na^+ and H_2O excretion

Progesterone & oestrogen → net Na^+ and H_2O retention



At the end of the cycle, sudden drop in progesterone and oestrogen levels lead to

- The elaborate secretory epithelium of the endometrium collapses.
- Apoptotic cell death.
- Dead tissue shed as menstrual bleed.
- Spiral arteries contract to reduce bleeding.



Pattern of gonadotrophins and gonadal steroids secretion over the normal menstrual cycle

Beginning of cycle

- Oestrogen, progesterone, inhibin levels are low.
- GnRH secretion is released from inhibition.
- LH and FSH rise, FSH more as low inhibin levels release FSH from selective inhibition at the pituitary.

FSH, followed by LH causes follicles to grow

- Oestrogen and inhibin secretion rises.
- FSH secretion is selective inhibited by inhibin at the pituitary.
- Rising oestrogen leads to stimulation of GnRH and hence LH secretion.



12–14 days into the cycle

- Positive feedback of rising oestrogen stimulates a LH surge
Precise timing may be influenced by environmental factors
- LH surge produces ovulation
- Oestrogen levels fall dramatically
- Corpus luteum forms

After ovulation

- LH promotes oestrogen and progesterone secretion from corpus luteum.
- As corpus luteum grows, more steroids are secreted
- Rising oestrogen does not positively feedback on LH because progesterone levels are also rising.



14 days after ovulation

- In the absence of pregnancy the corpus luteum regresses spontaneously.

Progesterone and oestrogen levels fall.

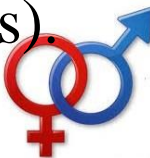
- Triggering a menstrual bleed.
- Relieves inhibition on GnRH, FSH and LH, triggering the development of new follicles and the beginning of a new cycle.

If conception has occurred

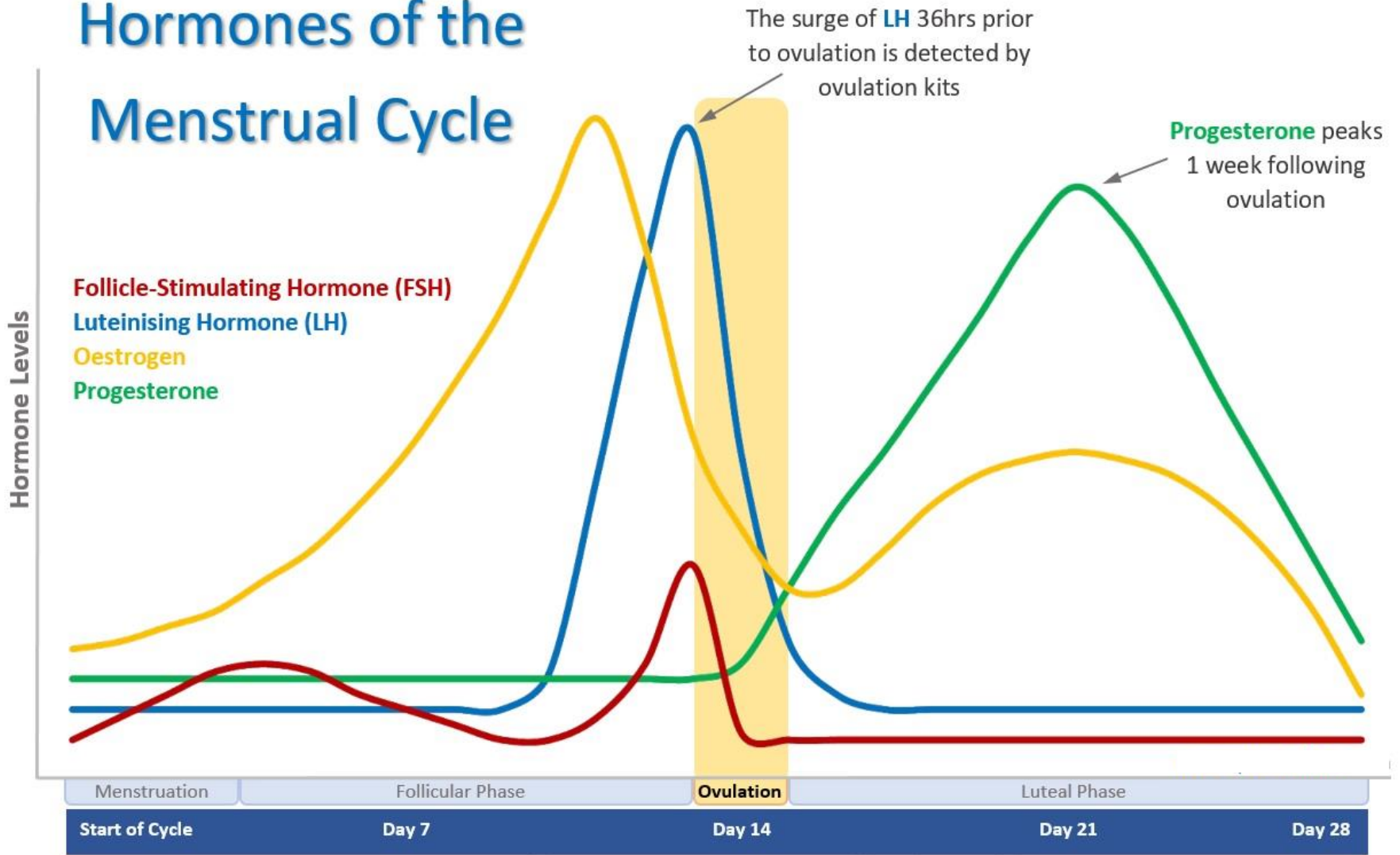
- The implanted embryo develops a placenta, which secretes **human chorionic gonadotrophin (hCG)**.

hCG prevents the regression of the corpus luteum

- Continues to secrete oestrogen and progesterone.
- Supports early weeks of pregnancy (until about 12-14 weeks).
- Maintains suppression of the ovarian cycle.



Hormones of the Menstrual Cycle

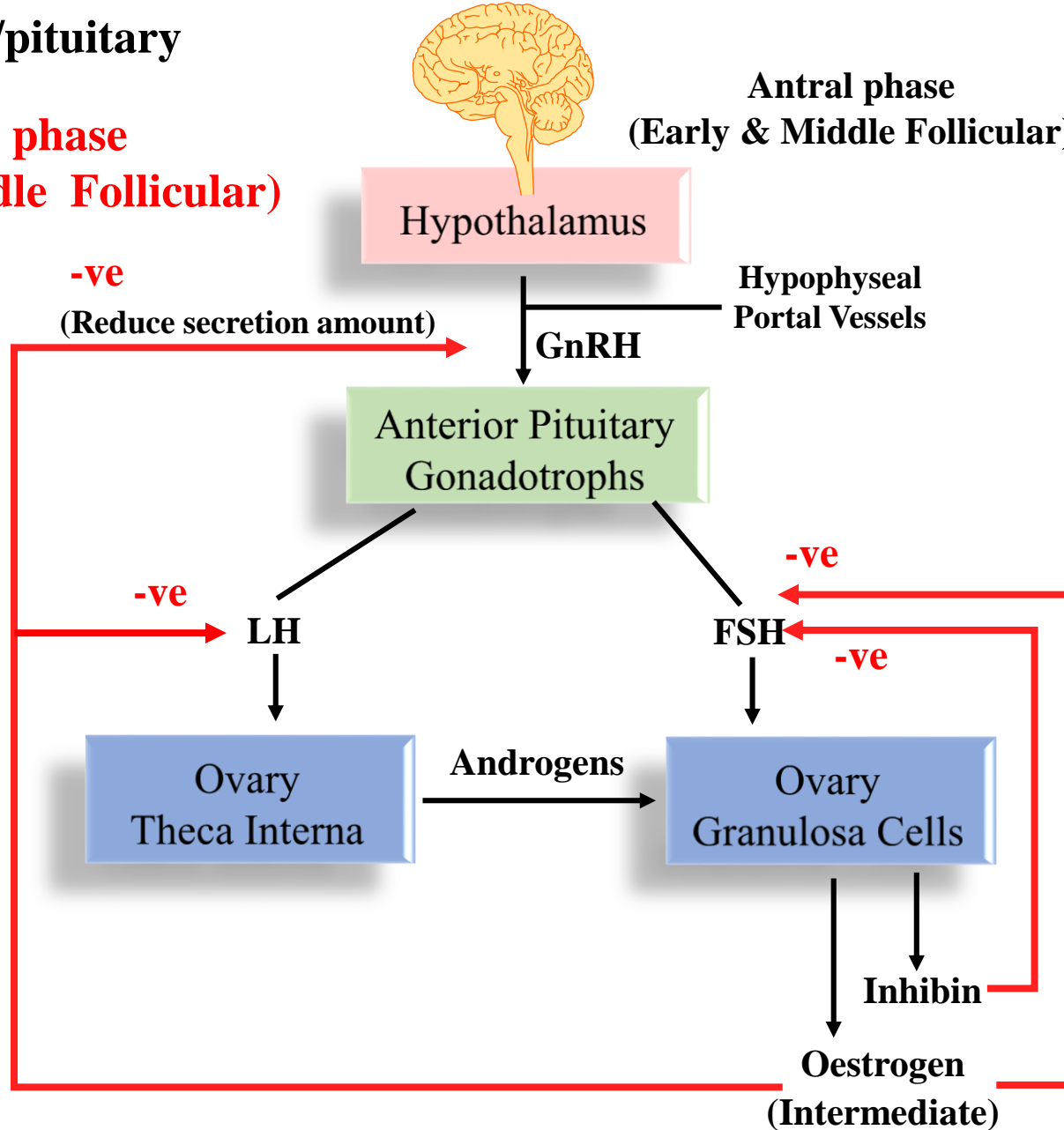


Hypothalamic and pituitary mechanisms underlying cyclical gonadotrophin secretion and the interactions between the ovaries and hypothalamus/pituitary

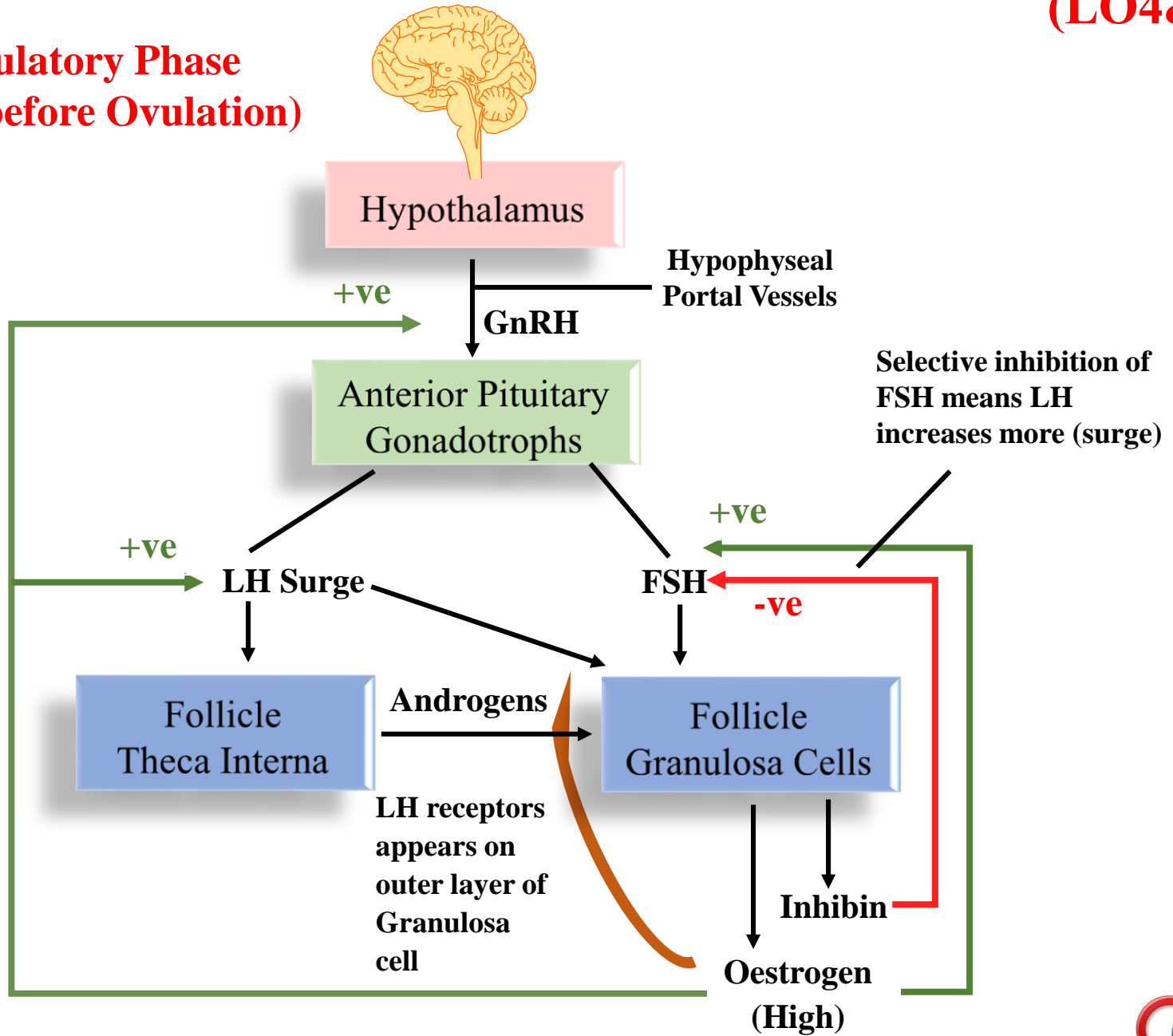
(LO4&9)

**Antral phase
(Early & Middle Follicular)**

**Antral phase
(Early & Middle Follicular)**



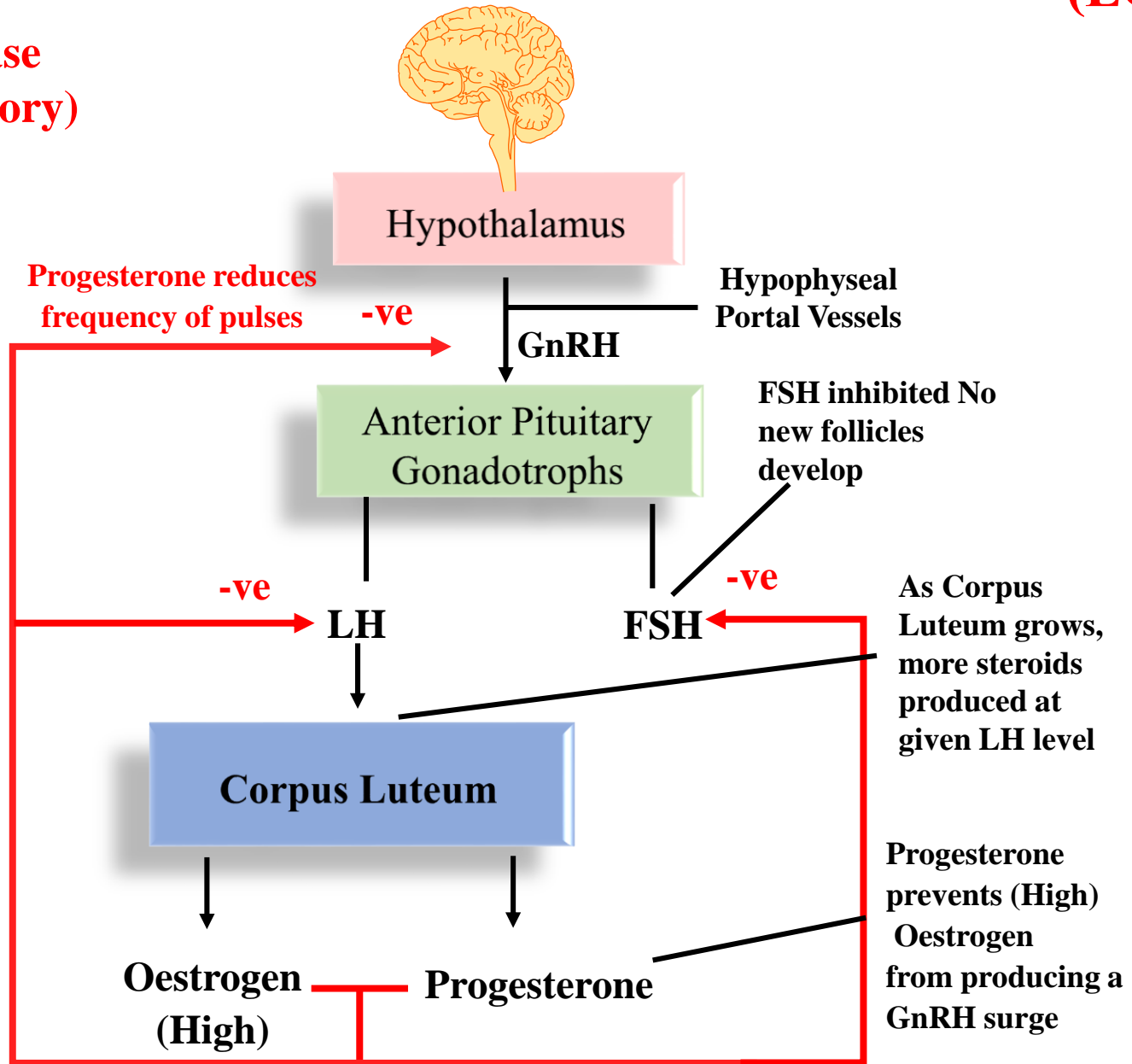
Pre-Ovulatory Phase (37 hours before Ovulation)



(Follicle has grown, producing more)



Luteal phase (Post Ovulatory)



Actions of Oestrogen in the non-pregnant women

(LO10)

1- Cyclical effects (thickening of endometrium, thin alkaline cervical secretions)

2- The oestrogen effects on the mucosal lining of the fallopian

3- Vaginal changes (the ovaries, fallopian tubes, uterus, and vagina all ↑ several times in size)

4- Oestrogen causes the skin to develop a texture that is soft and usually smooth

5- Oestrogen ↑ body metabolism & fat deposition

6- Calcium metabolism: faster calcification of bone vs. in males, Ca^{2+} deposits directly in bone



Actions of Progesterone in the non pregnant women

1-

Progesterone promotes secretory changes in the uterine endometrium

2-

It also promotes ↑ secretion by the mucosal lining of the fallopian tubes

3-

It promotes development of the lobules and alveoli of the breasts



Thank you

