



THE MENSTRUAL CYCLE

FLAME LECTURE: 213

STELLER 9.17.15

Learning Objectives



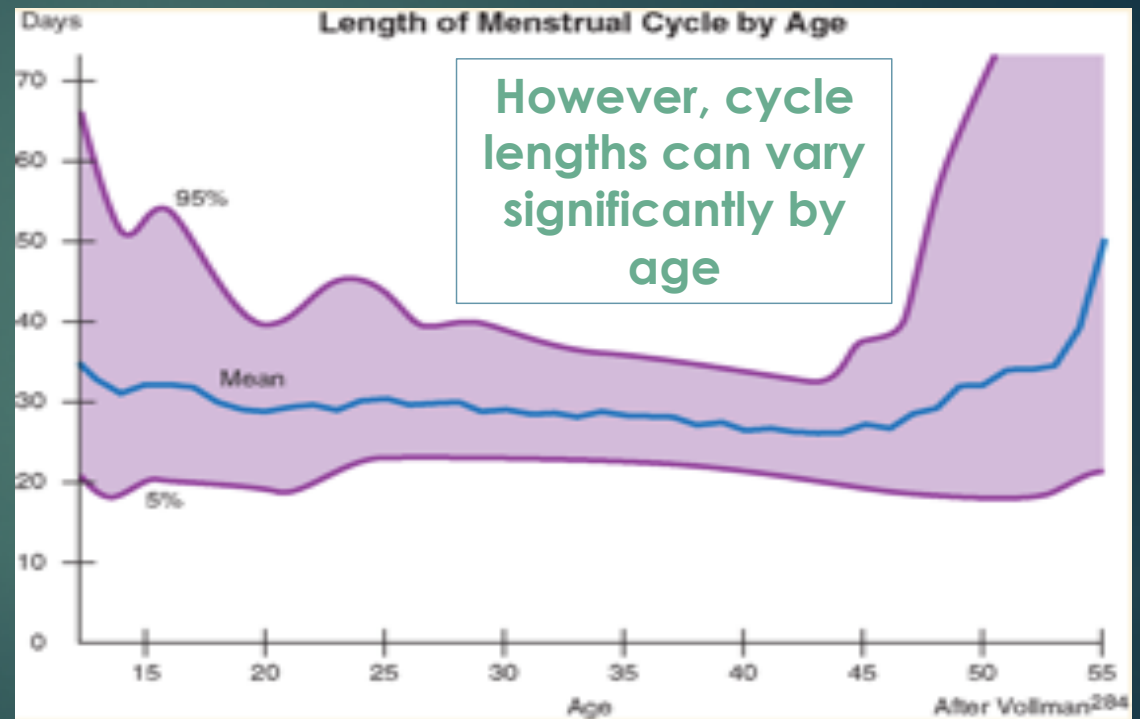
- ▶ To define the normal menstrual cycle and describe its endocrinology and physiology
- ▶ Prerequisites:
 - ▶ NONE
- ▶ See also – for closely related topics
 - ▶ FLAME LECTURE 213B: Ovulation
 - ▶ FLAME LECTURE 214: Evaluation of AUB

THE MENSTRUAL CYCLE - OVERVIEW

- ▶ The hormonally-regulated cycle that governs the anatomical changes in the ovary and uterus that are required for ovulation and support of an early pregnancy
- ▶ Should a pregnancy not result during the current cycle, the secondary role for the menstrual cycle is to facilitate preparation for a subsequent cycle the following month (including shedding of the endometrial lining, which is the main physical manifestation of menses)

NORMAL CYCLE LENGTH

- ▶ While we typically use 28 days as an avg **cycle length**, only 15% of women actually have a 28-day cycle
- ▶ However, 95% of women's cycles fall between **24-35 days** and 99% of cycles fall between 21-35 days



THE MENSTRUAL CYCLE - DETAILS



- ▶ Mean **duration** of menses is 5 days (range: 2-5 days)
- ▶ Mean **volume** of menses is 35ml/cycle (range: 10-80 ml)
- ▶ Normal **composition** ranges from brown discharge to dark and bright red bleeding with endometrial debris. Blood clots are noted frequently, but not considered normal

THE MENSTRUAL CYCLE - ENDOCRINE

- ▶ The menstrual cycle is directed by a complex interplay of positive and negative feedback loops between the *hypothalamus, anterior pituitary, and ovaries* termed the *HPO AXIS*
- ▶ These hormonal changes govern TWO concomitant anatomical cycles occurring in the ovaries and uterus which each have THREE phases

2 CYCLES X 3 PHASES

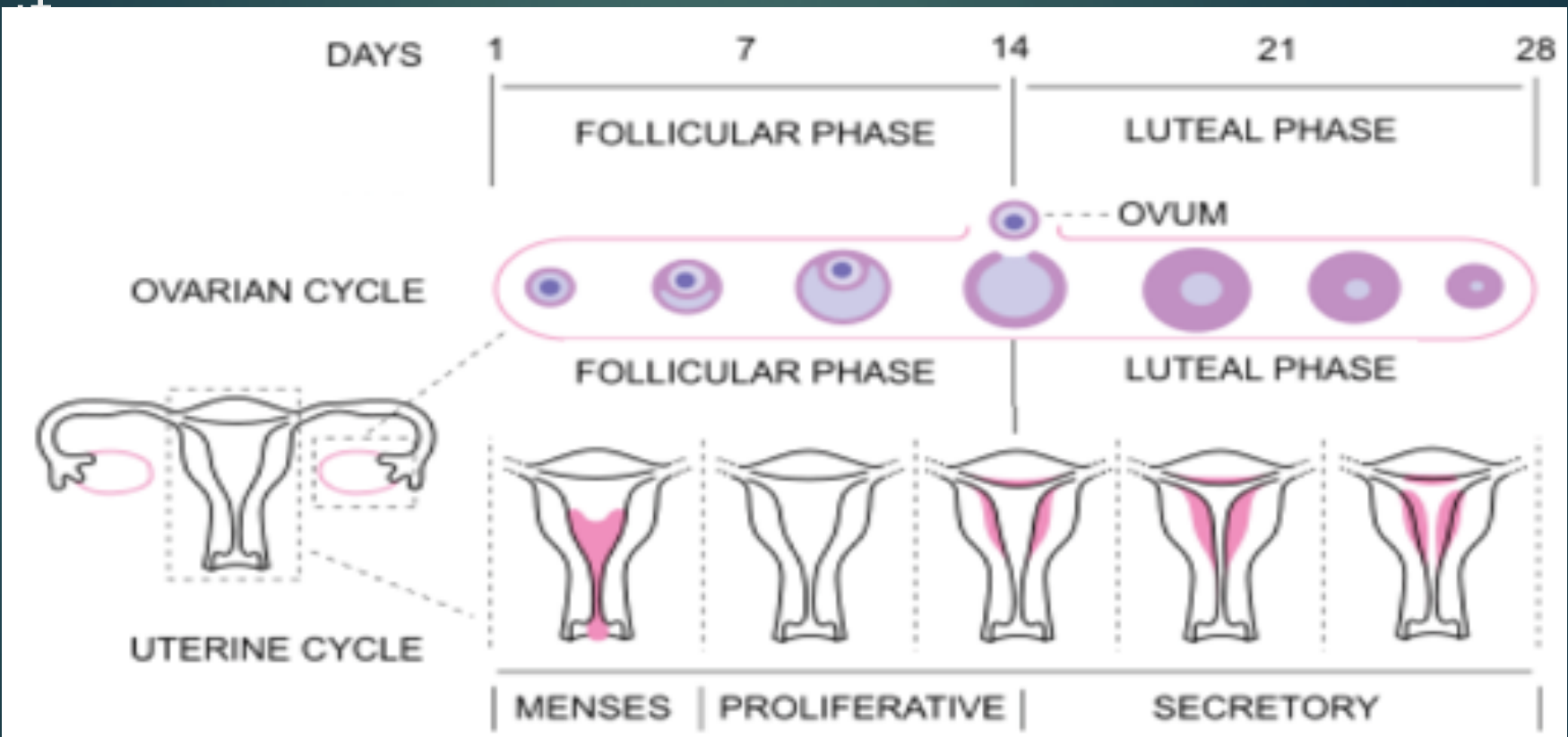
▶ OVARIAN

- ▶ **FOLLICULAR PHASE** – Follicle maturation over the 1ST ~10-14 days
- ▶ **OVULATION** – Ovum expelled from follicle
- ▶ **LUTEAL PHASE** – Corpus luteum is formed from the remains of the follicle to provide hormonal support for the early pregnancy OR will involute if there is no pregnancy

▶ UTERINE

- ▶ **MENSES** – Shedding of the endometrial lining
- ▶ **PROLIFERATIVE PHASE** – Endometrial lining builds up to allow implantation of a pregnancy
- ▶ **SECRETORY PHASES** – Endometrium breaks down if there is no pregnancy

2C X 3P – Another way of looking at it



HPO AXIS (SIMPLISTIC)

HYPOTHALAMUS – PULSITILE
RELEASE OF GNRH

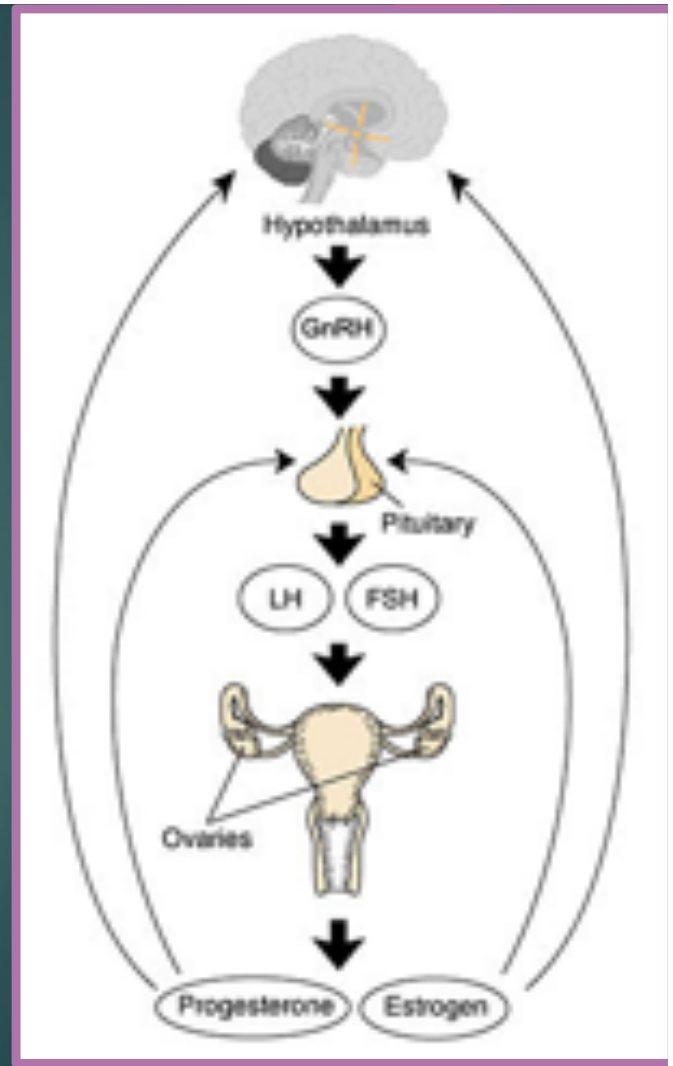


ANTERIOR PITUITARY –
SECRETES LH & FSH



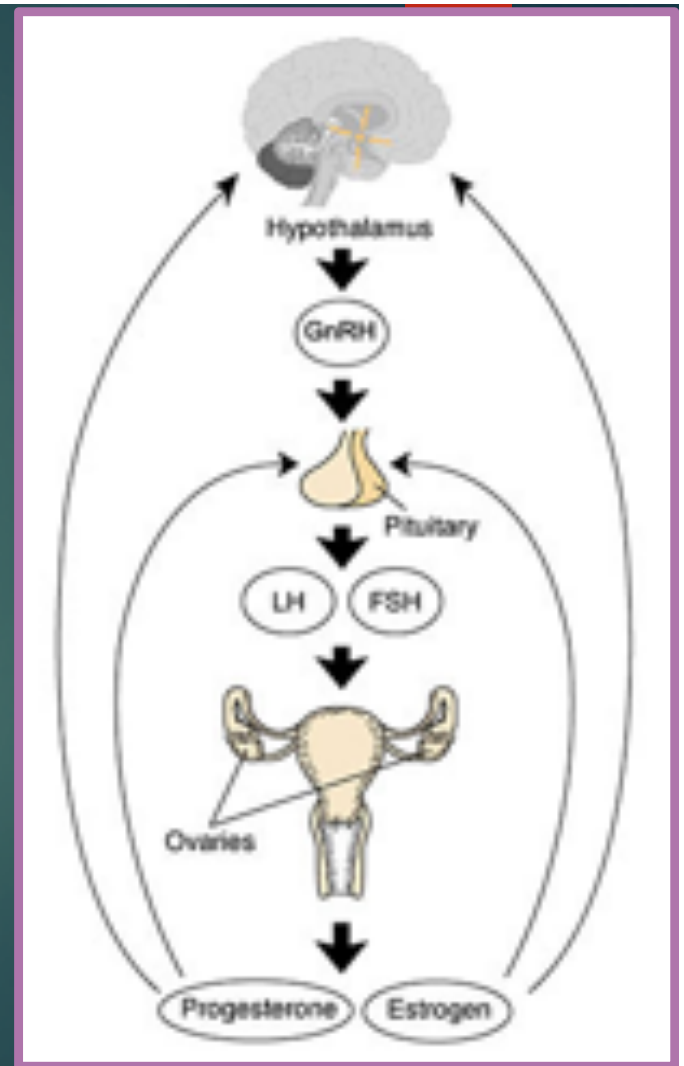
OVARY – SECRETES ESTROGEN,
PROGESTERONE, & INHIBIN

FEEDBACK



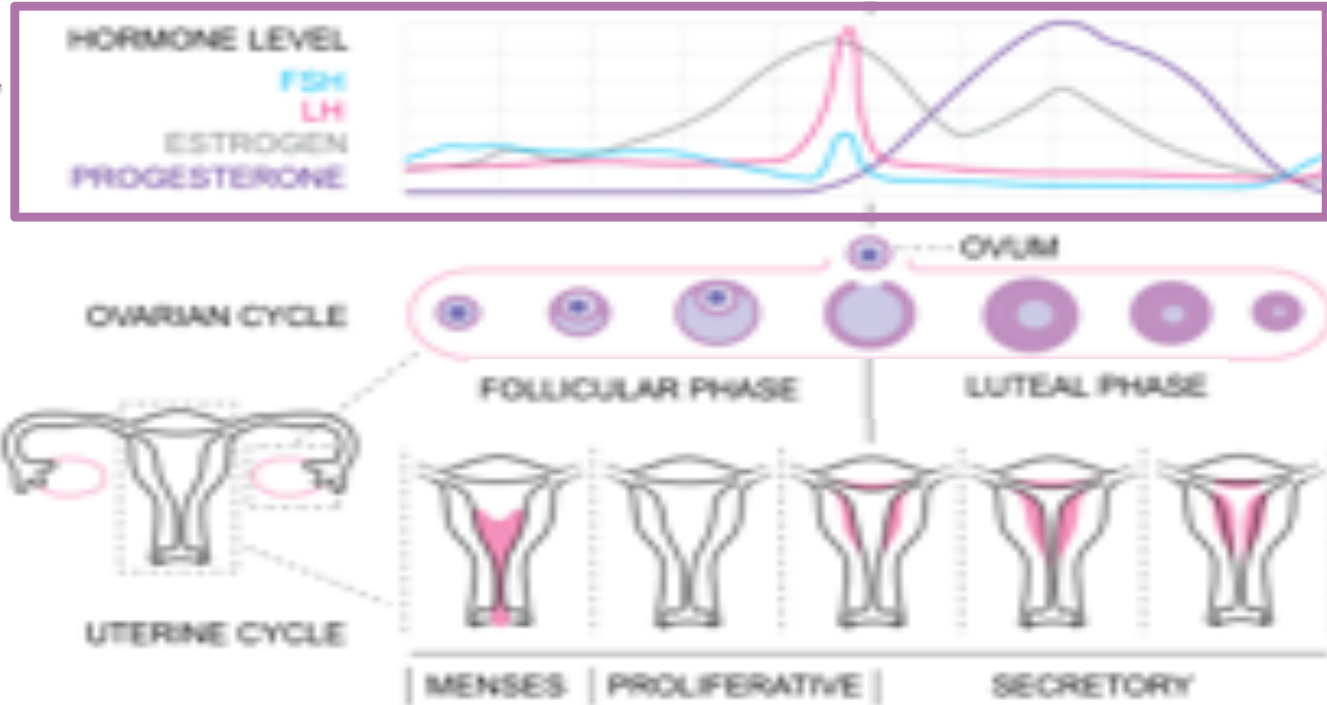
HPO ('Less' simplistic)

1. FSH is the fuel that drives the race of follicle maturation
2. As the follicles (with eggs inside) grow, they create egg-xhaust = estradiol (E2)
3. This increase in E2 drives endometrial growth and starts to suppress FSH
4. The follicle which is MOST sensitive to FSH, will grow the best and win the race; the rest die
5. Having a super high E2 for > 50 hours causes the LH surge which triggers ovulation and expulsion of the egg from the follicle
6. The follicle that secreted the egg then turns into corpus luteum and secretes progesterone
7. If no pregnancy, E2/progesterone fall, the endometrium sheds, and FSH (no longer suppressed) again starts the next race



DAYS 1 7 14 21 28

Below you can see graphically, the timing of secretion of each of these hormones in relation to the phase occurring in the uterus and ovary!



IMPORTANT LINKS / REFERENCES

- ▶ Fritz MA, Speroff L. Gynecologic Endocrinology and Infertility. 8th Edition. ISBN-13: 978-0781779685
- ▶ Images from Speroff and Magann EF. Obstet Gynecol. 2000