

Menstrual Cycle Review

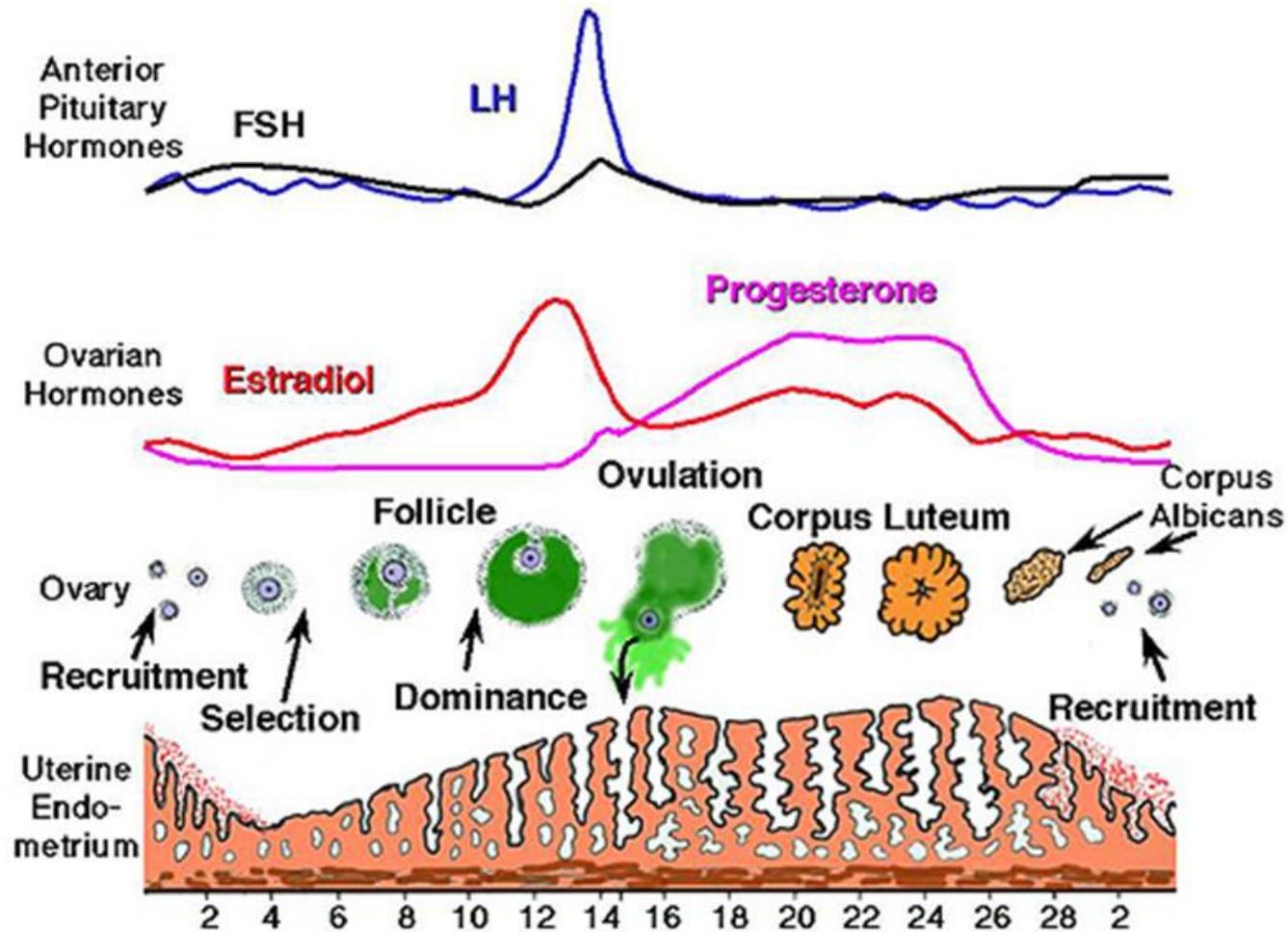
Reminder:

Independent Review Repro A & P

Sexual Maturity

- Puberty- transition b/w childhood & sexual maturity
 - Hormones develop into cyclic pattern ~1y before menarche (~13 years, some sources now say 12 years)
- Menarche- first menstruation
 - Initially irregular, unpredictable, painless and anovulatory
 - After ~1 year develop rhythm and mature ova
- Menstruation- periodic uterine bleeding
 - 14 days after ovulation; average cycle 28 days
 - Average blood loss 20 - 80 ml

A complex yet simple process...



4 components
of the
Menstrual
Cycle:

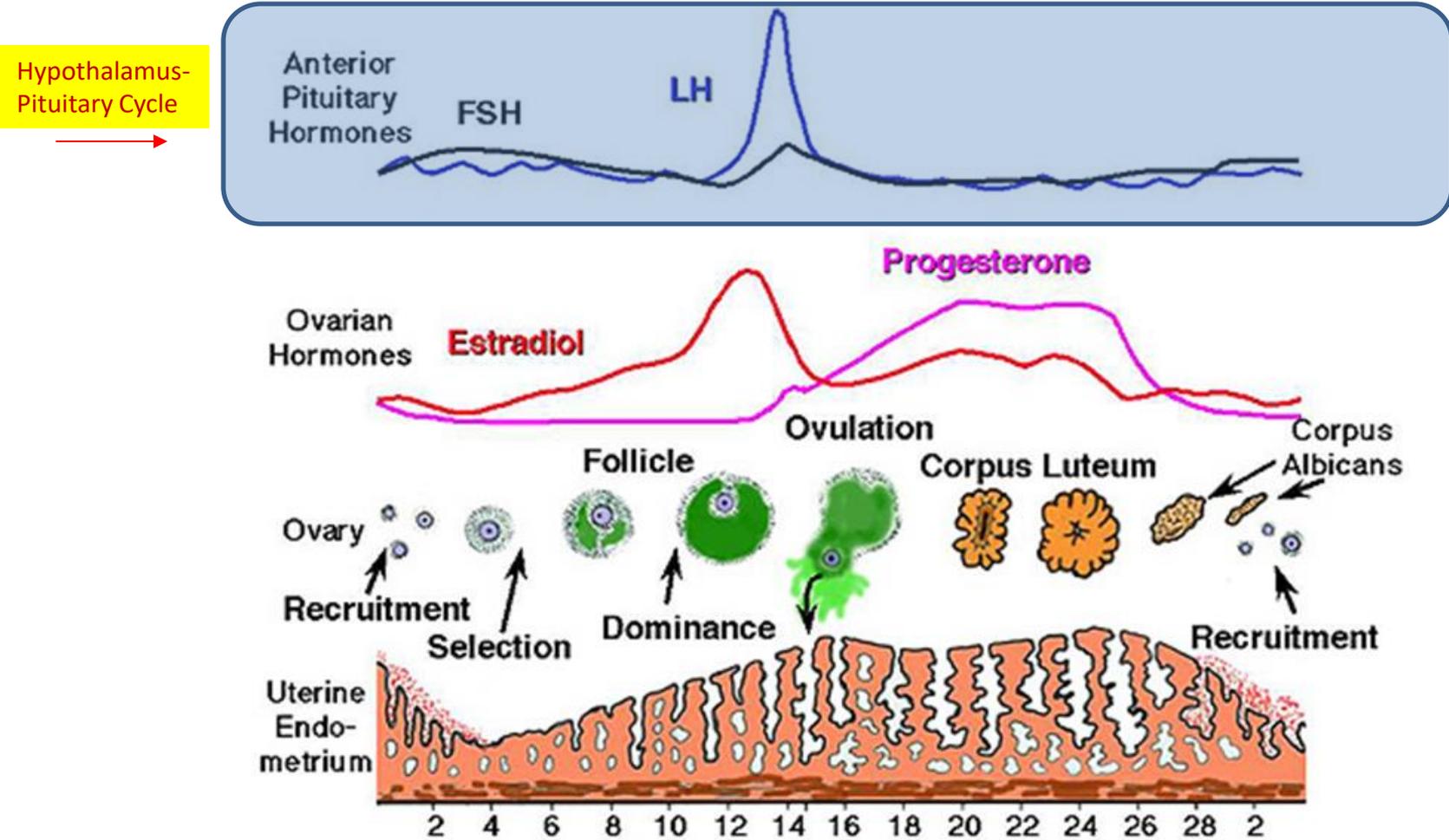
Hypothalamus- Pituitary Cycle

Ovarian Hormones

Ovarian Cycle

Endometrial Cycle

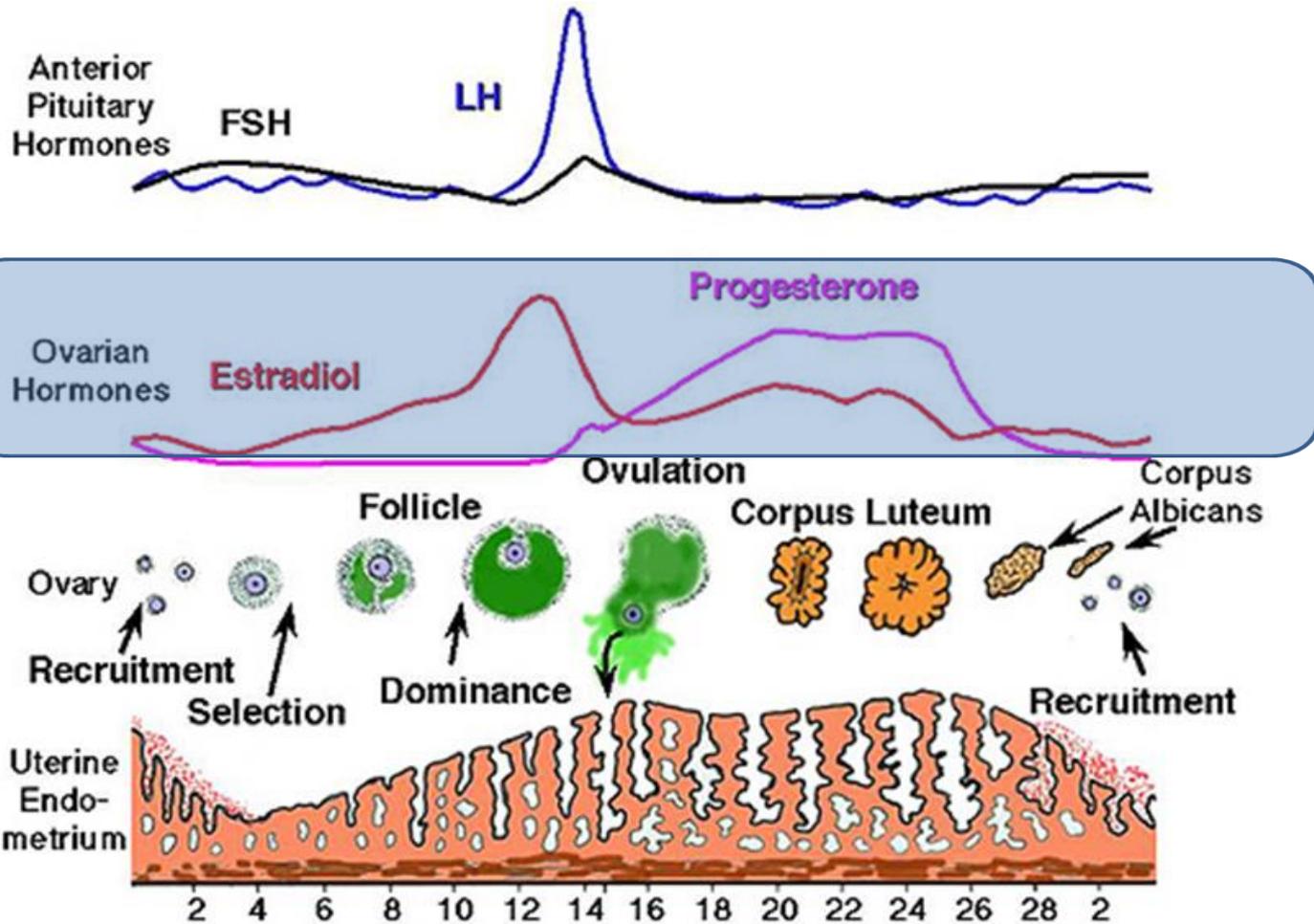
A complex yet simple process...



Hypothalamus-Pituitary Cycle

- Hypothalamus releases GnRH
 - Gonadotropic releasing hormone
- GnRH stimulates Pituitary to release FSH & LH
 - Follicle stimulating hormone
 - Luteinizing hormone
- FSH stimulates growth of ovarian follicles
 - Ovarian follicle = egg, cells w/ estradiol (estrogen), & fluid
 - As follicle matures, estrogen levels ↑
 - When estrogen levels are high enough, it stimulates a sudden release of LH
- Sudden release of LH is known as a “Surge”
- Surge of LH = ovulation i.e. release of mature egg

A complex yet simple process...



Ovarian hormones



Ovarian Hormones

- **Estrogen**

- Non-pregnant ovaries secrete large amount EST
- Greatest during proliferative phase
- Controls secondary female sex characteristics
- Effects: Endometrial growth, uterine change, liquidity and elasticity of cervical mucus, dilation of cervical os

- **Progesterone**

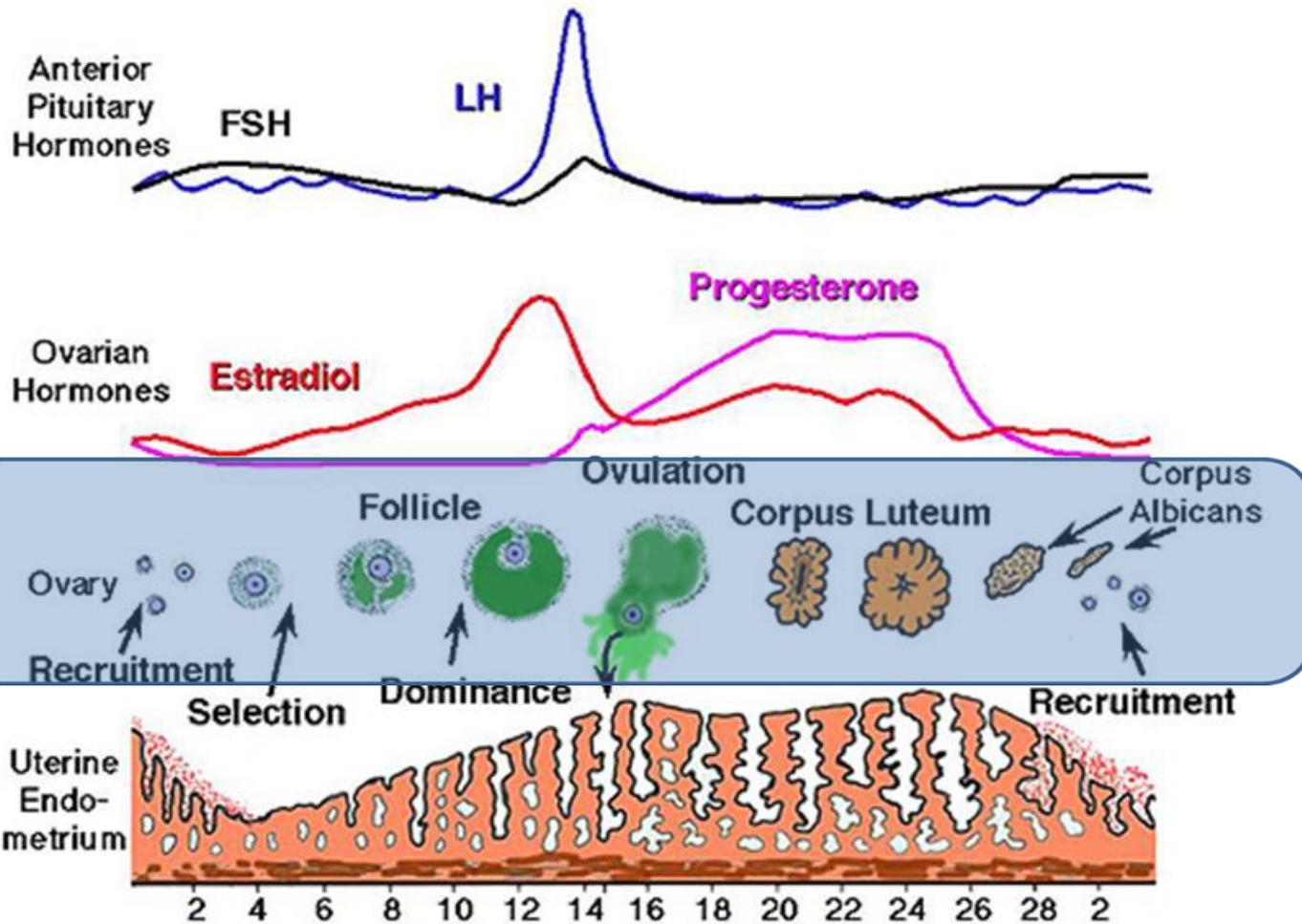
- Secreted by corpus luteum
- Greatest in secretory phase (luteal phase)
- Effects: Relaxes uterus, ripens uterine lining, prepares uterus for implantation, changes in cervical mucus, breast tissue preparation

Mnemonic for female hormones, in order, during menstrual cycle

“FELOP”

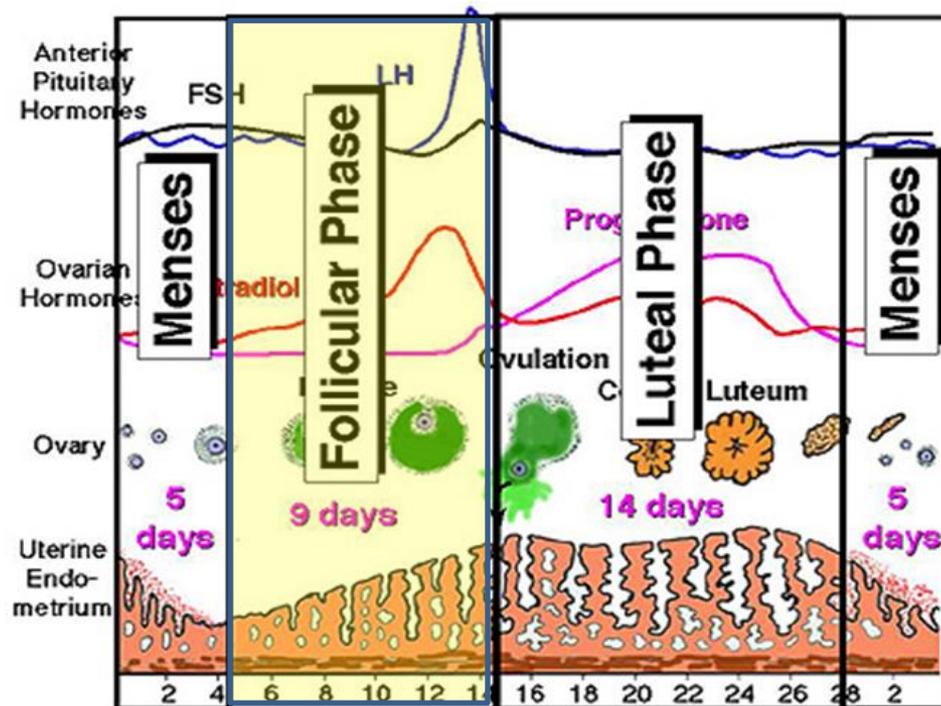
- **F**- Follicle Stimulating Hormone (FSH)
↓
- **E**- Estrogen (produced by maturing follicle)
↓
- **L**- Luteinizing Hormone (LH Surge)
↓
- **O**- Ovulation (egg is released, corpus luteum develops)
↓
- **P**- Progesterone (produced by corpus luteum)

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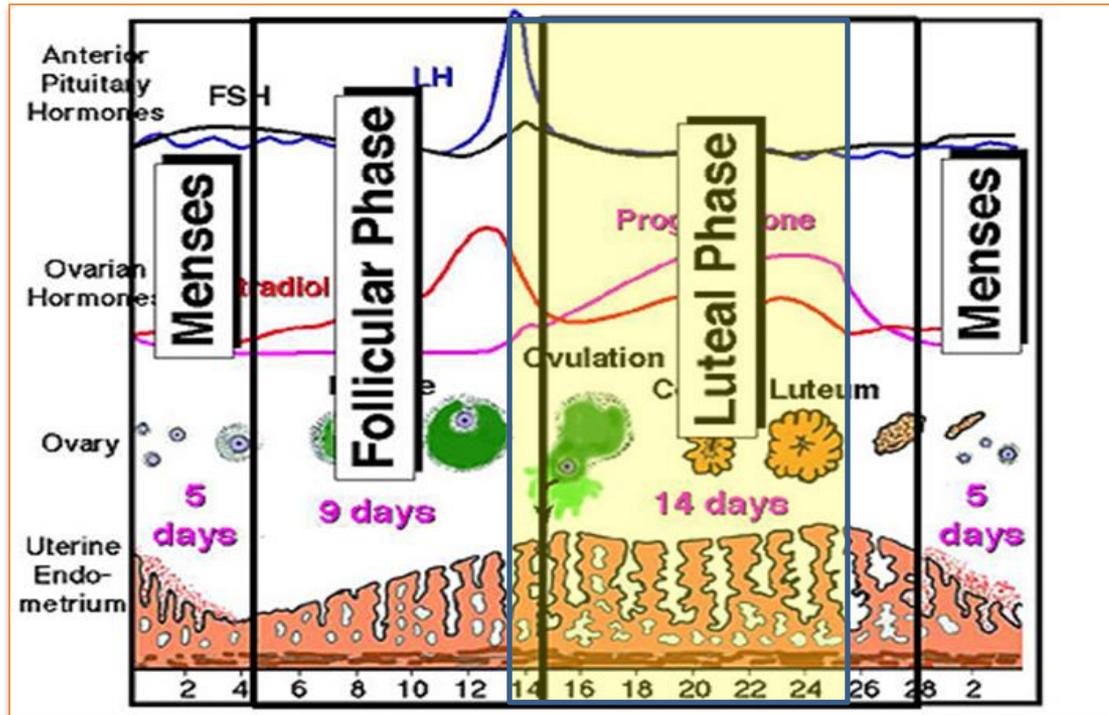
Ovarian Cycle – Phase 1 of 2

- Follicular Phase
(*Preovulatory Phase*)
- (Days 1-14) *Variable*
 - Primary follicles- immature, FSH stimulates growth into oocyte
 - Graafian follicle- small ovum, secretes EST



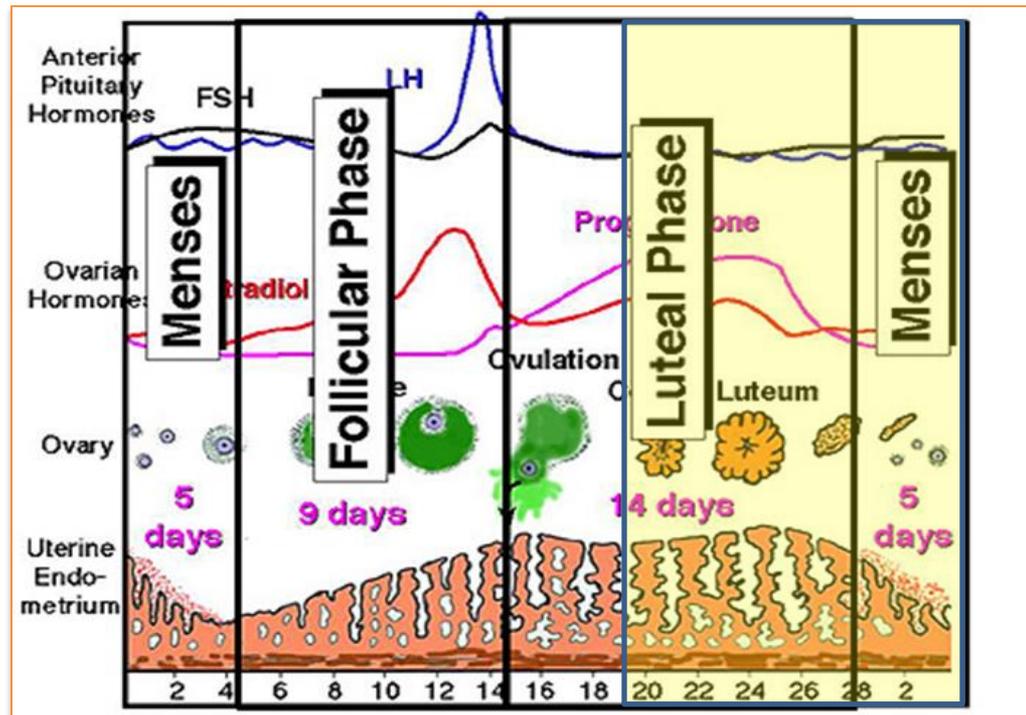
Ovarian Cycle – Phase 2 of 2

- Luteal Phase (Days 15-28) *Fixed*
 - Upsurge of LH = ovulation
 - Follicle ruptures, ovum is free, travels to fallopian tube
 - Corpus luteum develops
 - Remaining empty/hollow follicle fills with fluid high in PRO



What happens after ovulation?

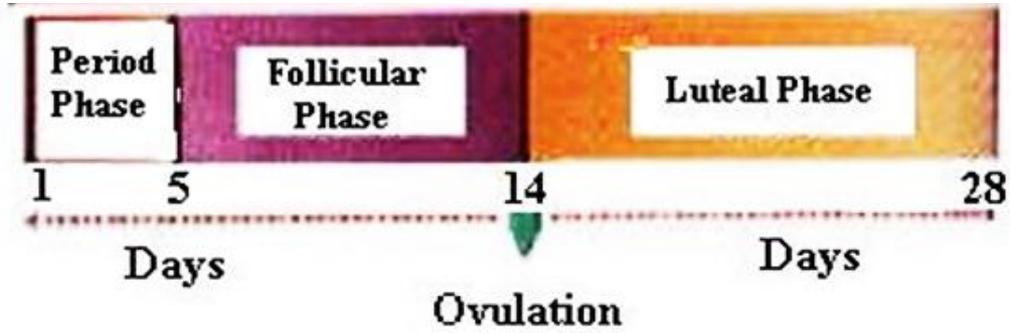
- What happens?
 - If ovum is fertilized - egg secretes HCG
 - HCG maintains the corpus luteum
 - Corpus luteum secretes PRO to maintain pregnancy
 - If no fertilization occurs, corpus luteum regresses



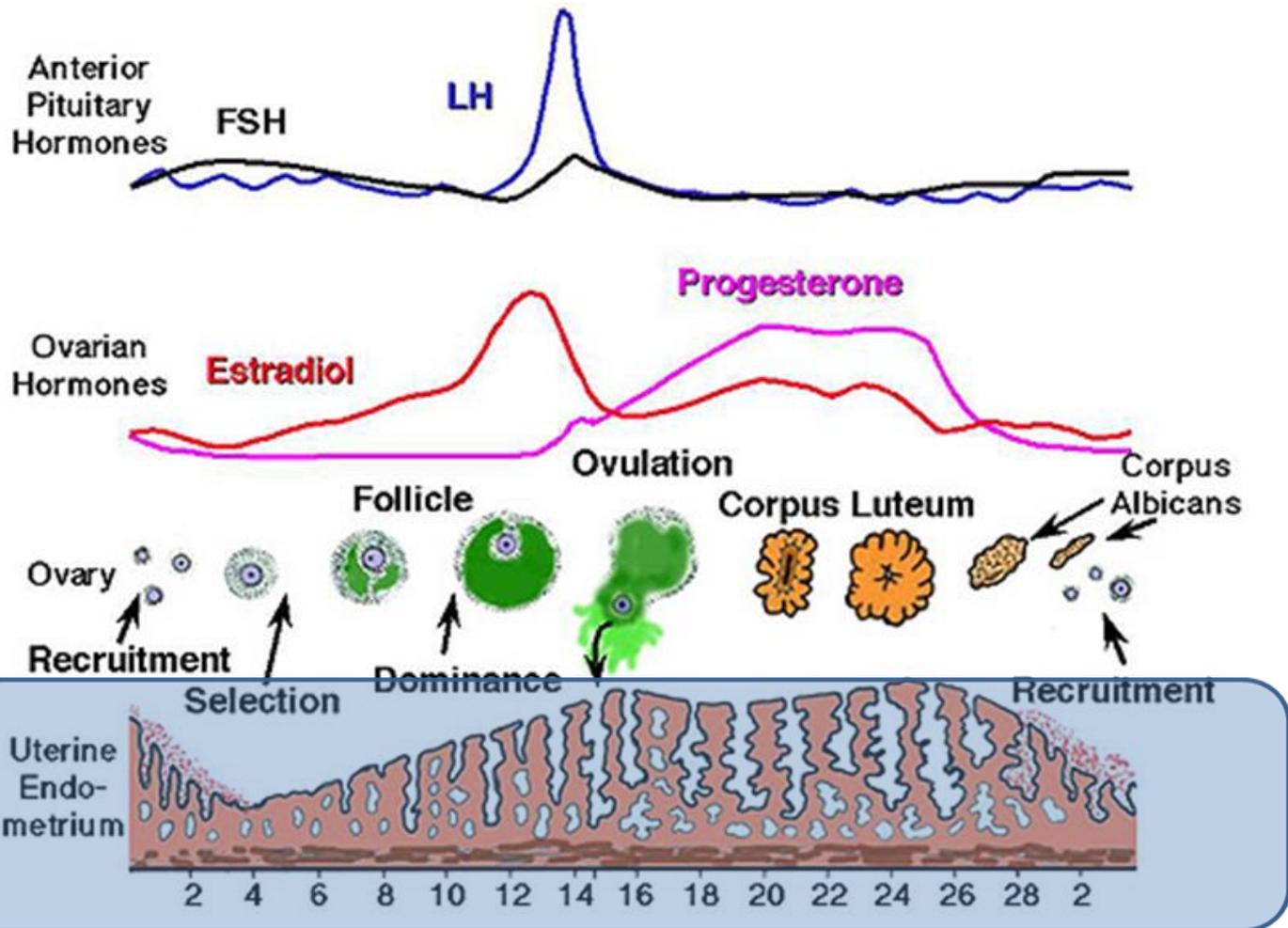
Follicular Phase

Ovulation

Luteal Phase



A complex yet simple process...



Endometrial Cycle

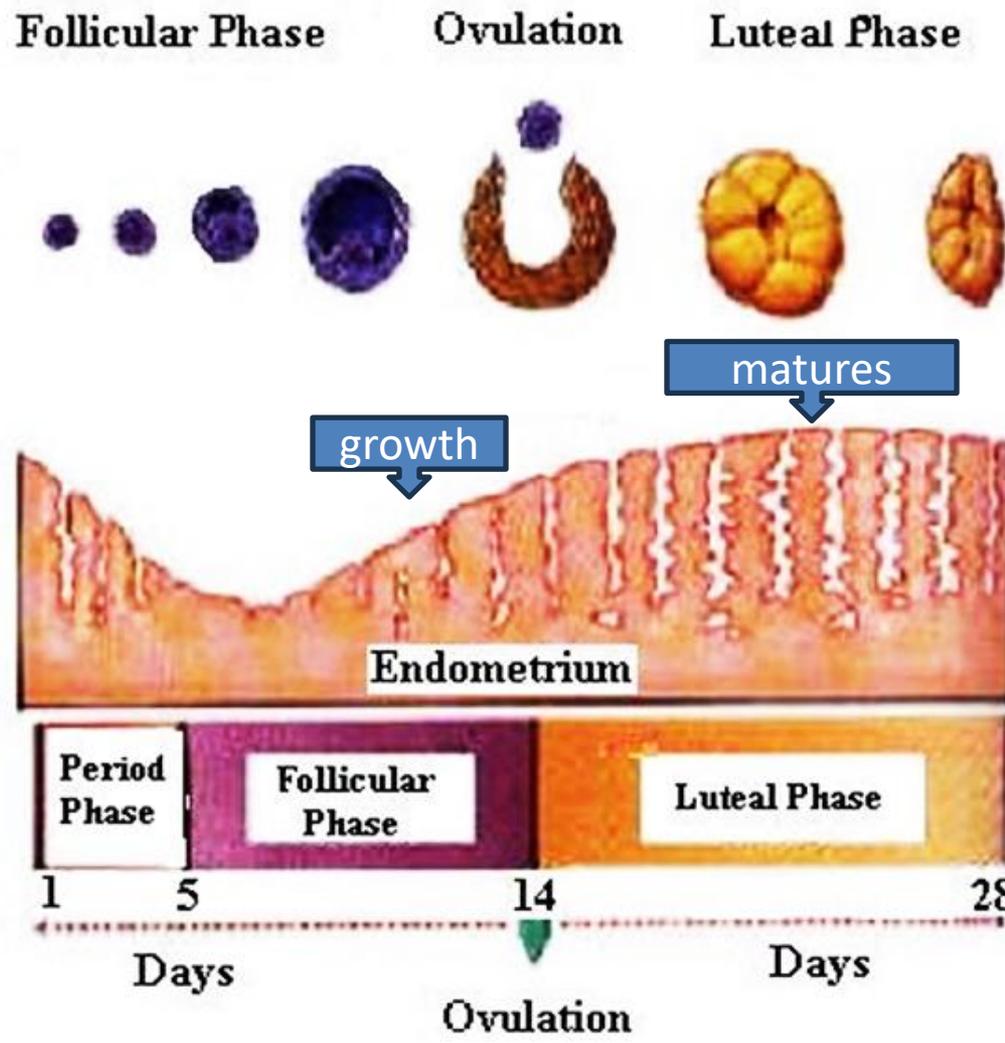
- Time when endometrium grows and matures in order to provide an optimal environment for a fertilized ovum to implant
- If no fertilization occurs, the endometrium sloughs or sheds, commonly known as menstruation
- Note the changes in the endometrial lining and when they occur during the menstrual cycle...

Endometrial Cycle – 4 Phases

Note changes in the Endometrial lining and when they occur:

- Phase 1 – **Menstrual** (Preovulatory) Phase
 - Periodic vasoconstriction = cramping
 - Shedding of epithelial layers of endometrium = **menses**
- Phase 2 – **Follicular** (Proliferative) Phase
 - Rapid **endometrial growth**
 - Due to **EST stimulation** from ovarian follicles
- Phase 3 – **Luteal** (Secretory) Phase
 - **Increase in PRO** from corpus luteum
 - **Matures** endometrial lining; nutritive bed for fertilized ovum
- Phase 4 – **Ischemic** Phase
 - If egg not fertilized, corpus luteum reaches end of life cycle, regresses; results in fall in EST & PRO
 - ↓PRO inhibits endometrial blood supply = necrosis = shedding = **menses**

Drop in EST & PRO stimulates hypothalamus & begins cycle again!



Putting it all together....

