Menstrual Cycle Review

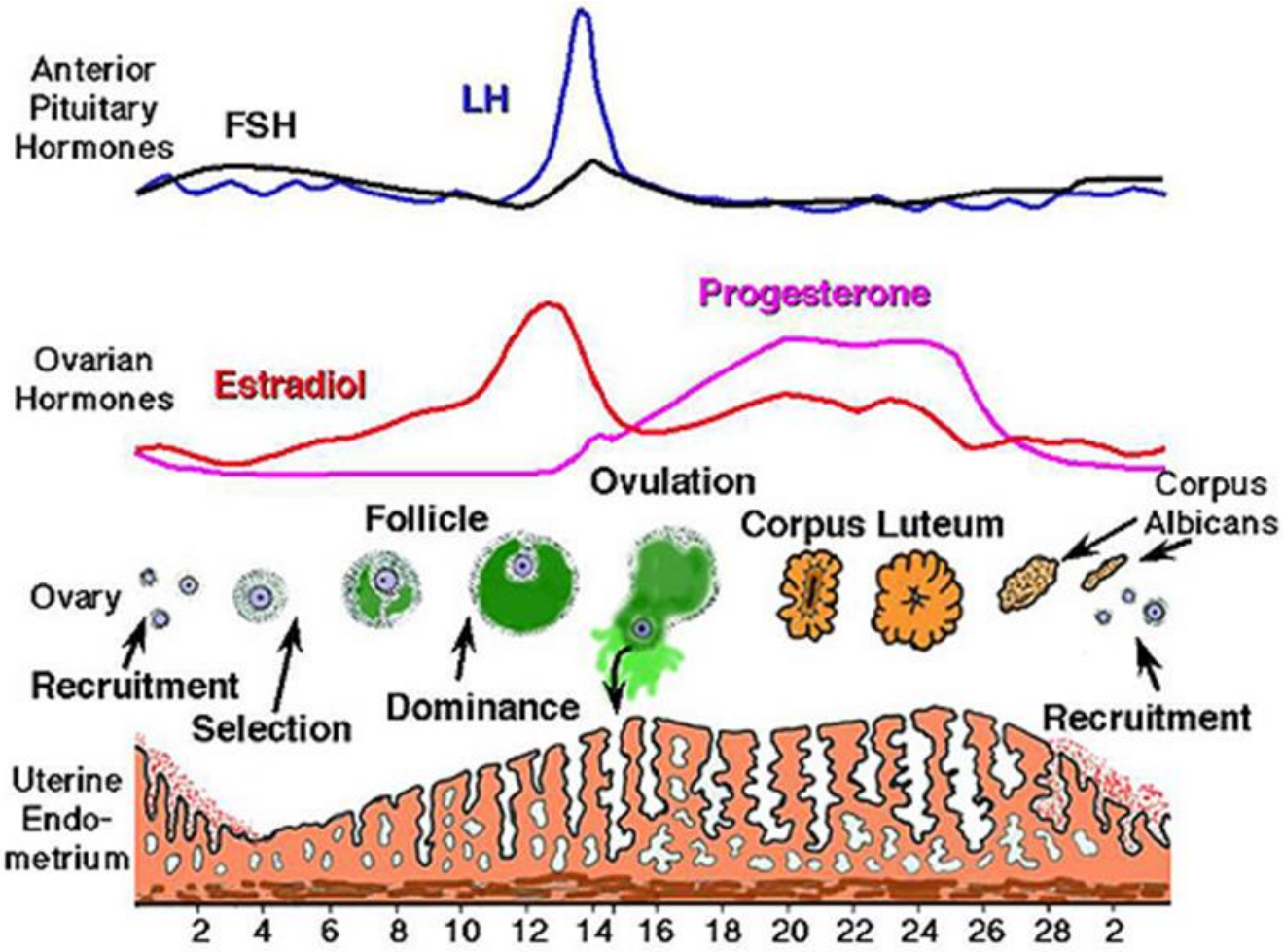
Reminder:

Independent Review Repro A &P

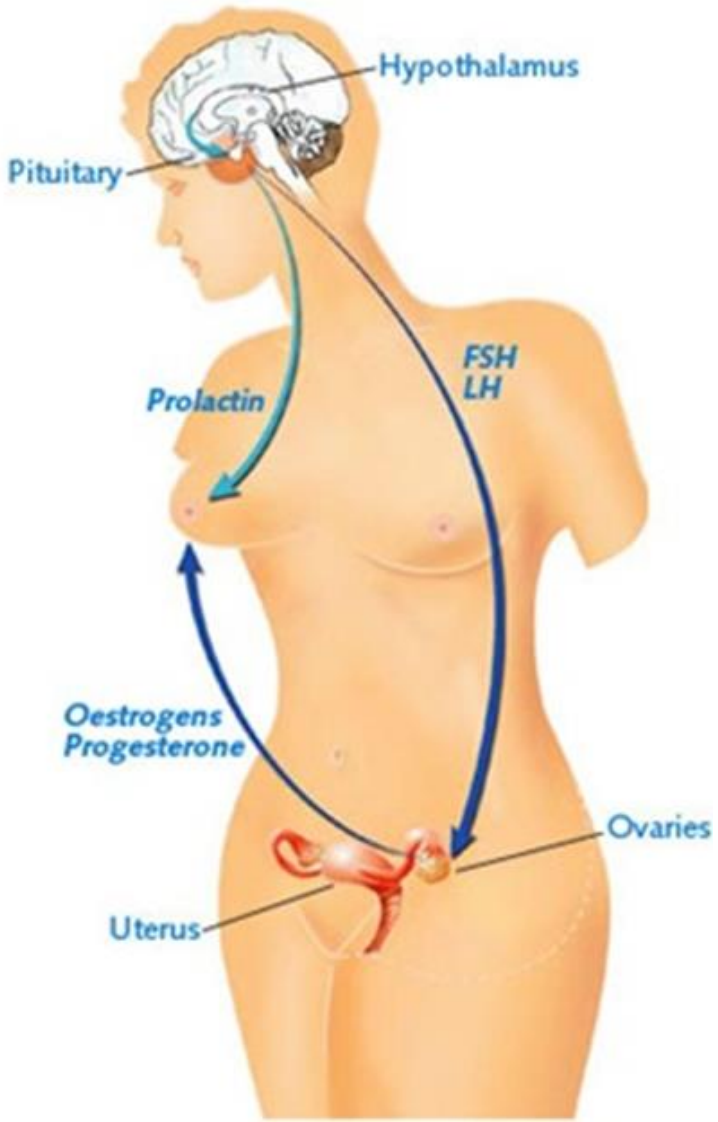
Sexual Maturity

- **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…



Hypothalamus-Pituitary Cycle

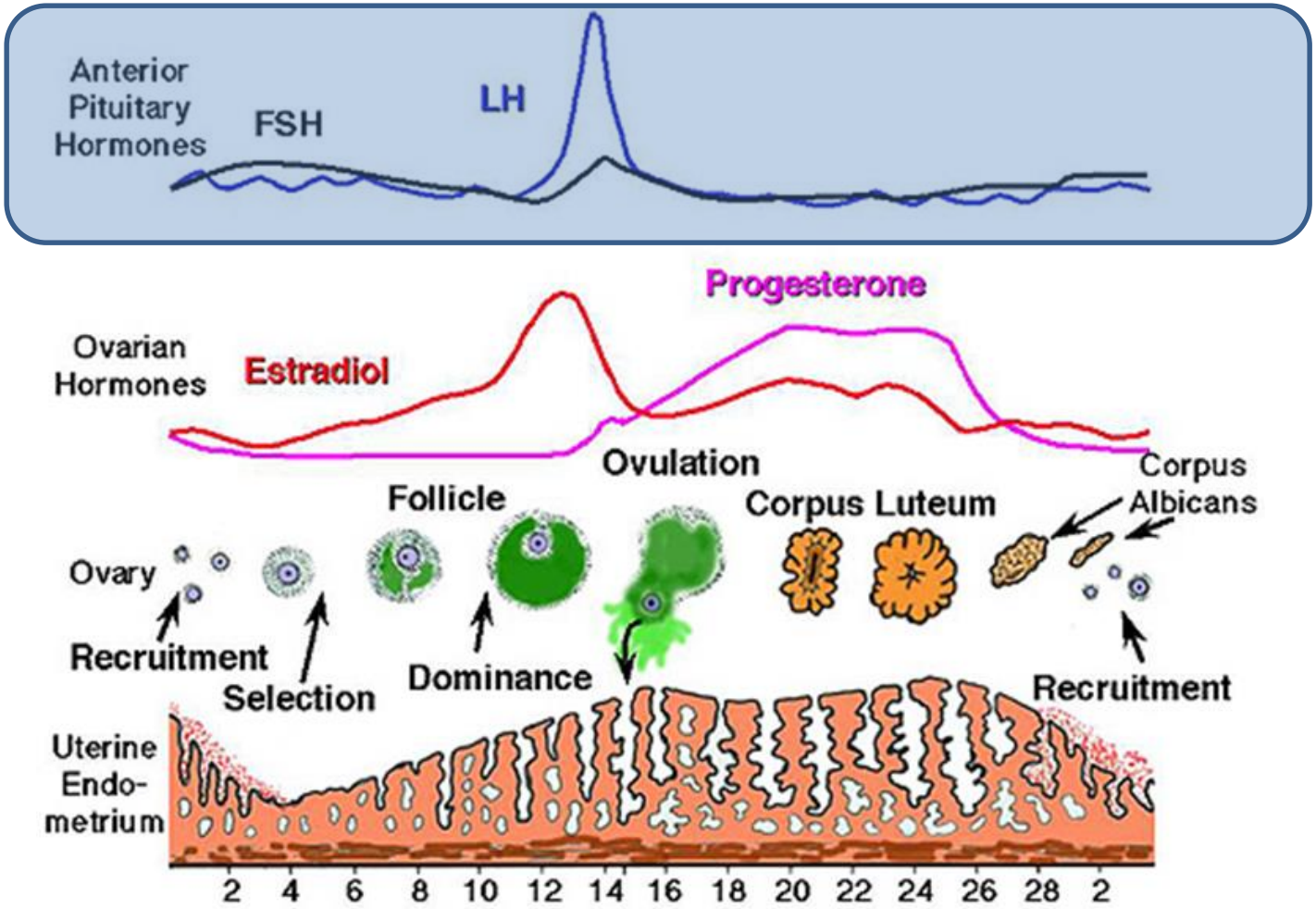


Hypothalamus-Pituitary Cycle

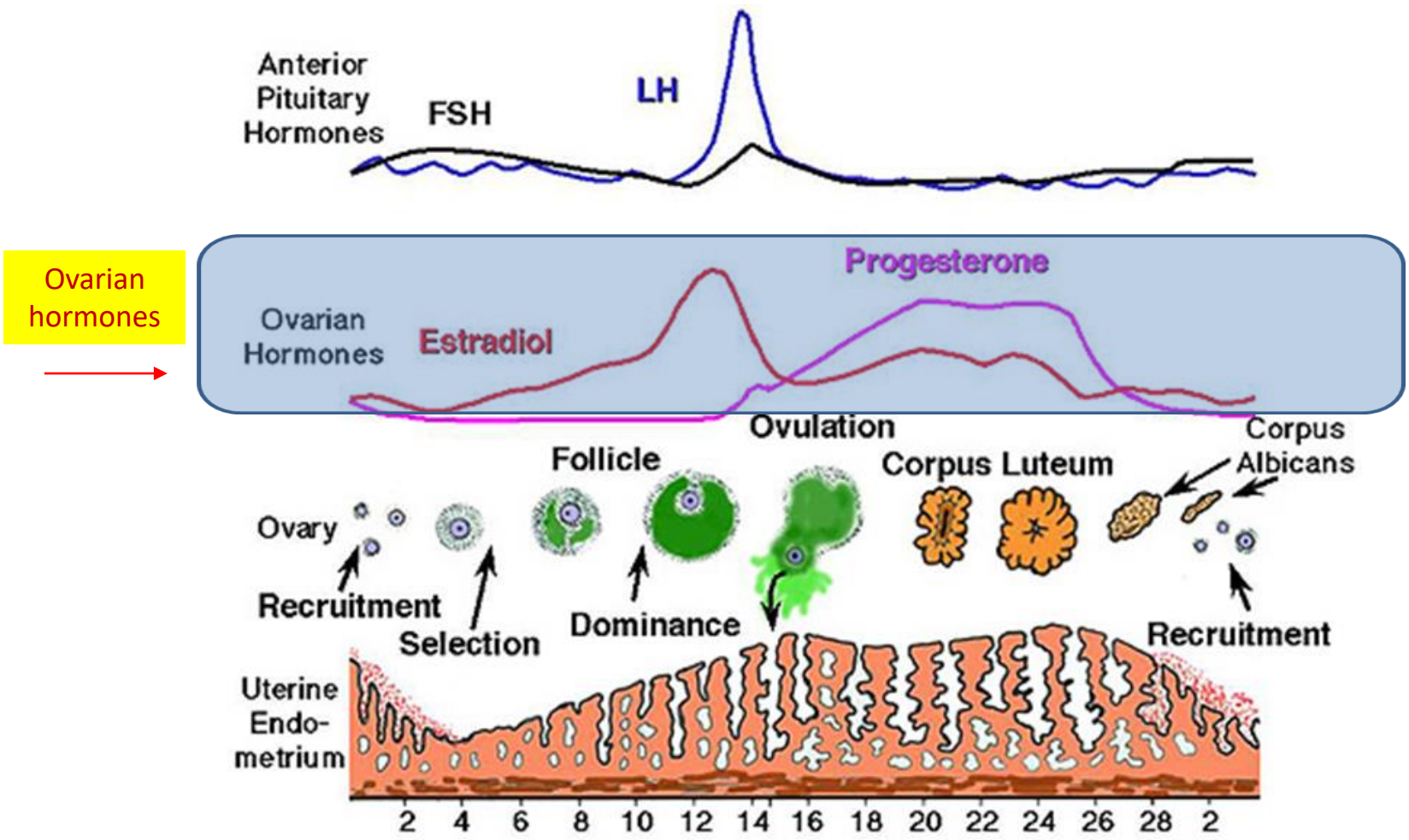
- Hypothalamus releases GnRH
  - Gonadotropic releasing hormone
- GnRH stimulates Pituitary to release FSH & LH
  - Follicle stimulating hormone
  - Luteinizing hormone
- FSH stimulates growth of ovarian follicles
  - Ovarian follicle = egg, cells w/ estradiol (estrogen), & fluid
  - Estrogen initially inhibits LH effects
  - Follicle matures, estrogen levels ↑ and overcomes inhibiting factors
- As follicle reaches maturity, allows LH to "Surge
- Surge of LH = ovulation i.e. release of mature egg

A complex yet simple process…

Hypothalamus-Pituitary Cycle →



A complex yet simple process…



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

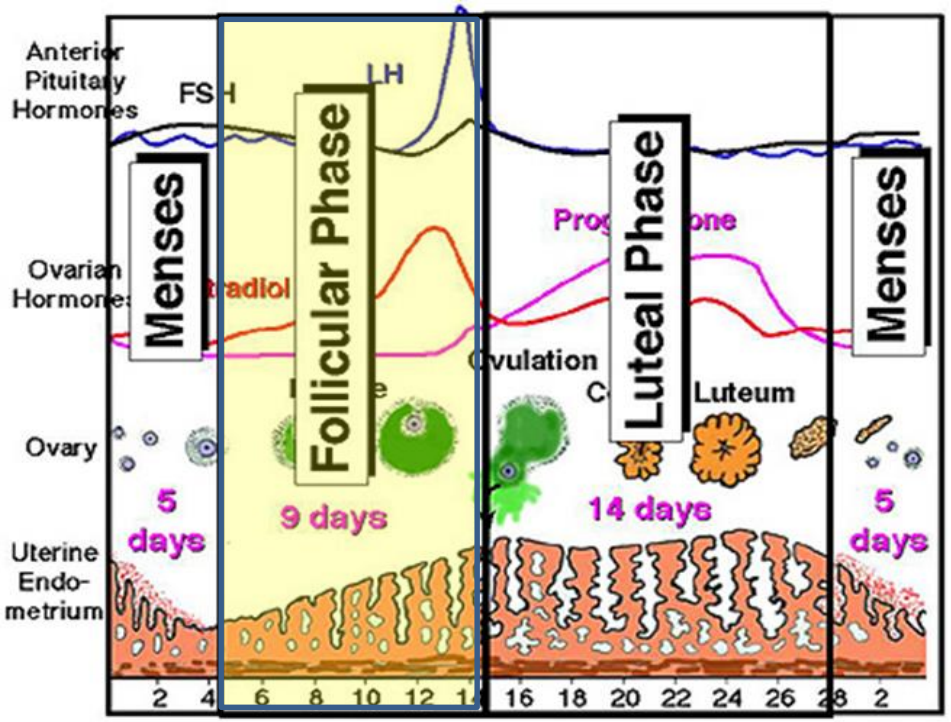
- **Progesterone**
  - Secreted by corpus luteum
  - Greatest in secretory phase (luteal phase)
  - Effects: Relaxes uterus, ripens uterine lining, prepares uterus for implantation, changes in cervical mucus, breast tissue preparation

Mnemonic for female hormones, in order, during menstrual cycle "FELOP"

- **F**- Follicle Stimulating Hormone (FSH)
- **E**- Estrogen
- **L**- Luteinizing Hormone (LH Surge)
- **O**- Ovulation
- **P**- Progesterone

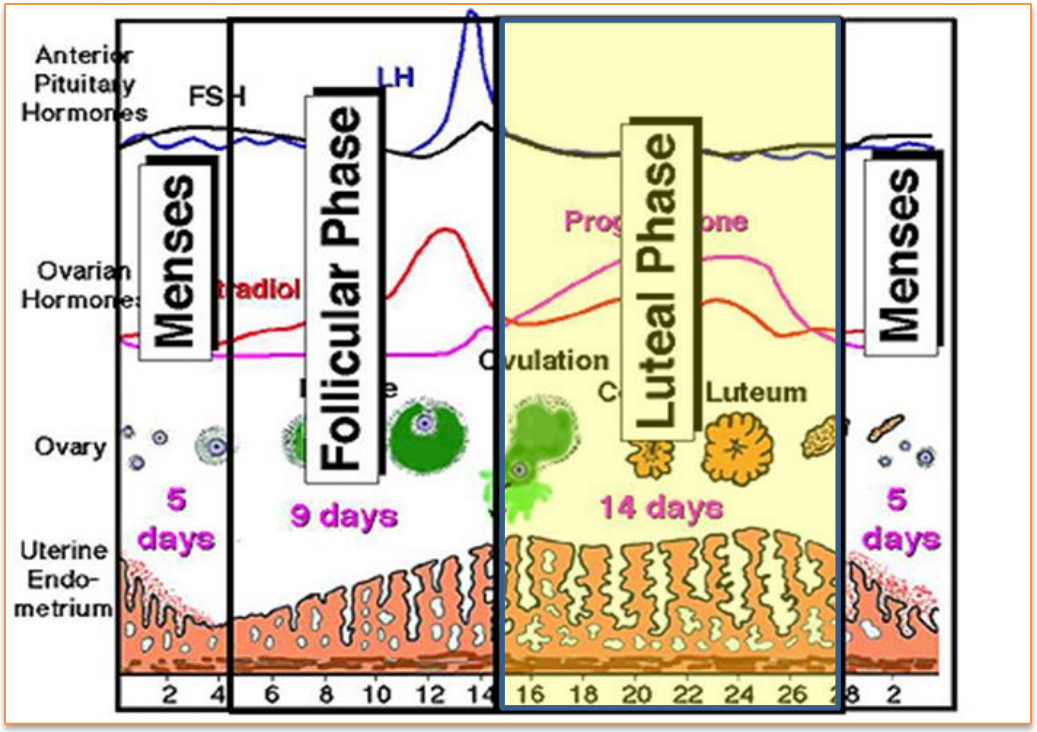
Ovarian Cycle – Phase 1 of 2

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

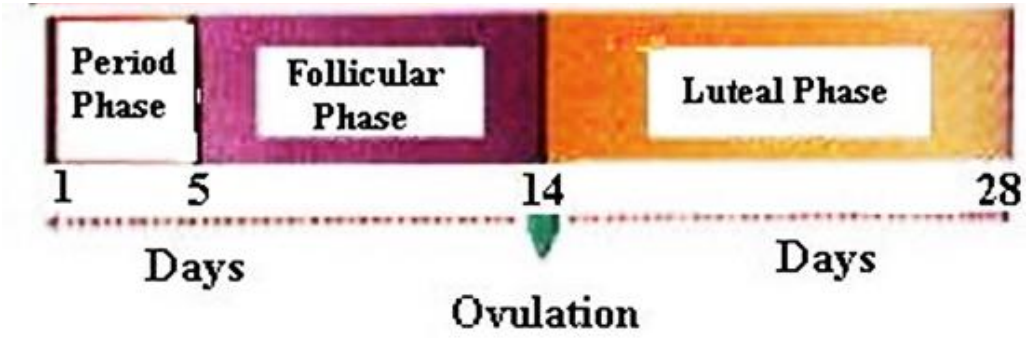


Ovarian Cycle – Phase 2 of 2

- 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

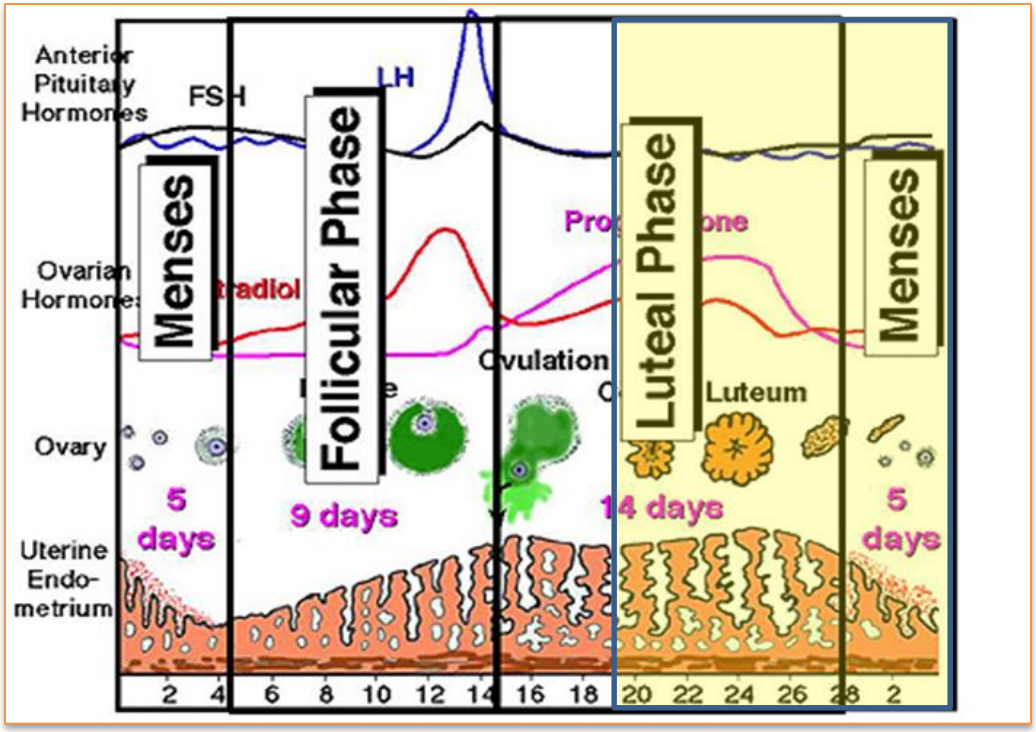



Follicular Phase
Ovulation
Luteal Phase


Period Phase
Follicular Phase
Luteal Phase
1
5
14
28
Days
Days
Ovulation

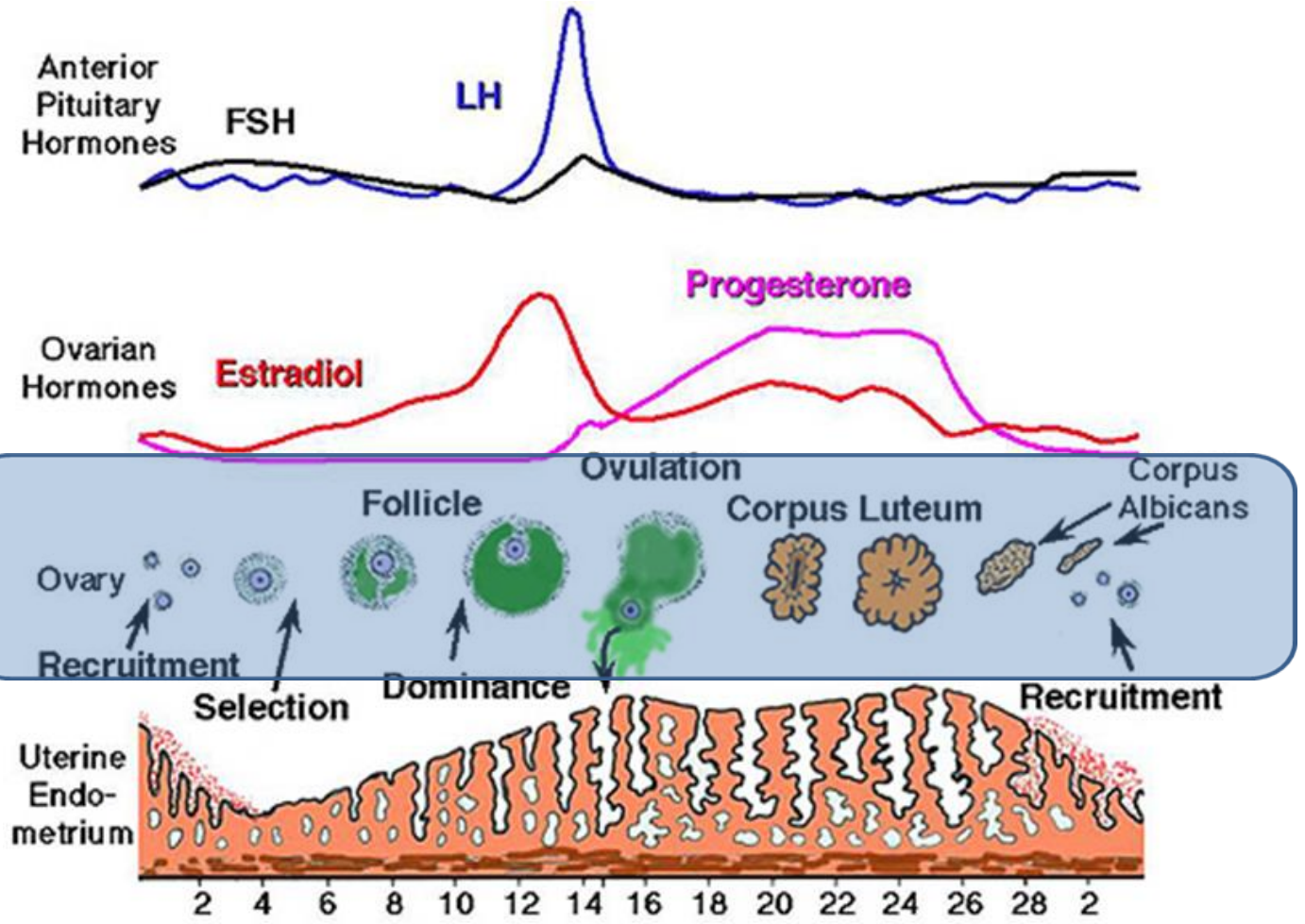
What happens after ovulation?

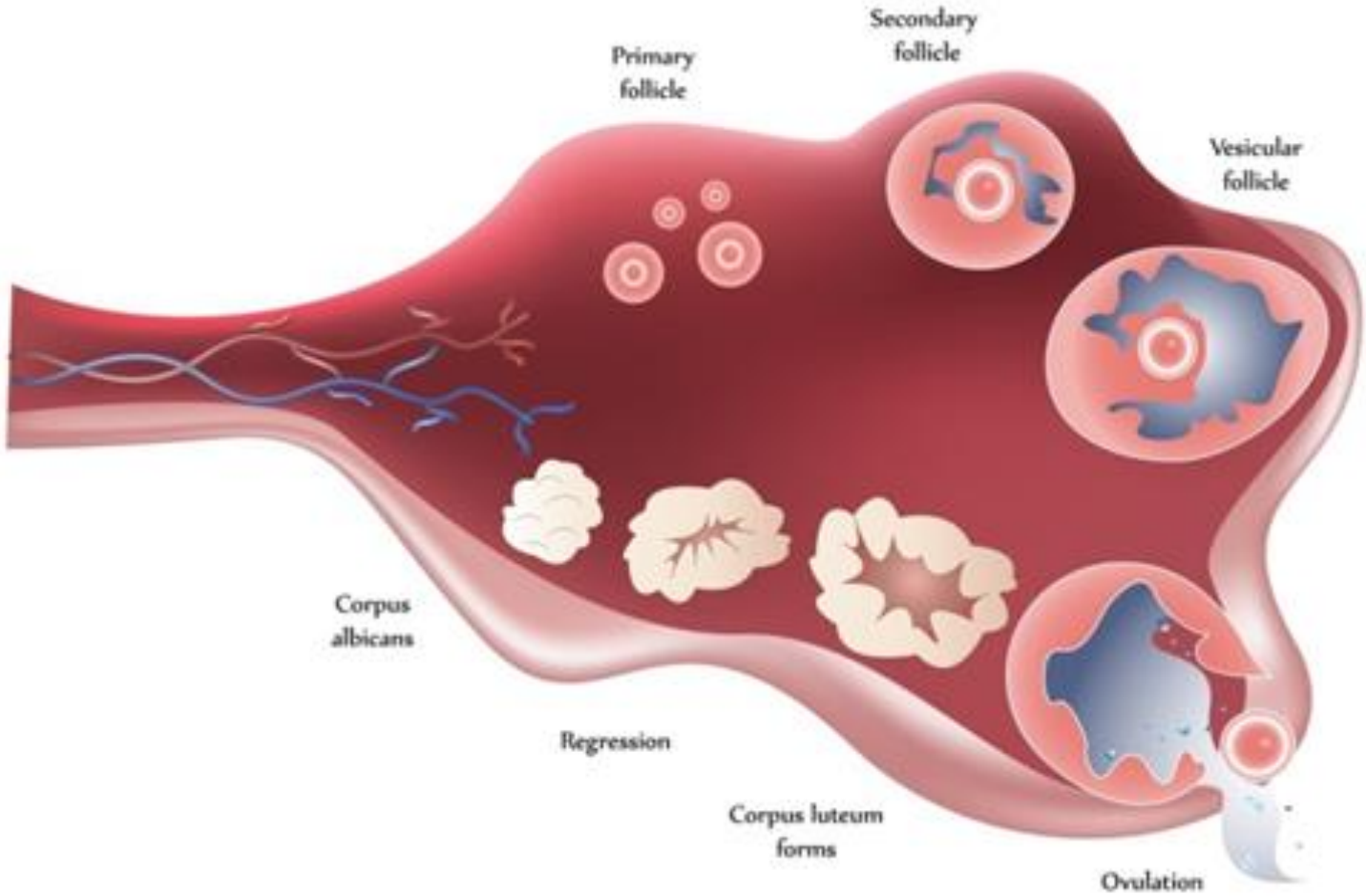
- What happens?
  - If ovum is fertilized - egg secretes HCG
    - HCG maintains the corpus luteum
    - Corpus luteum secretes PRO to maintain pregnancy
  - If no fertilization occurs, corpus luteum regresses



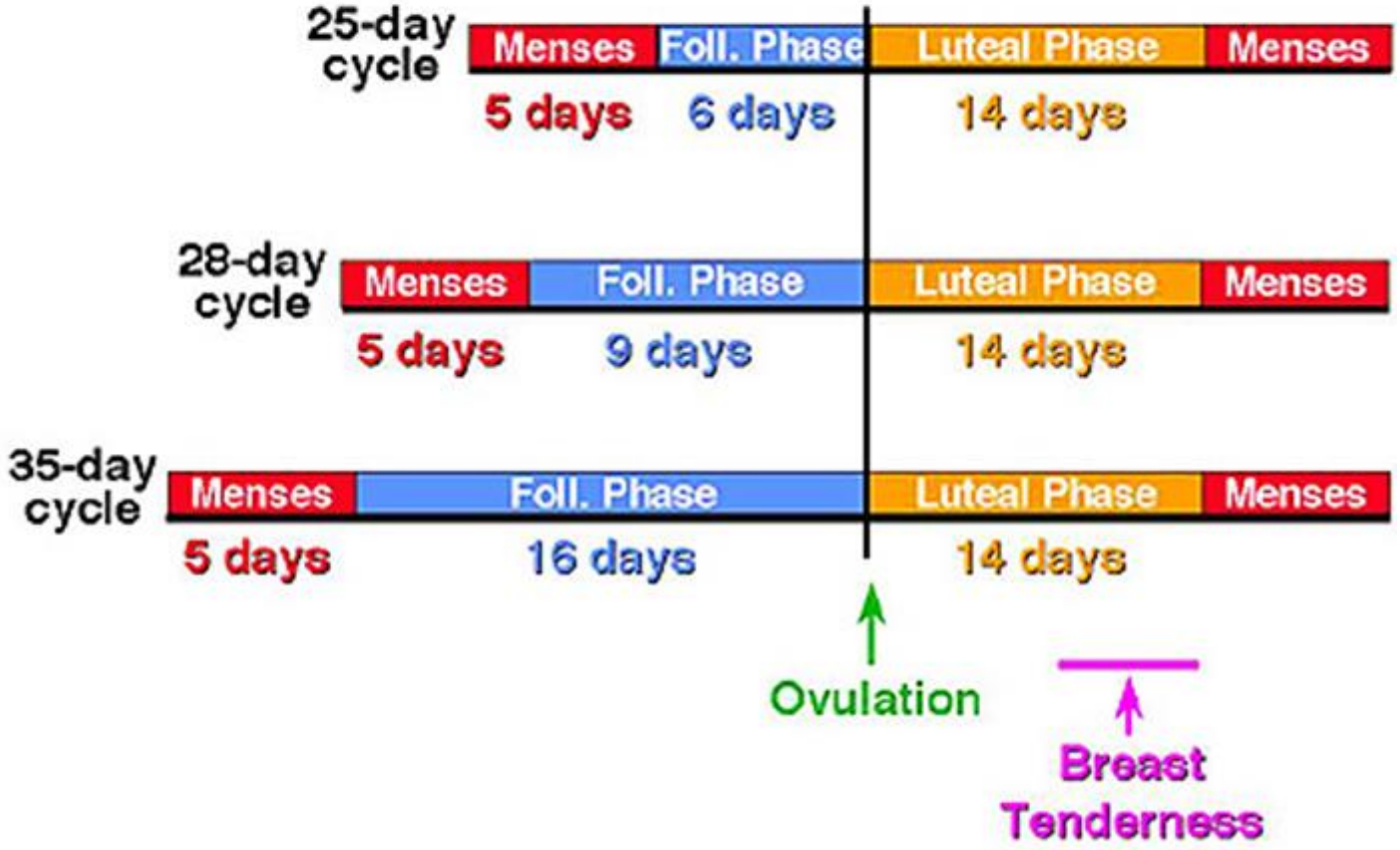
A complex yet simple process…

Ovarian Cycle – changes




Primary follicle
Secondary follicle
Vesicular follicle
Corpus albicans
Regression
Corpus luteum forms
Ovulation

Variation in Menstrual Cycle Length



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 know 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:

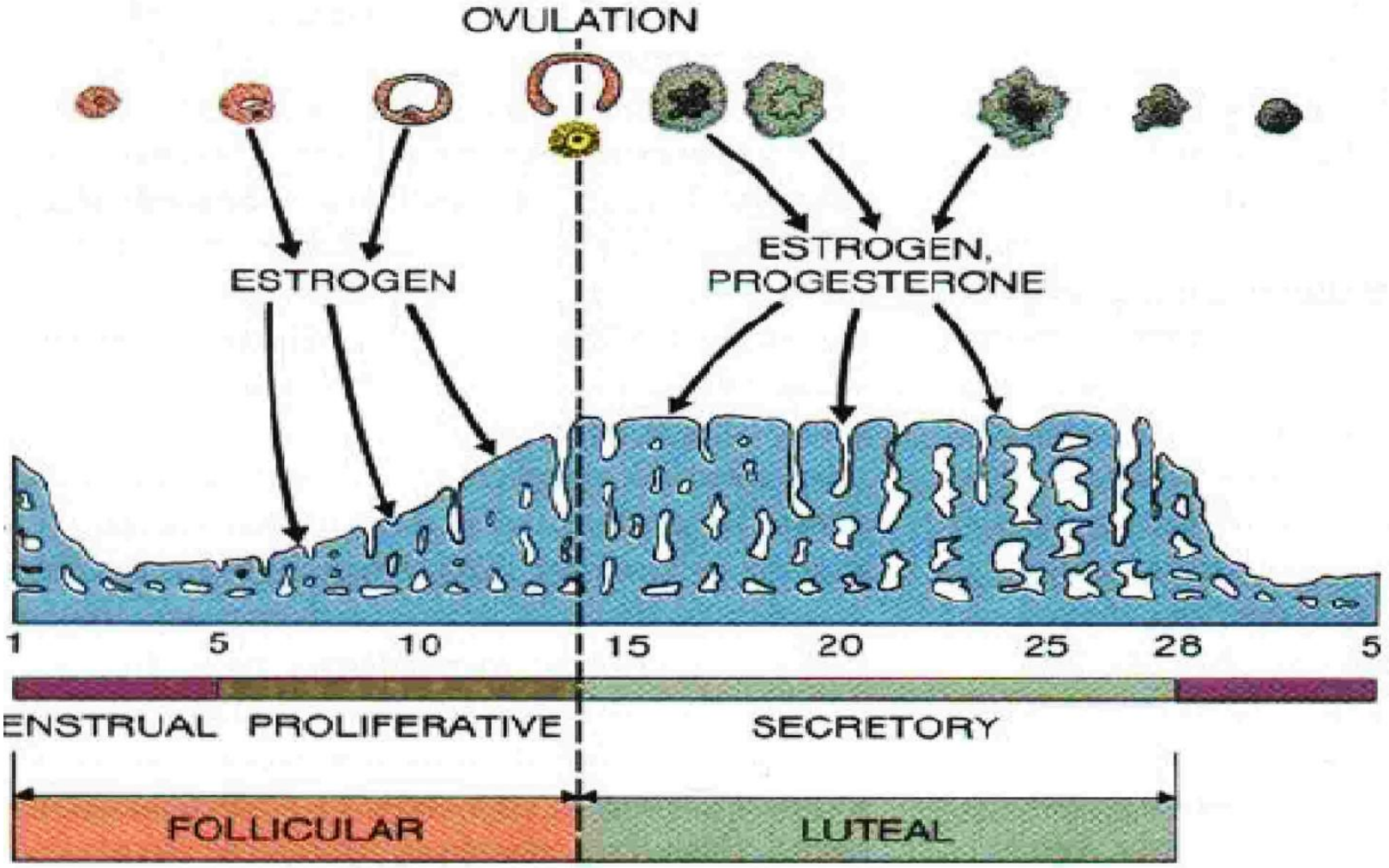
- Phase 1 – Menstrual (Preovulatory) Phase
  - Periodic vasoconstriction = cramping
  - Shedding of epithelial layers of endometrium = menses

- Phase 2 – Follicular (Proliferative) Phase
  - Rapid endometrial growth
  - Due to EST stimulation from ovarian follicles

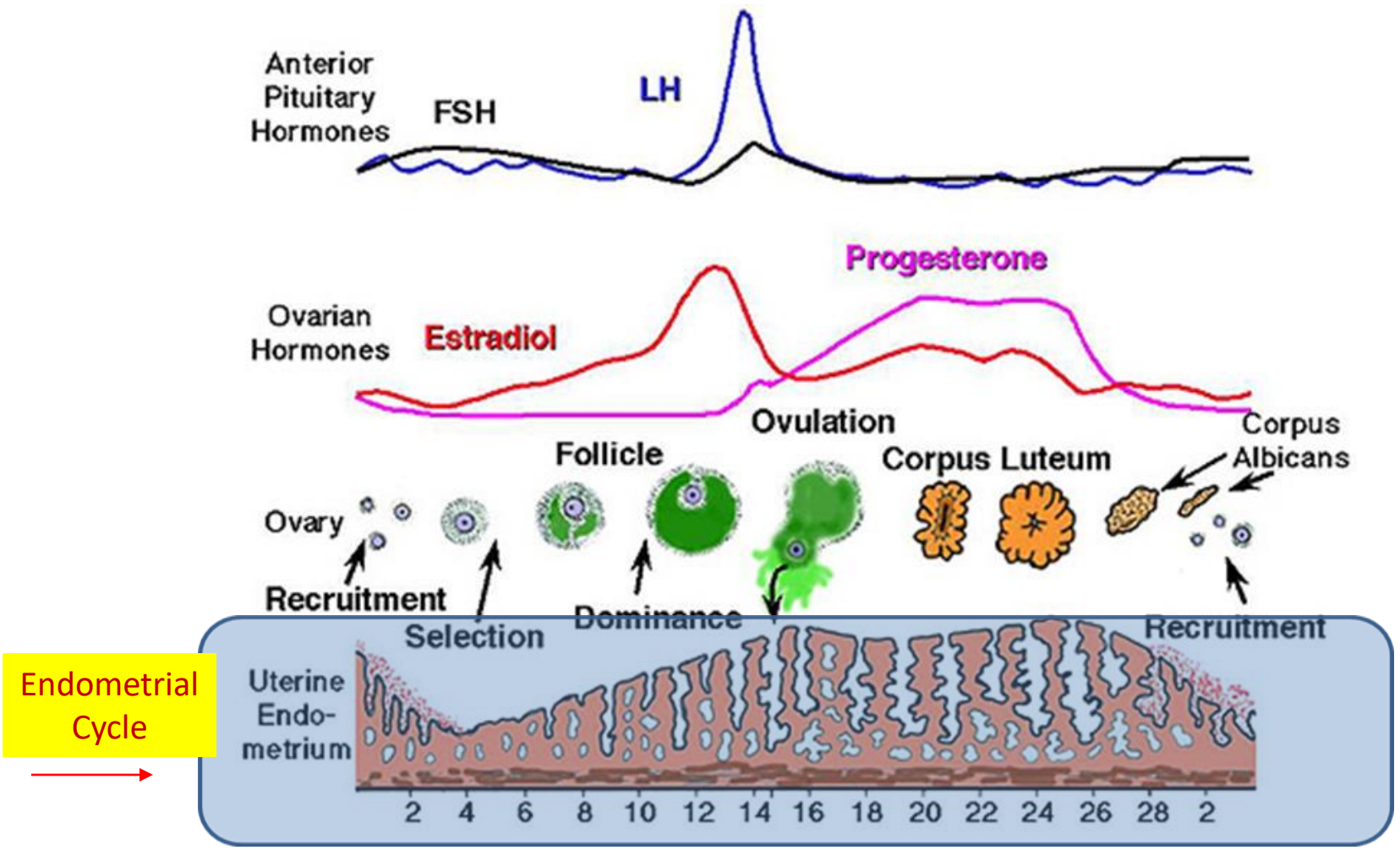
- Phase 3 – Luteal (Secretory) Phase
  - Increase in PRO from corpus luteum
  - Matures endometrial lining; nutritive bed for fertilized ovum

- 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

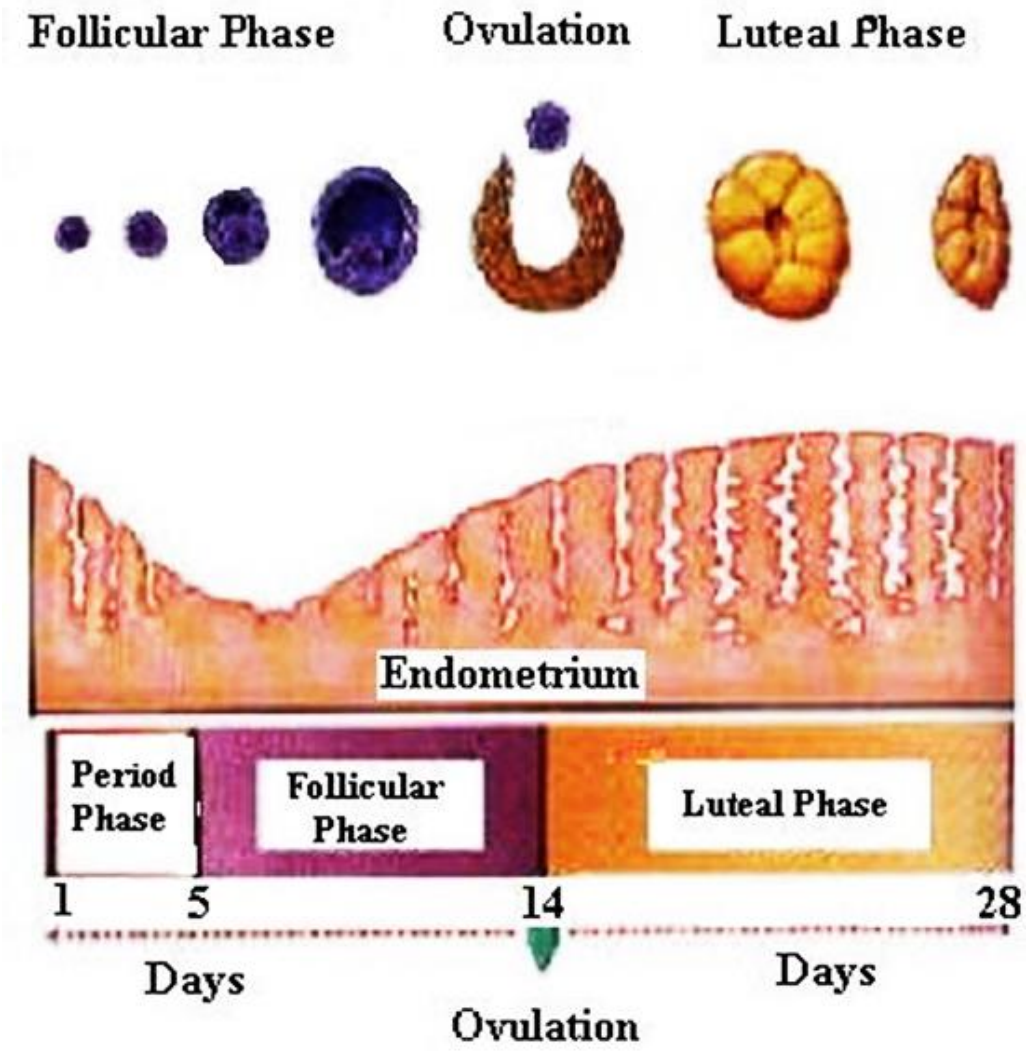
Drop in EST & PRO stimulates hypothalamus & begins cycle again!


OVULATION
ESTROGEN
ESTROGEN,
PROGESTERONE
1
5
10
15
20
25
28
5
ENSTRUAL
PROLIFERATIVE
SECRETORY
FOLLICULAR
LUTEAL

A complex yet simple process…



Endometrial Cycle


Follicular Phase
Ovulation
Luteal Phase
Endometrium
Period Phase
Follicular Phase
Luteal Phase
1
5
14
28
Days
Days
Ovulation

Putting it all together….