

**KEY Luteal Phase**

1. What are the stages of the Luteal Phase?  
Metestrus, Diestrus
2. What is the main hormone produced during the Luteal Phase? Why?  
Progesterone, CL forms and secretes it
3. What are the functions of Progesterone?
  - Maintains pregnancy
  - Inhibits the frequency of release of LH from AP
  - Uterine secretions ↑, muscle contractions ↓
  - ↑ Collagenase production

**Formation of the CL**

4. What does the Preovulatory follicle consist of..
  - Granulosa cells that line the antrum
  - Basement membrane separating Granulosa cells and Theca cells
5. What occurs shortly before ovulation?
  - Basement membrane begins to degenerate
    - Collagenase breaks down Collagen
  - Physical separation between Granulosa and Theca cells becomes incomplete and the cells intermingle
6. What occurs during ovulation?
  - Many small blood vessels rupture causing local hemorrhage
  - Follicle “implodes”
  - Granulosa and Theca cells begin to mix
  - Basement membrane forms the connective tissue structure of the CL
  - Formation of CH
7. At what stage is the CH ➔ CL?  
Metestrus
8. What does the functional CL consist of?  
Mixture of Large Luteal Cells (LLC) and Small Luteal Cells (SLC)

9. What are the functions and characteristics of the Large Luteal Cells?

- Came from Granulosa Cells
- During CL development, they grow in size (hypertrophy) by 2x
- Produce 85% of Progesterone
- Have a  $\text{PGF}_2\alpha$  receptor
- Produces relaxin
- Produces oxytocin
  - Signals for  $\text{PGF}_2\alpha$  from the uterus (used in Luteolysis)

10. What are the functions and characteristics of the Small Luteal Cells?

- Come from Theca Cells
- ↑ percentage of lipid droplets
- Have oxytocin receptor
- Produces progesterone
- During CL development, they increase in cell number (hyperplasia) by 5x

11. How is Progesterone secreted?

- Cholesterol is imported to luteal cell wall by way of Low Density Lipoprotein (LDL)
- LH binds to specific LH receptors on the plasma membrane
- LH receptor compact activates cascade that stimulates adenylate cyclase (AC) which stimulates the production of a 2nd messenger (cAMP)
- Mitochondrial enzymes convert cholesterol to pregnenolone
- Pregnenolone is converted to Progesterone in the Smooth ER

12. Where does Progesterone cause an effect?

- Suppresses GnRH secretion
- ↓ the # of GnRH receptors in AP
- Promotes development of mammary gland
- Induces secretion of “uterine milk”
- “Quiets” myometrial muscle contractions

13. What happens to the CL when a female isn't pregnant? What does it become?

- CL is irreversibly damaged and eventually “dies” - Luteolysis
- Becomes a CA

14. What must occur before a female can reenter the Follicular Phase?

Luteolysis

15. What reproductive organ is required for successful Luteolysis?

Uterus

16. Where is  $\text{PGF}_2\alpha$  produced?

- Uterine Endometrium
- PGF2a is transported into the ovary and enters the CL through the vascular countercurrent exchange system without becoming diluted

17. What are the 2 phases of Luteolysis?

- Functional Luteolysis
- Structural Luteolysis

18. What occurs in Functional Luteolysis?

- This will be 1st to occur
- ↓ P4 production
  - PGF2a will bind to its receptor on LLC
    - PGF2a ↑ oxytocin
    - Oxytocin receptors are on SLC
  - PGF2a signaling
    - ↓ in LDL and LH receptors on luteal cells

19. What occurs in Structural Luteolysis?

- Luteal cells die (apoptosis)
  - Blood cells and SLC die first
  - LLC die 2nd
  - Immune cells digest cell fragments

20. How does PGF2a send a signal to Luteal Cells to stop P4 synthesis?

- PGF2a binds to its receptors on luteal cells
- PGF2a receptor complex opens calcium channels
  - High calcium leads to apoptosis
- PGF2a receptor complex also activates protein kinase c (PKC), inhibiting P4 synthesis