

## Luteal Phase

What is the difference between Luteinization, Luteolysis, Luteolytic, and Luteotropic?

Luteinization: the process by which granulosa and theca cells are transformed into luteal cells

Luteolysis: the process whereby luteal tissue (CL) undergoes regression and cell death

Luteolytic: a material that promotes luteolysis (death of CL)

Luteotropic: having a stimulating action on the development or assisting in maintaining the corpus luteum

What are the two stages that compromise the luteal phase?

Metestrus & Diestrus

What do the theca and granulosa cells transition into?

Theca: SLC

Granulosa: LLC

How does the hormone profile change during the luteal phase?

- Progesterone is at its peak high
- Estrogen is low

What are the two phases Luteolysis occurs?

Functional Luteolysis \*ALWAYS first\*

- Decrease in progesterone production
- PGF2a binds to receptor on LLC
  - o PGF2a increases oxytocin
  - o Oxytocin receptors are on SLC
- PGF2a signaling results in:
  - o Decrease in LDL receptors on luteal cells
  - o Decrease LH receptors on luteal cells

Structural Luteolysis \*6-10 hours later\*

- Luteal cells die (apoptosis)
- Endothelial (blood cells: cut off blood supply) and SLC die first
- LLC die second
- Immune cells digest and remove cell fragments

Cell Type	Receptor	Production of..
Large Luteal Cells	PGF2a	<ul style="list-style-type: none"> <li>- 85% of progesterone</li> <li>- Relaxin</li> <li>- Oxytocin</li> </ul>
Small Luteal Cells	Oxytocin	<ul style="list-style-type: none"> <li>- Progesterone</li> </ul>

What are the two cell types in the CL and what are the differences between them?

LLC: round nucleus and abundant mitochondria, increase in size via hypertrophic growth, oxytocin signals for PGF2a from the uterus (luteolysis)

SLC: irregular nucleus, increases percentage of lipid droplets (stores cholesterol), increase in number via hyperplasia growth

What are the steps of Progesterone Secretion?

1. Cholesterol imported luteal cell by way of Low Density Lipoprotein (LDL)
2. LH binds to specific LH receptors on the plasma membrane
- 3-5. LH receptor complex activates an intracellular cascade that stimulates adenylate cyclase which stimulates production of a 2<sup>nd</sup> messenger (cAMP)
6. Mitochondria enzymes convert cholesterol to pregnenolone(intermediate to progesterone)
7. Pregnenolone is converted to progesterone in the smooth ER

Where does Progesterone cause an effect?

Hypothalamus: suppresses GnRH secretion

AP: decreases number of GnRH receptors

Mammary Gland: promotes development of the mammary gland

Uterus:

- induces max secretion of “uterine milk”
- Quiets myometrium muscle contractions

What are the steps of PGF2a signaling in luteal cells?

1. PGF2a binds to specific receptors on luteal cells
2. PGF2a receptor complex opens calcium channels
  - a. High intracellular calcium leads to apoptosis
3. PGF2a receptor complex also activates protein kinase c (PKC) that inhibits progesterone synthesis