SI Session 2.1 9/24/19 Lecture: 9/18

Define:

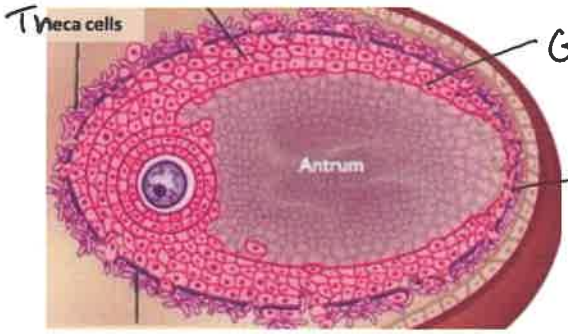
Luteinization: process where granulosa/theca cells are transformed into luteal cells = terminal differentiation

Luteolysis: luteal tissue (CL) undergoes regression/cell death

Luteolytic: something that promotes luteolysis

Luteotropic: something that stimulates an action to develop/maintain the CL "-tropic" = to assist

Label the pre-ovulatory follicle:



Granulosa cells

basement membrane

What is the enzyme responsible for degenerating the basement membrane?

collagenase

What hormone increses this enzyme production? P_4

Which Corpus Luteum cells produce this hormone? Large/Small luteal cells

Explain the formation of the CH:

(1) follicle "implodes" = blood vessels rupture = hemorrhage

- granulosa/theca cells mix

- from granulosa cells
- round nucleus/abundant mitochrondria

Describe Large Luteal Cells:

- Produce 95% of P_4
- Produce relaxin and oxytocin
- have $PGF_{2\alpha}$ receptor
- Hypertrophy (2-fold) = ↑ in size = "steroidogenic potential" of CL

What's the job of Oxytocin?

signals for $PGF_{2\alpha}$ from the uterus for luteolysis

Describe Small Luteal Cells:
- from theca cells
- irregular nuclei, ↑ % of lipid droplets
- has oxytocin receptor

- Produce P4
- Hyperplasia = (5-fold) ↑ in #

T/F: The Corpus Luteum has a high metabolic demand?
consumes 2-6x more O_2 / unit weight than the liver, kidney, and heart

Explain the steps for Progesterone secretion: How does a luteal cell produce P4?

1. chol. LDL (low density lipoprotein) b/c its hydrophobic and needs a carrier in the blood to luteal cells
2. LH binds to LH receptor on plasma membrane
3. LH receptor complex activates intracellular cascade - Stimulates Adenylate cyclase
4. Adenylate cyclase promotes conversion of ATP to cyclic AMP (cAMP)
5. cAMP protein kinase enzymes - promotes entry of chol. into mitochondria
6. mitochondria enzymes convert chol. → pregnenolone
7. pregnenolone converted to progesterone in smooth ER

- chol imported by LDL and transported to mitochondria
- pregnenolone travels to smooth ER (chol → pregnenolone)
(pregnenolone → P4)

What are some of the affects of progesterone?
- suppress GnRH production
  - ↓ # of GnRH receptors in ant. pit. gland
- promotes mammary gland development
- induces max secretion of "uterine milk"
- quiets myometrium smooth muscle contractions

What happens if the female does not become pregnant?
Luteolysis occurs during 1-3 day period at the end of diestrus
= irreversible structural / functional damage to the CL

- CL → CA

Key Hormones Involved:	Hormone Sourse:
PGF2a	CL, uterus
Oxytocin	PPG ~~Hypothalamus~~, CL
Progesterone	CL, placenta

T/F The Uterus is not required for successful luteolysis to occur.

uterine $PGF_{2\alpha}$ is required for Luteolysis

ovarian artery and utero-ovarian vein have counter-current exchange to transfer $PGF_{2\alpha}$ to ovary (CL) without dilution

Explain the difference between functional and structural luteolysis

Functional: (always 1st) = ↓ in P_4 progesterone production

- uterine $PGF_{2\alpha}$ binds on LLC = ↑ in oxytocin
  - $PGF_{2\alpha}$ signaling = ↓ in LDL receptors on luteal cells and ↓ in LH receptors on luteal cells

Structural: (6-10 hours later) = luteal cells die (apoptosis)

- endothelial (blood cells) and SLC die first
  - LLC die second
- immune cells digest/remove cell fragments

$PGF_{2\alpha}$ ↓ blood flow to CL

↑ OT (LLC)

- SLC = OT receptor