



- **Synthesis of estrogen and progesterone:**

- **Cholesterol will be converted to pregnenolone** under the influence of LH-hormone secreted by theca cells. Notice that **pregnenolone can be directly converted to progesterone.**
- **Pregnenolone will be converted to 17-hydroxypregnenolone.**
- **17-hydroxypregnenolone. will be converted to dehydroepiandrosterone and then to androstendione.**
- Androstendione will diffuse to the nearby granulosa cells, which contain 17 β -hydroxysteroid dehydrogenase, which **converts androstendione to testosterone**, and aromatase, which **converts testosterone to 17 β -estradiol** (this action is enhanced by FSH-hormone).

Note: sources of estrogen include the following:

- ✓ Ovary: 17 β -estradiol
- ✓ Placenta: estriol
- ✓ Adipose tissue: estrone
Potency: estradiol > estrone > estriol

- **Regulation of the ovary:**

- Pulsatile secretion of GnRH from hypothalamus stimulates the anterior pituitary gland to secrete LH and FSH. These two –in turn- will stimulate the following in the ovaries:
 - ✓ Synthesis of steroids in the ovarian follicle and corpus luteum.
 - ✓ Follicular development beyond the antral stage.
 - ✓ Ovulation.
 - ✓ Luteinization.

- **What are the functions of estrogen?**

- It has both negative and positive feedback effects on FSH and LH secretion.
- Causing maturation of female internal genitalia: fallopian tubes, uterus, cervix and vagina (which are developing from paramesonephric duct).
- Development of female secondary sexual characteristics in puberty.
- Development of breasts.
- Maintains pregnancy.
- Lowers the uterine threshold to contractile stimuli during pregnancy.
- Stimulate prolactin secretion (but then blocks its action on the breast until estrogen level is suddenly reduced after giving birth).

- **What are the functions of progesterone?**

- It has a negative feedback on LH and FSH secretion during the luteal phase of the menstrual cycle (this will be explained in details later).
- Maintains secretory activity of the uterus during the luteal phase (preparing it to receive the fertilized egg for implantation).
- Maintains pregnancy.
- Participates in the development of breasts.

- **Menstrual cycle:**

• **Follicular phase (days 0-14):**

- ✓ A primordial follicle will develop to the graafian stage (you will not understand what is meant by all of this if you don't study histology of the female reproductive system).
- ✓ Estradiol levels will increase causing proliferation of the uterus.
- ✓ FSH and LH levels are suppressed by the negative feedback effect of estradiol on the anterior pituitary.
- ✓ Progesterone levels are low.



- **Ovulation (day 14):**
 - ✓ A burst of estradiol synthesis at the end of the follicular phase has a positive feedback effect of the secretion of FSH and LH (leading to what is known as LH surge).
 - ✓ Ovulation occurs as a result of the estrogen-induced LH surge.
 - ✓ Cervical mucus increases in quantity; it becomes less viscous and more penetrable by sperm.
- **Luteal phase (days 14-28):**
 - ✓ Corpus luteum begins to develop and it synthesizes estrogen and progesterone.
 - ✓ Vascularity and secretory activity of the endometrium increase to prepare for receipt of a fertilized egg.
 - ✓ Basal body temperature increases because of the effect of progesterone on the hypothalamic thermoregulatory center.
 - ✓ If fertilization does not occur, the corpus luteum regresses at the end of the luteal phase. As a result, estradiol and progesterone levels decrease abruptly.
- **Menses (days 0-4):**
 - ✓ The endometrium is sloughed because of the abrupt withdrawal of estradiol and progesterone.

