# HUMAN ANATOMY & PHYSIOLOGY-II- BP201T

UNIT: 5 (REPRODUCTIVE SYSTEM)

CLASS: 5

## TOPIC: OVARIAN HORMONES

Ovary secretes the female sex hormones estrogen and progesterone. Ovary also secretes few more hormones, namely inhibin, relaxin and small quantities of androgens.

### ESTROGEN

In a normal non-pregnant woman, estrogen is secreted in large quantity by theca interna cells of ovarian follicles and in small quantity by corpus luteum of the ovaries. Estrogen secretion is predominant at the later stage of follicular phase before ovulation. Estrogen is derived from androgens, particularly androstenedione, which is secreted in theca interna cells.

Androstenedione migrates from theca cells to granulosa cells, where it is converted into estrogen by the activity of the enzyme aromatase. A small quantity of estrogen is also secreted by adrenal cortex. In pregnant woman, a large amount of estrogen is secreted by the placenta. Estrogen is a C18 steroid. Estrogen is present in three forms in plasma: 1. β- estradiol 2. Estrone 3. Estriol. All the three forms of estrogen are present in significant quantities in plasma. The quantity and potency of β-estradiol are more than those of estrone and estriol. Plasma level of estrogen in females at normal reproductive age varies during different phases of menstrual cycle. Half-life of estrogen is 30 to 60 minutes.

The different forms of estrogen are synthesized from the cholesterol or acetate. If estrogen is formed from acetate, first acetate is converted into cholesterol.

Pathway for synthesis of estrogen

Acetate → Cholesterol → Pregnenolone ↓ Estrogen

← Testosterone ← Progesterone

During synthesis of estrogen, progesterone and testosterone are synthesized first. Then, before leaving the ovaries, almost all the testosterone and much of the progesterone are converted into estrogen. About 1/15 of testosterone is secreted into the plasma of the female by the ovaries. Estrogen is transported mainly by the plasma protein, albumin. A small quantity of estrogen is also transported by globulin.

FUNCTIONS OF ESTROGEN

1. Effect on Ovarian Follicles: Estrogen promotes the growth of ovarian follicles by increasing the proliferation of the follicular cells. It also increases the secretory activity of theca cells.
2. Effect on Uterus: Estrogen produces the following changes in uterus: i. Enlargement of uterus to about double of its childhood size due to the proliferation of endometrial cells ii. Increase in the blood supply to endometrium iii. Deposition of glycogen and fats in endometrium iv. Proliferation and dilatation of blood vessels of endometrium v. Proliferation and dilatation of the endometrial glands, which become more tortuous with increased blood flow vi. Increase in the spontaneous activity of the uterine muscles and their sensitivity to oxytocin vii. Increase in the contractility of the uterine muscles. All these changes prepare uterus for pregnancy.
3. Effect on Fallopian Tubes Estrogen: i. Acts on the mucosal lining of the fallopian tubes and increases the number and size of the epithelial cells, especially the ciliated epithelial cells lining the fallopian tubes ii. Increases the activity of the cilia, so that the movement of ovum in the fallopian tube is facilitated iii. Enhances the proliferation of glandular tissues in fallopian tubes. All these changes are necessary for the fertilization of ovum.
4. Effect on Vagina Estrogen: i. Changes the vaginal epithelium from cuboidal into stratified type; the stratified epithelium is more resistant to trauma and infection ii. Increases the layers of the vaginal epithelium by proliferation iii. Reduces the pH of vagina, making it more acidic. All these changes are necessary for the prevention of certain common vaginal infections such as gonorrheal vaginitis. Such infections can be cured by the administration of estrogen.
5. Effect on Secondary Sexual Characters Estrogen is responsible for the development of secondary sexual characters. i. Hair distribution: Hair develops in the pubic region and axilla. In females, pubic hair has the base of the triangle upwards. Body hair growth is less. Scalp hair grows profusely ii. Skin: Skin becomes soft and smooth. Vascularity of skin also increases iii. Body shape: Shoulders become narrow, hip broadens, thighs converge and the arms diverge. Fat deposition increases in breasts and buttocks iv. Pelvis:
   a. Broadening of pelvis with increased transverse diameter b. Round or oval shape of pelvis c. Round or oval=shaped pelvic outlet.

## PROGESTERONE

In non-pregnant woman, a small quantity of progesterone is secreted by theca interna cells of ovaries during the first half of menstrual cycle, i.e. during follicular stage. But, a large quantity of progesterone is secreted during the latter half of each menstrual cycle, i.e. during secretory phase by the corpus luteum. Small amount of progesterone is secreted from adrenal cortex also. In pregnant woman, large amount of progesterone is secreted by the corpus luteum in the first trimester. In the second trimester, corpus luteum degenerates. Placenta secretes large quantity of progesterone in second and third trimesters.

## FUNCTIONS OF PROGESTERONE

1. Effect on Fallopian Tubes
2. Effect on the Uterus
3. Effect on Cervix
4. Effect on the Mammary Glands
5. Thermogenic Effect
6. Effect on Respiration