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**18/ENG08/020**

**BIOMEDICAL ENGINEERING**

**ASSIGNMENT**

**Briefly discuss the CYCLIC CHANGES in any two of the following:**

**a) CERVIX       (b) VAGINA         (c) BREASTS**

**Explicate any one of the following:**

**1) Menstrual cycle**

**2) Hormonal regulation of the menstrual cycle**

**ANSWERS**

1. ***CYCLIC CHANGES IN THE BREAST***

Breast development is a vital part of a woman’s reproduction. Breast development happens in certain stages during a woman's life: first before birth, again at puberty, and later during the childbearing years. Changes also happen to the breasts during the menstrual cycle and when a woman reaches menopause. As a girl approaches her teen years, the first visible signs of breast development begin. When the ovaries start to produce and release estrogen, fat in the connective tissue starts to collect. This causes the breasts to enlarge. The duct system also starts to grow. Once ovulation and menstruation begin, the maturing of the breasts begins with the formation of secretory glands at the end of the milk ducts. The breasts and duct system continue to grow and mature, with the development of many glands and lobules. The rate at which breasts grow is different for each young woman.

Each month, women go through changes in the hormones that make up the normal menstrual cycle. The hormone estrogen is produced by the ovaries in the first half of the menstrual cycle. It stimulates the growth of milk ducts in the breasts. The increasing level of estrogen leads to ovulation halfway through the cycle. Next, the hormone progesterone takes over in the second half of the cycle. It stimulates the formation of the milk glands. These hormones are believed to be responsible for the cyclical changes that many women feel in their breasts just before menstruation. These include swelling, pain, and soreness. During menstruation, many women also have changes in breast texture. Their breasts may feel very lumpy. This is because the glands in the breast are enlarging to get ready for a possible pregnancy. If pregnancy does not happen, the breasts go back to normal size. Once menstruation starts, the cycle begins again. By the time a woman reaches her late 40s and early 50s, perimenopause is starting or is well underway. At this time, the levels of estrogen and progesterone begin to change. Estrogen levels dramatically decrease. This leads to many of the symptoms commonly linked to menopause. Without estrogen, the breast’s connective tissue becomes dehydrated and is no longer elastic. The breast tissue, which was prepared to make milk, shrinks and loses shape. This leads to the "saggy" breasts associated with women of this age.

1. ***CYCLIC CHANGES IN THE VAGINA***
* Proliferative phase: Ephithilal cells of vagina are cornified for which estrogen is responsible.
* Secretary phase: Vaginal epithelium proliferates due to the action of progesterone. It is also infiltrated with leukocytes. These two changes increase the resistance of vagina for infection.

2. Hormones involved in the regulation of menstrual cycle

The regulation system functions through the hormones of hypothalamo-pituary-ovarian axis. Hormones involved in the regulation of menstrual cycle are:

1. Hypothalamic hormone: GnRH
2. Anterior pituitary hormones: FSH and LH
3. Ovarian hormones: Estrogen and progesterone.
4. ***Hypothalamic Hormone – GnRH –***

GnRH triggers the cyclic changes during menstrual cycle by stimulating secretion of FSH and LH from anterior pituitary. GnRH secretion depends upon two factors:

* External factors like psychosocial events, which act on hypothalamus via cortex and many other brain centers.
* Feedback effects of ovarian changes via ovarian hormones.
1. ***Anterior Pituitary Hormones***: FSH and LH-FSH and LH modulate the ovarian and uterine changes by acting directly and indirectly via ovarian hormones. FSH stimulates the recruitment and growth of immature ovarian follicles. LH triggers ovulation and sustains corpus luteum. Secretion of FSH and LH is under the influence of GnRH.
2. ***Ovarian Hormones (Estrogen and Progesterone):*** Estrogen and progesterone which are secreted by follicle and corpus luteum, show many activities during menstrual cycle. Ovarian follicle secretes large quantity of estrogen and corpus luteum secretes large quantity of progesterone. Estrogen secretion reaches the peak twice in each cycle; once during follicular phase just before ovulation and another one during luteal phase. On the other hand, progesterone is virtually absent during follicular phase till prior to ovulation. But it plays a critical role during luteal phase. Estrogen is responsible for the growth of follicles. Both the steroids act together to produce the changes in uterus, cervix and vagina. Both the ovarian hormones are under the influence of GnRH, which acts via FSH and LH. In addition, the secretion of GnRH, FSH and LH is regulated by ovarian hormones.