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1(a). CYCLIC CHANGES IN CERVIX

Mucus membrane of the cervix also shows cyclic changes during different phases of menstrual cycle.

Proliferative Phase: During proliferative phase, the mucus membrane of cervix becomes thinner and more alkaline due to the influence of estrogen. It helps in the survival and motility of spermatozoa.

Secretory Phase: During secretory phase, the mucus membrane of cervix becomes more thicker and adhesive because of actions of progesterone.

Changes in the properties of the cervical mucus promote the survival and transport of sperm and can thus be important for normal fertility. The cervical mucus undergoes cyclic changes in composition and volume. During the follicular phase, estrogen increases the quantity, alkalinity, viscosity, and elasticity of the mucus. The cervical muscles relax, and the epithelium becomes secretory in response to estrogen. By the time of ovulation, elasticity of the mucus is greatest. Sperm can readily pass through the estrogen-dominated mucus. With progesterone rising either after ovulation, during pregnancy, or with low-dose administration of progestogen during the cycle, the quantity and elasticity of the mucus decline; it becomes thicker and does not form a ferning pattern when dried on a microscope slide. With these conditions, the mucus provides better protection against infections and sperm do not easily pass through. The vaginal epithelium proliferates under the influence of estrogen. Basophilic cells predominate early in the follicular phase. The columnar epithelium becomes cornified (keratinized) under the influence of estrogen and reaches its peak in the periovulatory period. During the postovulatory period, progesterone induces the formation of thick mucus, the epithelium becomes infiltrated with leukocytes, and cornification decreases.

1(c). CYCLIC CHANGES IN BREASTS

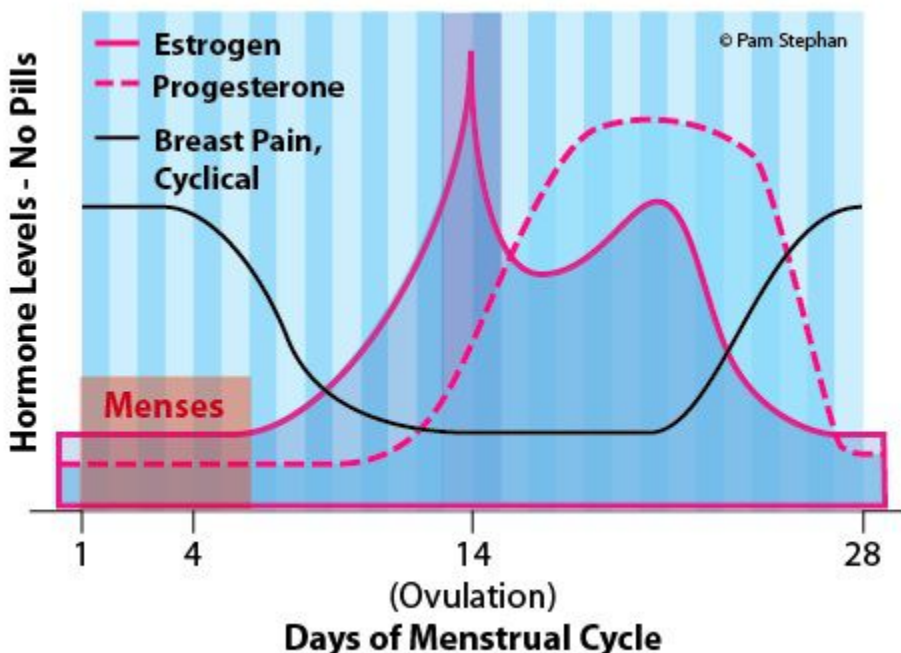
Cyclical breast pain happens during a woman's menstrual cycle or at least varies in intensity at different points in the cycle. A range of sensations in one or both breasts can accompany the hormonal ebb and flow that a premenopausal woman normally experiences.

Breast pain is often one of the components of premenstrual syndrome (PMS) and can present along with fatigue, irritability, and abnormal hormone levels. Breast pain may

also occur before your periods without the other common symptoms of PMS. Breast pain associated with PMS is often achy with a sensation of your breast feeling full, heavy, or swollen. The discomfort often begins a few days before your period starts and may continue until your period has stopped, though it often decreases in severity as time goes on.

Normal Cyclical Pain: Cyclical breast pain may be normal and associated with normal hormonal changes. This is the most common cause, and even though "normal" can be as severe and interfere with life as much as pain due to medical conditions. If you are living with this kind of pain it's important not to dismiss the pain, or feel that as a woman you need to "suck it up" and just deal with it.

Associated Conditions: Cyclical breast pain may also be due to benign breast conditions known as fibrocystic breast changes or mammary duct ectasia. With fibrocystic breast changes, you may note generalized achiness with diffuse areas of your tenderness in your breasts. Your breasts may also feel firm and thick. Both microcysts (which can't be felt) and macrocysts (which can be felt) may occur. Larger cysts can be seen on ultrasound, and a needle biopsy to drain the cyst may be needed to diagnose the condition. Mammary duct ectasia is more common in perimenopausal (women nearing menopause) women and often causes tenderness in the nipple and areola. Less commonly, duct ectasia may occur in older people or adolescents.



2(b). HORMONAL REGULATION OF MENSTRUAL CYCLE

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

1. Hypothalamic hormone: Gonadotropin-releasing hormone (GnRH)
2. Anterior pituitary hormones: Follicle-stimulating hormone and Luteinizing Hormone (FSH and LH)
3. Ovarian hormones: Estrogen and progesterone.

Hypothalamic Hormone: Gonadotropin-releasing 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:

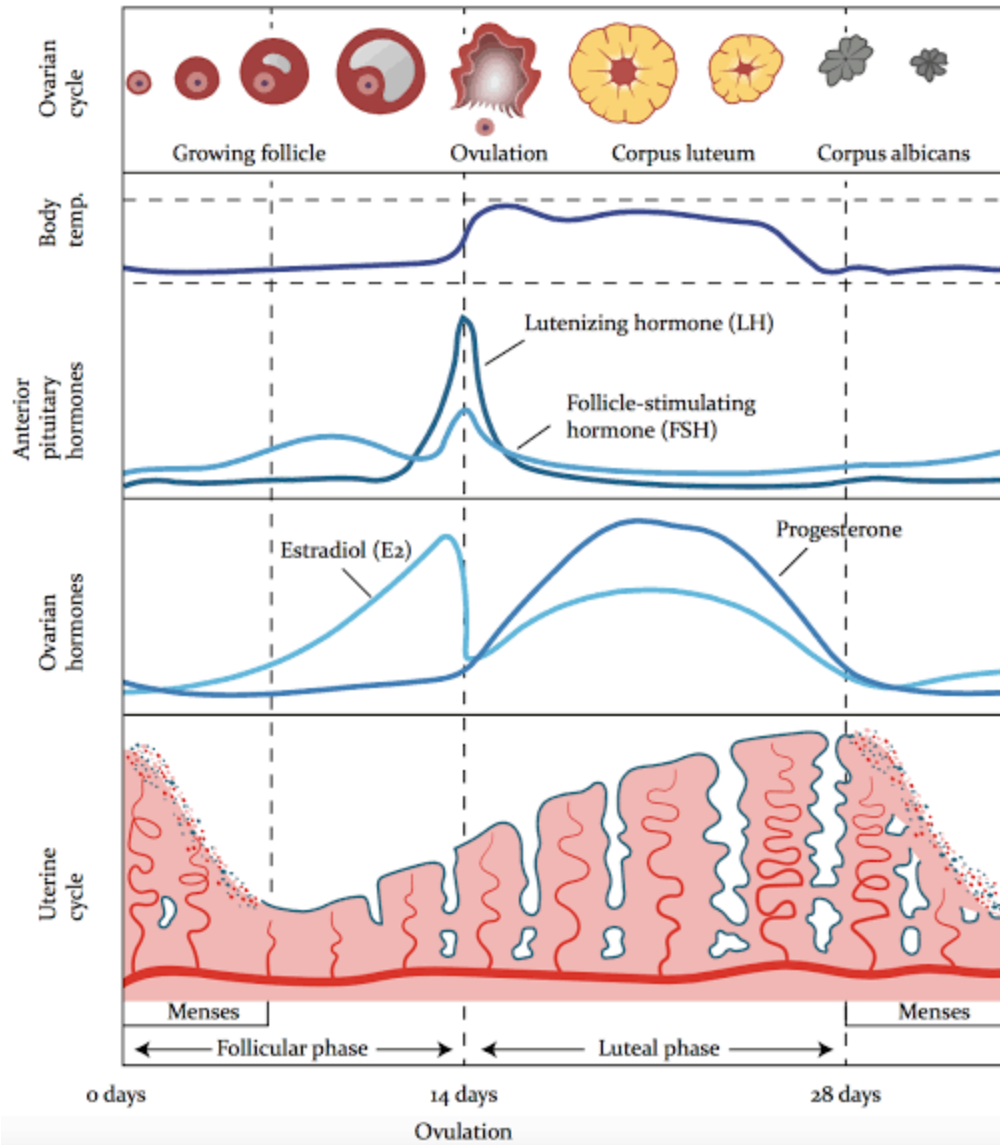
- a. External factors like psychosocial events, which act on hypothalamus via cortex and many other brain centers
- b. Feedback effects of ovarian changes via ovarian hormones.

Anterior Pituitary Hormones: Follicle-stimulating hormone and Luteinizing Hormone (FSH and LH)

FSH and LH modulate the ovarian and uterine changes by acting directly and/or 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.

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.



Hormonal Regulation of Menstrual Cycle