Female Physiology Before Pregnancy and Female Hormones-II

Unit XIV

Chapter 82

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Functions of the ovarian hormones

Two types of ovarian sex hormones:

1-Estrogens

- promote proliferation and growth of specific cells in the body that are responsible for the development of most **secondary sexual characteristics** of the female
- mainly from ovary (in non-pregnant) and very little from the adrenal cortex.
- In pregnancy the placenta secretes very large amount.

- **Three estrogens.**
- β-estradiol (the principle one and most potent)
- Estrone: most of this is formed in the peripheral tissues from androgens secreted by the adrenal cortices
- Estriol: weak, Increase in pregnancy

Functions of the ovarian hormones

Two types of ovarian sex hormones:

2-progestins

- the most important progesterone
- little of 17-α- hydroxyprogesterone.
- In non-pregnant progesterone is secreted mainly from corpus luteum.
- In pregnancy, large amount by placenta especially after 4th month of pregnancy
- to prepare the uterus for pregnancy and the breasts for lactation.

Estrogens and Progesterone Are Transported in the Blood Bound to Plasma Proteins (albumin and with specific estrogen and progesterone-binding globulins)

Functions of estrogen

- External female sex organs: at puberty, increase in size of ovaries, fallopian tubes, uterus and vagina, external genitalia

  deposition of fat in mons pubis

- change vaginal epithelia from cuboidal to stratified type→more resistant to trauma & infection

- endometrium: proliferation of stroma and endometrial glands (important in nutrition of fertilized ovum)

- Fallopian Tubes: proliferation of **glandular tissues** of this lining to proliferate, and especially important, **increase number of ciliated** epithelial cells that line the fallopian tubes

  Increase activity of the cilia -cilia always beat toward the uterus→ helps propel the fertilized ovum in that direction.

- Breasts: fat deposition, development of stromal cells, growth of ducts

(progesterone (mainly), prolactin important in milk production. estrogen influence growth of alveoli & lobules)

Functions of estrogen

- Skin: increase vascularization of skin and development of soft skin
- Hair: little effect -pubic & axillary hair→adrenal androgens
- Bones: estrogen inhibits osteoclastic activity→+ osteoprotegerin/osteoclastogenesis inhibitory factor, so height increases after puberty, but epiphyses and shafts of bones unite early and growth stops

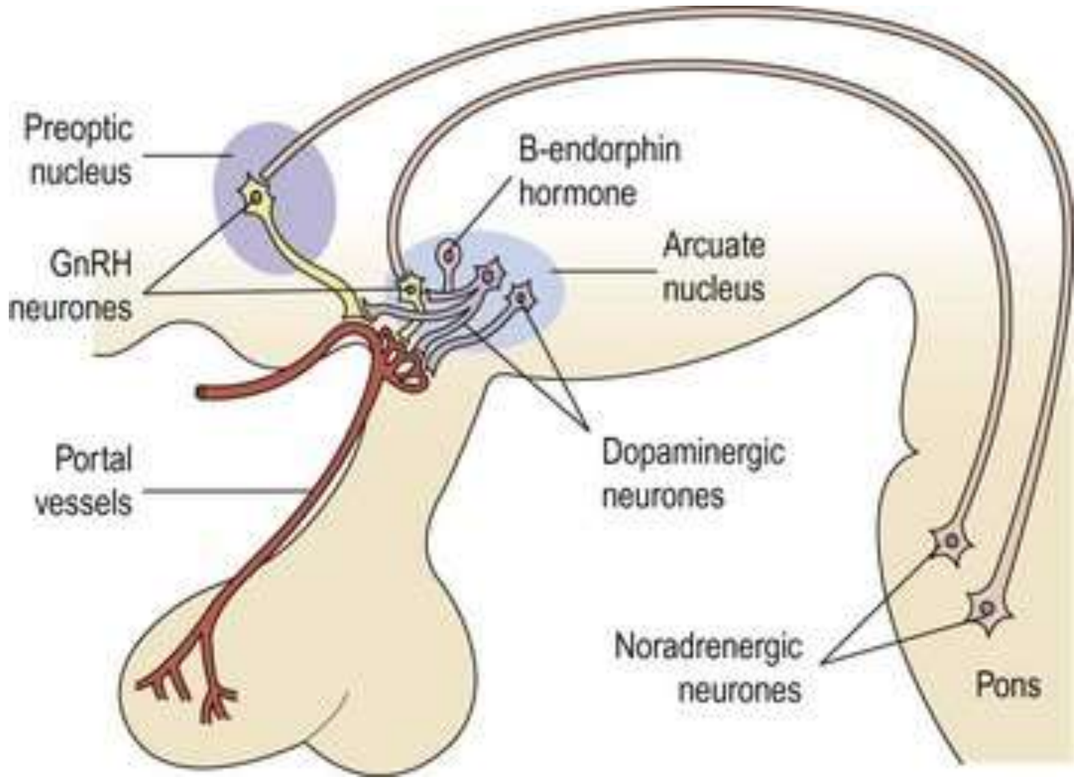
Menopause→osteoporosis

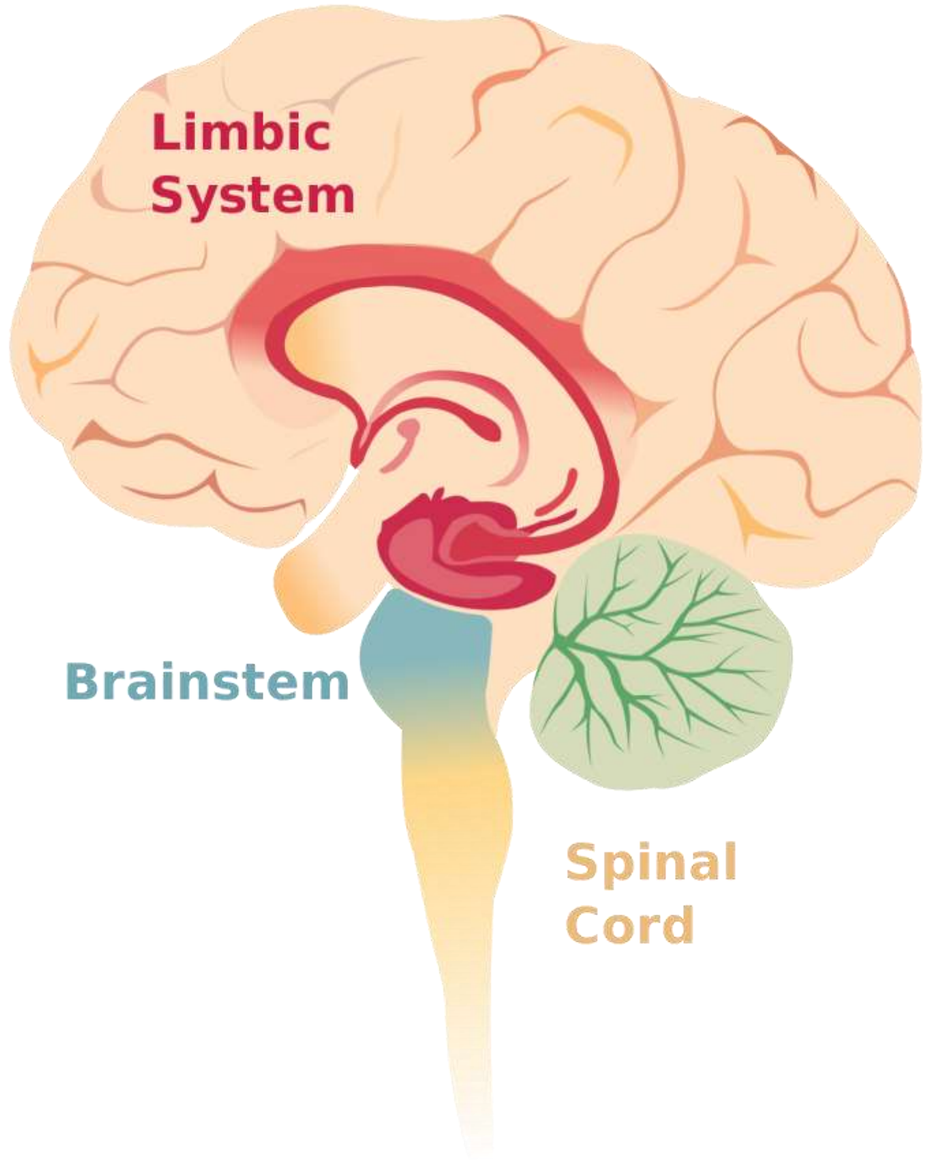
- Estrogens slightly increase protein deposition (more in males)
- Sodium and water retention by the kidney. Slight effect but during **pregnancy** the tremendous formation of estrogens by the placenta may contribute to **body fluid retention**
- Estrogens increase body metabolism and fat deposition (subcutaneous tissues, breasts, buttocks and thighs)
- More subcutaneous fat in women than men

Functions of Progesterone

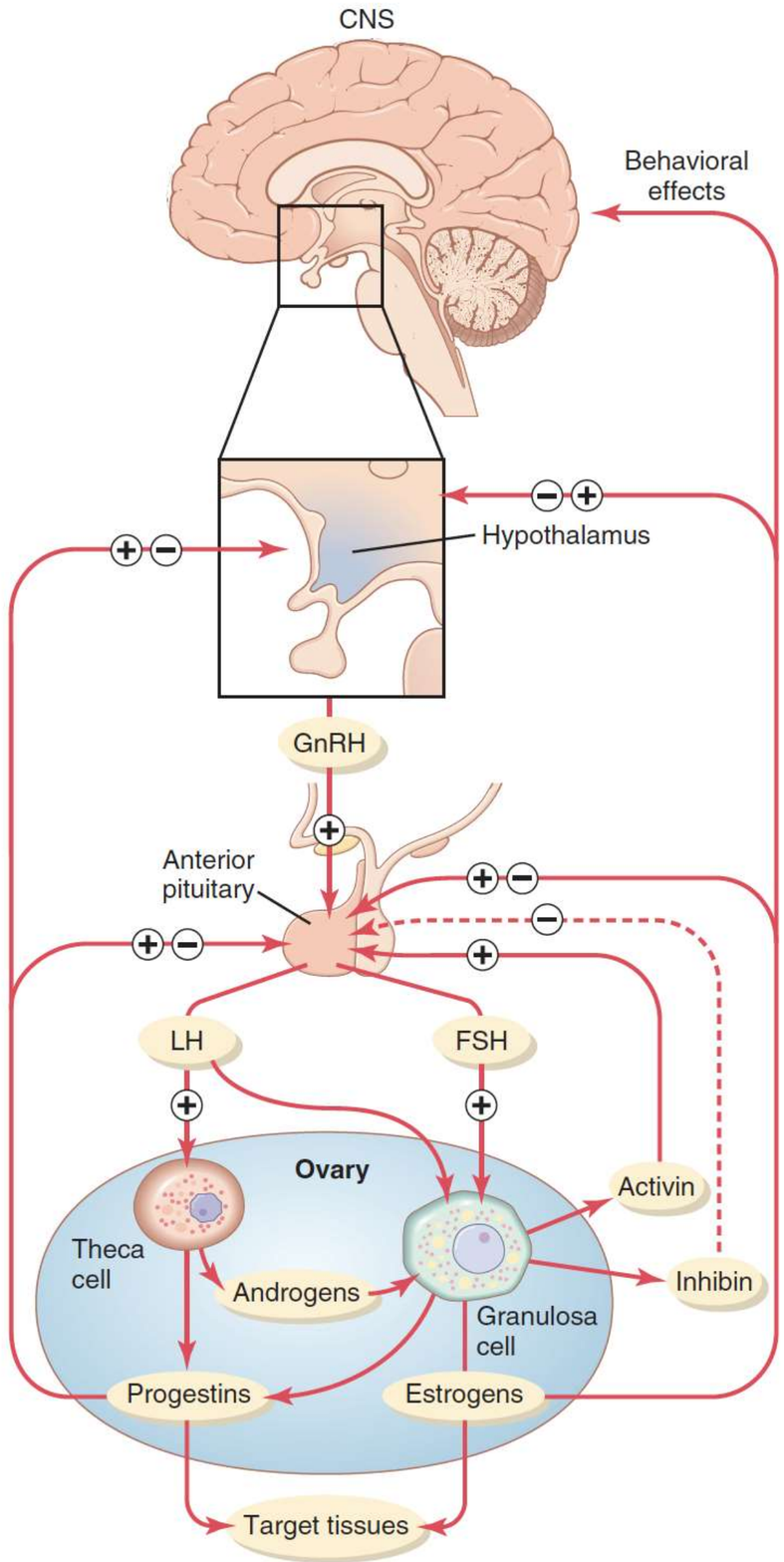
1. Promotes **secretory changes** in the uterus during the latter half of the monthly female sexual cycle suitable for implantation of an embryo (secretory phase).
2. Decreases contraction of uterine tubes and myometrium (decreases expulsion of implanted ovum).
3. Stimulates breast growth, and swelling particularly glandular tissue.
4. Increase mucosal secretions of the fallopian tubes to provide nutrition to the fertilized dividing ovum which traverses the tubes towards the uterus body.
5. Changes the cervix mucus into thick and sticky (cervical plug).

Overview of Hormonal Regulation

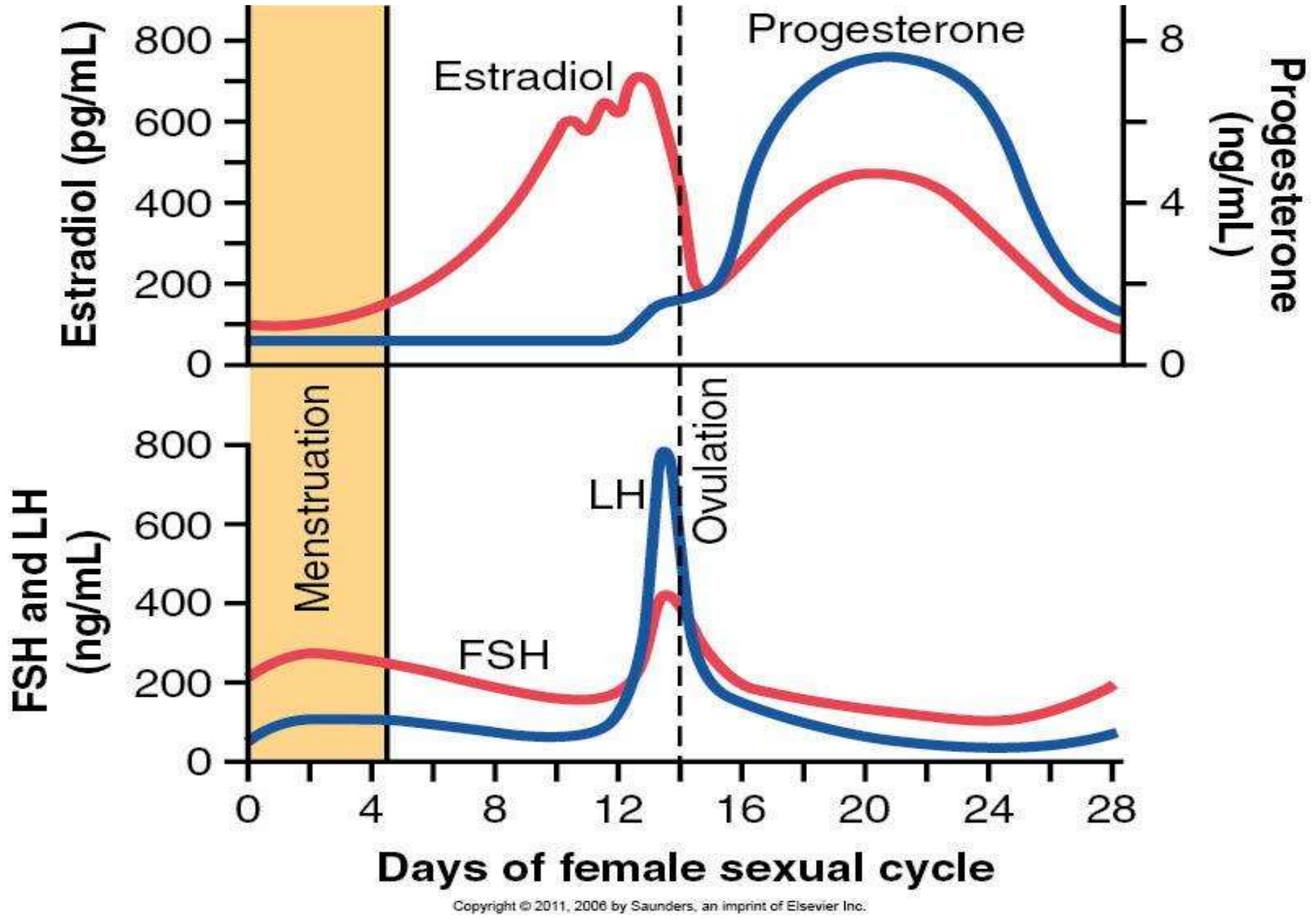




Overview of Hormonal Regulation



Feedback oscillation of the hypothalamic-pituitar-yovarian system



Anovulatory Cycles—Sexual Cycles at Puberty

preovulatory surge of LH is not sufficient →anovulatory cycle

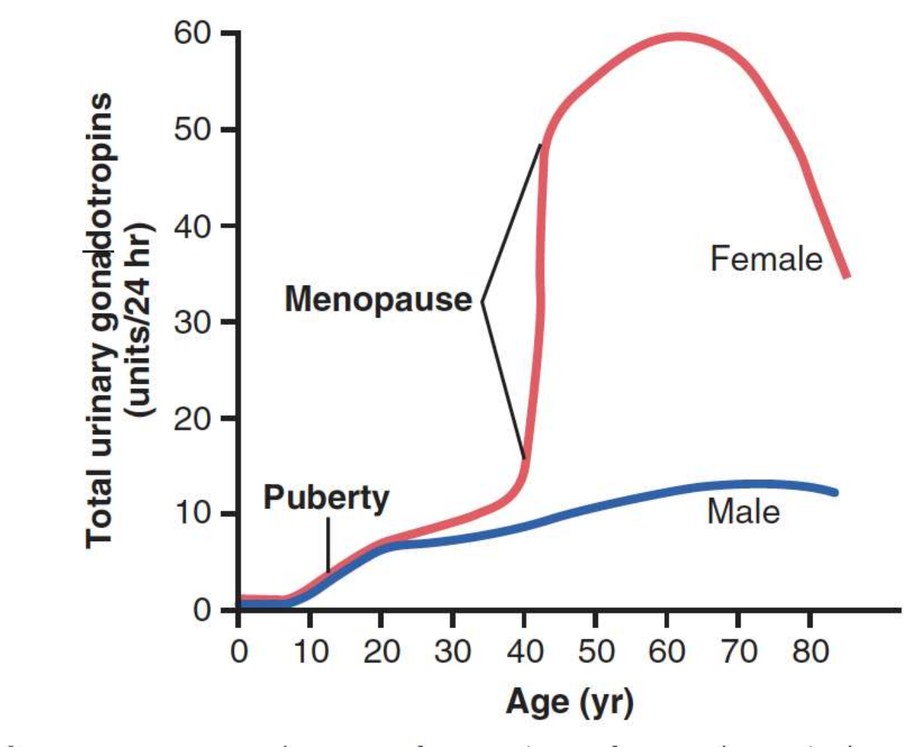
Consequences
failure of development of corpus luteum
no secretion of **progesterone** during the latter portion of the cycle
cycle is shortened

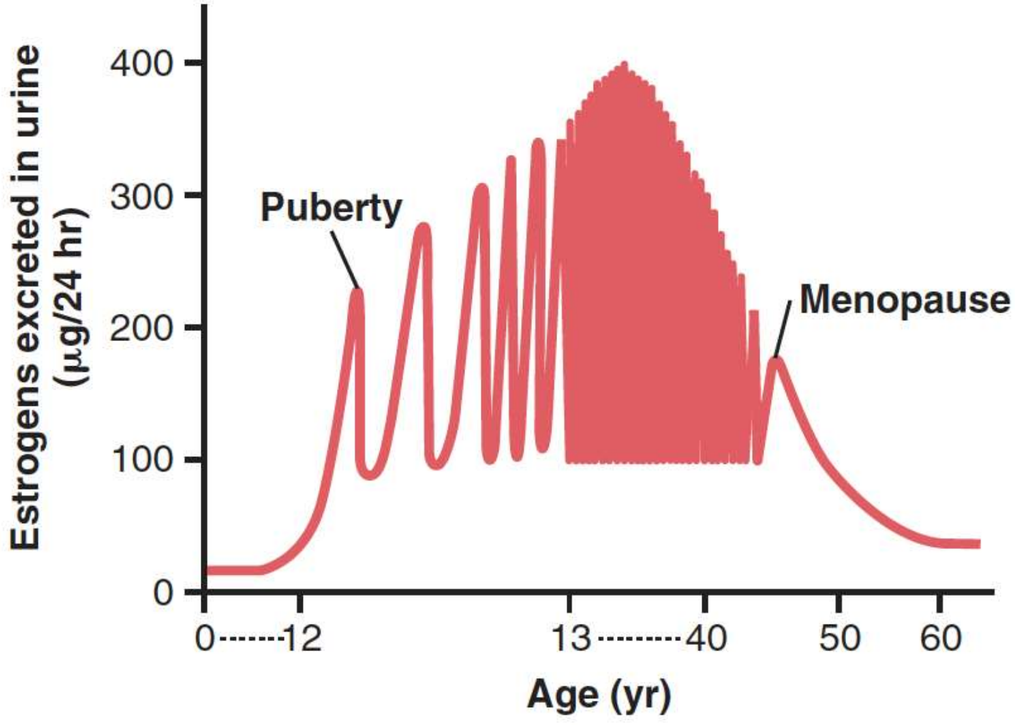
The first few cycles after the onset of puberty are usually anovulatory, as are the cycles occurring several months to years before menopause

PUBERTY AND MENARCHE

The period of **puberty** is caused by a gradual increase in **GnRH** by the pituitary beginning in about the **eighth** year of life, and usually culminating in the onset of puberty and menstruation between ages **11 and 16** years in girls (average, 13 years).

the hypothalamus does not secrete significant quantities of GnRH during childhood.





Menopause

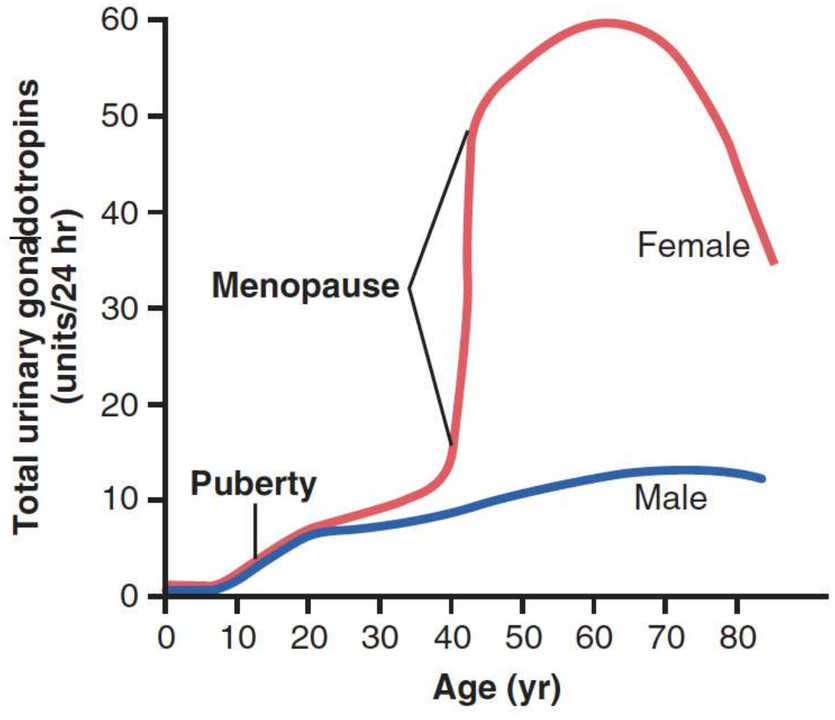
At age 40 to 50 years, the sexual cycle usually becomes **irregular** and **ovulation often fails to occur**.

After a few months to a few years, the cycle ceases

The period during which the **cycle ceases** and the **female sex hormones diminish** to almost none is called **menopause**

estrogens can no longer inhibit FSH and LH

FSH and LH (mainly FSH) are produced after menopause **in large** and continuous quantities



Menopause

the production of estrogens by the ovaries falls virtually to zero.

The loss of estrogens :

(1) “hot flushes” characterized by extreme flushing of the skin
(2) psychic sensations of dyspnea
(3) Irritability
(4) Fatigue
(5) anxiety
(6) Decreased strength and calcification of bones throughout the body

Administration of estrogen (HRT) after menopause→ ▼symptoms of menopause, may increase the risk for cardiovascular disease

Female sexual response

- **Stimulation of the Female Sexual Act.**
- psychic stimulation, local sexual stimulation & thoughts.
- Sexual desire is based on psychological and physiological drive
- sexual desire does increase in proportion to the level of sex hormones
- Desire also changes during the monthly sexual cycle, reaching a **peak** near the time of **ovulation**, probably because of the high **levels of estrogen** secretion during the **preovulatory period.**

Female sexual act

- Sexual stimulation in women is initiated by stimulation of the vulva, vagina, and other perineal regions can create sexual sensations.
- The glans of the clitoris is very sensitive the sexual stimulation

sensory signals

↓

pudendal nerve and sacral plexus

↓

sacral segments of the spinal cord

↓

Cerebrum

Female Erection and Lubrication.

Parasympathetic from sacral plexus → Bilateral Bartholin glands

↓

erectile tissue located around the introitus

↓

release of Ach, NO, and VIP

↓

Vasodilation & accumulation of blood in the erectile tissue

↓

introitus tightens around the penis

↓

stimulation for ejaculation

↓

Mucus

↓

Lubrication

Vaginal epithelium

Male urethral glands

Female Orgasm

Female Orgasm (female climax) : happens when maximal sexual sensation is reached.

This is supported by **psychic conditioning signals** from the cerebrum

female orgasm is analogous to **emission and ejaculation** in the male, and it may help promote fertilization of the ovum.

Process is similar in males and females:

1) Excitement phase:caused by psychological or physical stimulation; engorgement and erection of clitoris, vaginal congestion -- parasympathetic nerves

2) Plateau phase: intensification of these responses, increased HR, BP, respiratory rate, muscle tension

3) Orgasmic phase:culmination of sexual excitement, intense physical pleasure

4) Resolution phase:returns genitalia and body systems to pre-arousal state

Male and female sexual response

Differences:

Women don’t require refractory time before beginning excitation again

No ejaculation in the female

Fertile Period of Each Sexual Cycle.

The ovum remains viable and capable of being fertilized → 24 hours after it is expelled from the ovary.

Therefore, sperm must be available soon after ovulation if fertilization is to take place.

A few sperm can remain fertile in the female reproductive tract for up to 5 days.

Therefore, for fertilization to take place, intercourse must occur sometime between **4 and 5 days before ovulation up to a few hours after ovulation**.

Thus, the period of female fertility during each month is short—about 4 to 5 days.

Concept of contraception

The end