



Estrogens are a family of female sex steroid hormones, the main representatives of which are estradiol, estriol, and estrone. They are primarily secreted by the ovaries, but also in small amounts by the adrenal glands and adipose tissue. Estrogens play an essential role in the development and maintenance of female sexual characteristics, as well as in the regulation of the menstrual cycle.

Estradiol (E2) is the most potent and abundant estrogen in women of childbearing age. It is synthesized by the granulosa cells of the ovarian follicle from androgens produced by the internal theca cells, under the influence of FSH. Estradiol production gradually increases during the follicular phase, parallel to the growth and maturation of the dominant follicle.

Estrogens exert multiple actions on the female reproductive system and the entire body. In the uterus, they stimulate the proliferation of the endometrium in the follicular phase, thus preparing a favorable ground for embryonic implantation. They also act on the cervix by stimulating the production of a threadlike and permeable cervical mucus during the peri-ovulatory period.

In the breasts, estrogens promote the development of the mammary ducts and the growth of adipose tissue, thus contributing to breast development at puberty and with each menstrual cycle. They also contribute to maintaining bone density by stimulating the activity of osteoblasts, and to the regulation of the distribution of body fats according to a gynoid distribution (hips and thighs).

Estrogens exert feedback on the hypothalamic-pituitary axis, modulating the secretion of gonadotropins FSH and LH. At the beginning of the follicular phase, low levels of estradiol exert negative feedback on the hypothalamus and pituitary, allowing high secretion of FSH

necessary for follicular recruitment. As estradiol levels increase with follicular growth, they exert negative feedback on FSH secretion, allowing the selection of the dominant follicle.

At the end of the follicular phase, when estradiol levels reach a critical threshold for a sufficient duration, they exert positive feedback on the gonadotropic axis, triggering the ovulatory peak of LH responsible for ovulation. After ovulation, estradiol levels temporarily decrease, then increase again in the luteal phase under the influence of progesterone secreted by the corpus luteum.

Abnormalities in estrogen secretion or action can disrupt the menstrual cycle and fertility. Premature ovarian insufficiency, characterized by early exhaustion of the follicular reserve, leads to an estrogen deficit responsible for amenorrhea and infertility. Conversely, relative hyperestrogenism, observed in some cases of polycystic ovary syndrome, can disrupt follicular growth and ovulation.

Estrogen deficiency after menopause is responsible for many climacteric symptoms, such as hot flashes, vaginal dryness, mood disorders, and osteoporosis. Hormone replacement therapy based on estrogens may be offered to relieve these symptoms and prevent bone loss, after evaluating the benefit/risk ratio.

Estrogens are also involved in the development of certain hormone-dependent diseases, such as breast, endometrial or ovarian cancer. Prolonged exposure to estrogens, related to early puberty, late menopause or obesity, is a risk factor for these cancers. Conversely, early bilateral ovariectomy, performed before the age of 40, significantly reduces the risk of breast cancer.

Understanding the role of estrogens in regulating the menstrual cycle and female physiology is essential to understand the mechanisms of endocrine disorders and infertility. The dosage of estrogens, especially estradiol, is commonly performed in the evaluation of amenorrhea, infertility or ovarian insufficiency. It also allows for the monitoring of follicular growth during ovarian stimulations for assisted reproduction.

Points to recall:

- Estrogens, primarily secreted by the ovaries, are essential for the development and maintenance of female sexual characteristics and the regulation of the menstrual cycle.
- Estradiol (E2), the most potent estrogen, is synthesized by the granulosa cells of the ovarian follicle under the influence of FSH.
- Estrogens stimulate endometrial proliferation, cervical mucus production, mammalian development, and bone density maintenance.

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- Estrogens are involved in the development of certain hormone-dependent diseases such as breast, endometrial or ovarian cancer.
- The dosage of estrogens is commonly performed in the evaluation of amenorrhea, infertility or ovarian insufficiency, and to monitor follicular growth during ovarian stimulations.