

Difference Between Androgen and Estrogen

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Key Difference - Androgen vs Estrogen

Sex [hormones](#) are [steroid hormones](#) that play a major role in the determination of the sex characters in organisms while also involving in other regulatory functions. Androgen and Estrogen fall under the category of sex hormones. Androgens are a group of sex hormones that are found in higher levels in males. Different hormones fall into this group of androgens including testosterone, which is the main male sex hormone. These hormones are responsible for male characteristics and reproduction. Estrogen is the sex hormone that is found in higher levels in females. Estrogen is responsible for the female characteristics and reproduction. The **key difference** between androgen and estrogen is its distribution between the two main genders; male and female. **Androgen is distributed in higher levels in males whereas, estrogen is distributed in higher levels in females.**

What is Androgen?

Androgens are referred to as male sex hormones that are required in imparting secondary sexual characteristics to males while playing an important role during reproduction; the production of sperms. Androgens are also present in females but in very minute quantities, making men to have 20-25 fold higher concentration than in females. There are two main types of androgens namely, adrenal androgens and testicular androgens. Adrenal androgens function as weak steroids, and they include Dehydroepiandrosterone (DHEA), dehydroepiandrosterone sulfate (DHEA-S), and androstenedione. The main androgen, which is testosterone is the testicular androgen and is produced by the [Leydig cells](#) of the testes.

The secretion of testosterone is mainly mediated by the Gonadotropin-Releasing Hormone produced in the [hypothalamus](#). Gonadotropin Releasing Hormone stimulates the Luteinizing hormone to secrete testosterone. Testosterone which is the main male androgen is a steroid hormone composed of the characteristic four ring sterol structure. Thus, it is lipid soluble. Hence, it readily crosses the [plasma membrane](#) once bound to the androgen receptor. The androgen receptor – testosterone complex then bind the corresponding Hormone response element in the [DNA](#) and activate [transcription](#).

Testosterone or male androgens are involved in performing a wide array of functions in males. Testosterone is involved in the process of [spermatogenesis](#): the production of sperms in males. It is also involved in maintaining the testicular functions. Testosterone is the active hormone responsible for male secondary sexual characteristics including the development of body hair, voice deepening, broadening of shoulders, muscle mass increase, penile growth and the emergence of Adam's apple.

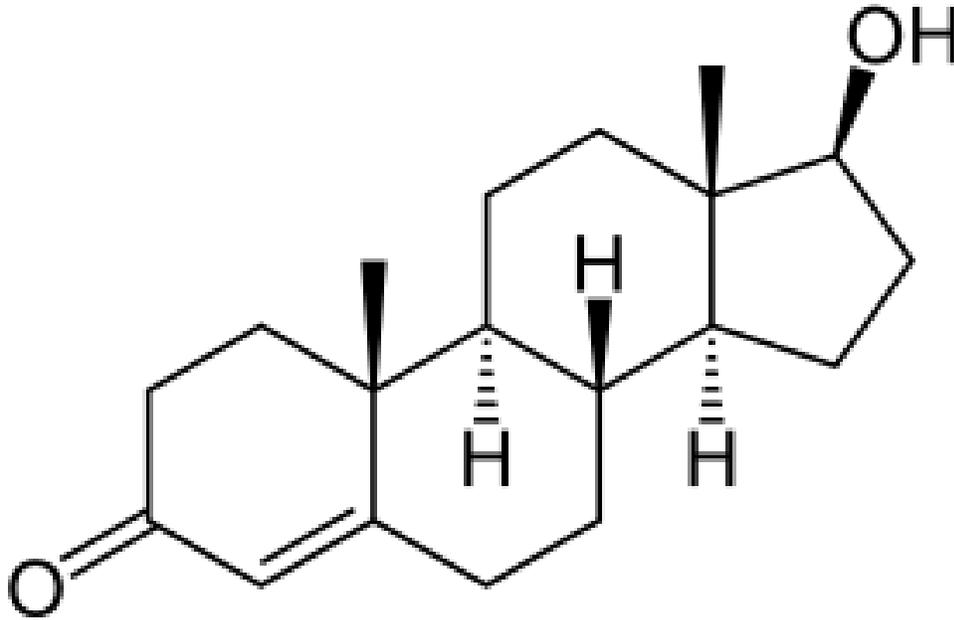


Figure 01: Androgen – Testosterone

Androgen activity is also present in females but in a very low scale. Androgens in females are involved in premature uterine contractions and help to create a balance of hormones. Although conditions such as hyperandrogenism, where androgens levels of females rise above the normal can lead to health complications such as [Polycystic ovary syndrome in females \(PCOS\)](#).

What is Estrogen?

Estrogens belong to the class of steroid hormones and are the main hormone that involves in imparting sexual characteristics to females. Estrogen is mainly secreted by the [ovaries](#). The [placenta](#) also can secrete a minute amount of estrogen during the [gestation phase](#) of a female. Similar to androgens, estrogen is also present in males but in very fewer quantities.

There are three main types of estrogen secreted by females. They include:

- Estradiol – predominant estrogen type during the reproductive phase.
- Esterone – predominant form during [menopause](#).
- Estriol – predominant form during [pregnancy](#).

Estrogens are also steroid hormones composed of the characteristic sterol ring, and hence it is fat soluble. The estrogen receptors bind to estrogen that is secreted in response to stimuli. The estrogen complex then enters the nucleus where it binds to the hormone response element of the DNA to activate transcription.

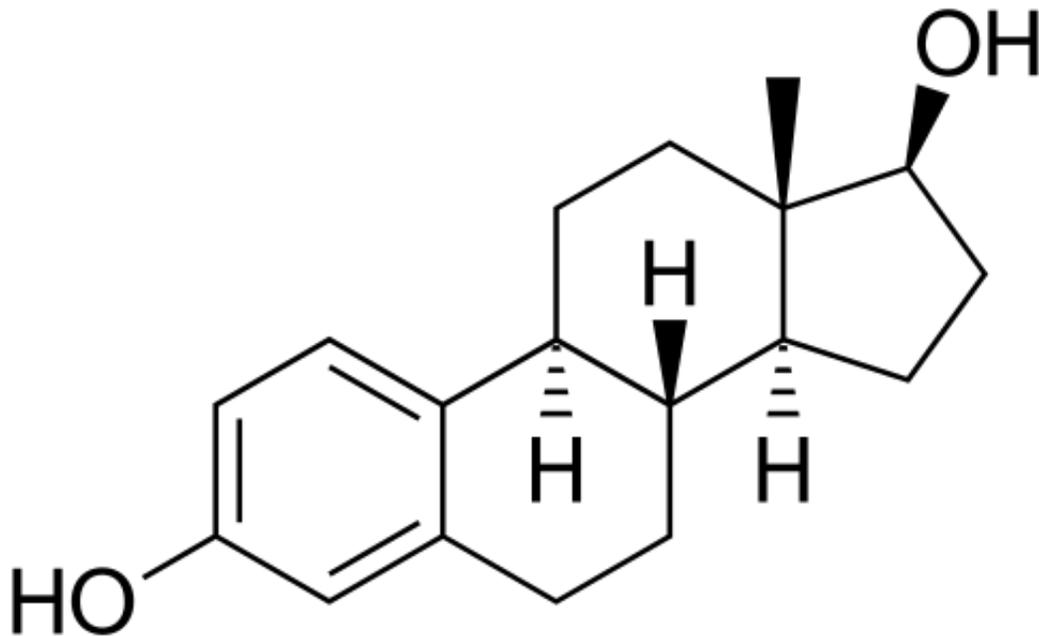


Figure 02: Estrogen

Estrogens are involved in wide spectra of functions related to female reproduction and development. Estrogen favours the development of the female reproductive organs and mediates their functions. Estrogen is also involved in the growth of the endometrium and uterus during the [fertilization](#) process, increase vaginal lubrication and thicken the vaginal wall. Estrogen is also the main hormone that brings about the secondary sexual characteristics in females. They include the development of breast, development of pubic hair, widening of hips and increase of muscle mass. Estrogen along with progesterone plays an important role in maintaining the menstrual cycle in females.

What are the Similarities Between Androgen and Estrogen?

- Both Androgen and Estrogen hormones are steroid hormones.
- Both Androgen and Estrogen hormones are present in males and females.
- Deficiency in both Androgen and Estrogen hormones can lead to altered sexual characteristics and functions in males and females.
- Both Androgen and Estrogen hormones are involved in the reproduction process and in the development of secondary sexual characteristics.
- Both Androgen and Estrogen hormones signal transduction pathways involve binding to the hormone response element of the DNA via the formation of the hormone – receptor complex.

What is the Difference Between Androgen and Estrogen?

Androgen vs Estrogen	
Androgen is the sex hormone that is found in high amounts in males that are responsible for male characteristics and reproduction.	Estrogen is the sex hormone that is found in high levels in females which is responsible for the female characteristics and reproduction.
Types	
There are two major types of androgens namely, adrenal androgens and testicular androgens.	There are three main types of estrogen namely, estradiol, estrone, estriol.
Function	
Androgen imparts male sexual characteristics and aids in the reproduction process	Estrogen imparts female sexual characteristics and aids in the reproduction process, pregnancy, delivery of the baby and the process of menstruation and menopause.

Summary - Androgen vs Estrogen

Androgen and estrogen are the two main steroid sex hormones present in males and females respectively. Androgens are predominant in males and have varied types out of which testosterone plays the major role. It is responsible for the reproductive functions as well as the development of secondary sexual characteristics in males. In contrast, estrogen is the main female sex hormone. Similar to testosterone, estrogen also directs the reproductive functions in females and is responsible for the development of the secondary sexual characteristics. Deficiency or excess of these hormones can lead to different disorders in males and females. Therefore, it is important that the androgen to estrogen ratio is maintained in both males and females.

Reference:

- 1.Horstman, Astrid M., et al. "The Role of Androgens and Estrogens on Healthy Aging and Longevity." The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, Oxford University Press, Nov. 2012. [Available here](#)
- 2.Nichols, Hannah. "Estrogen: Functions, uses, and imbalances." Medical News Today, MediLexicon International, 2 Jan. 2018. [Available here](#)

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