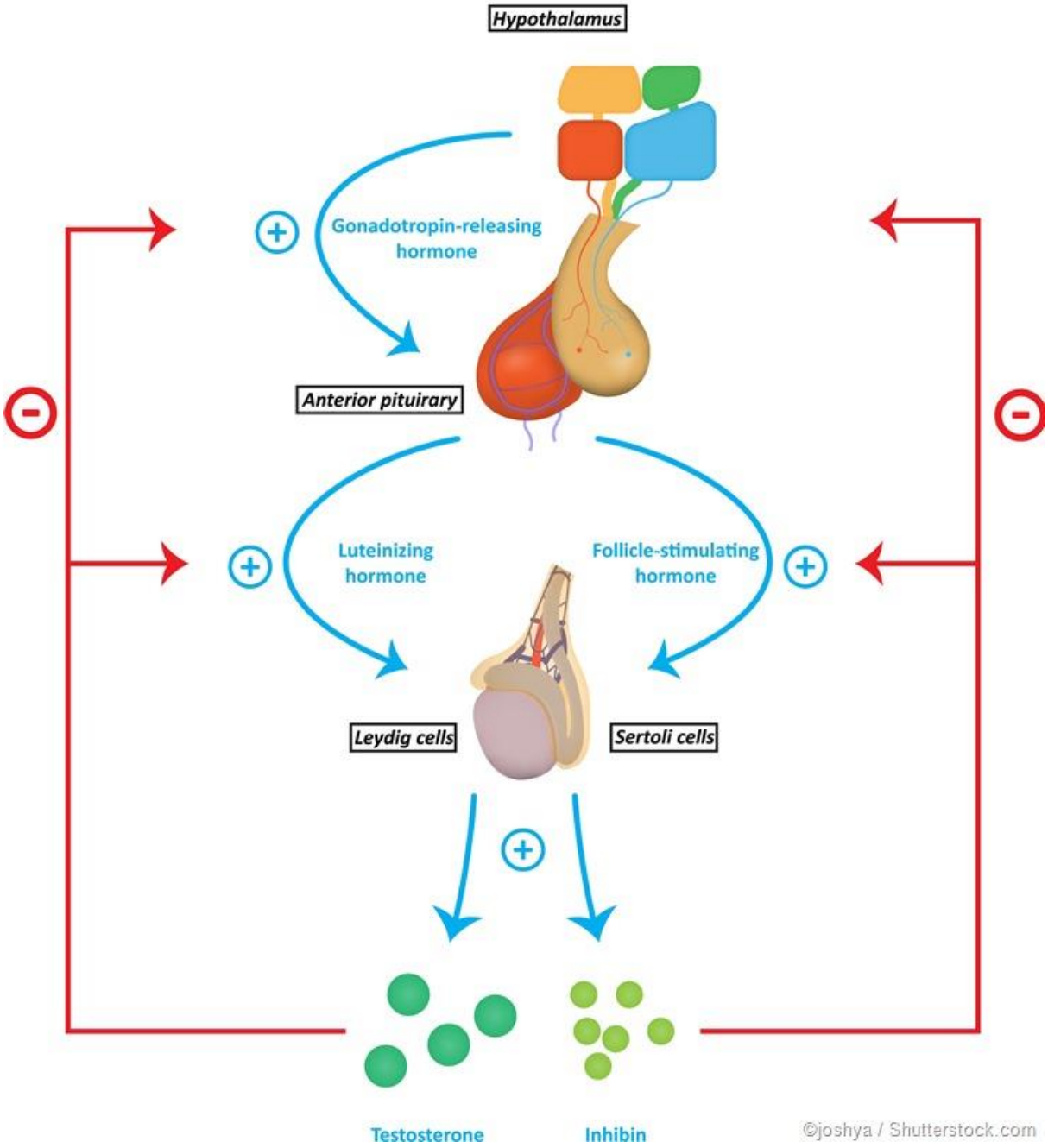
Regulation of reproduction

Endocrine Regulation of Reproduction

The functions of the testes and ovaries are regulated by gonadotropic hormones secreted by the anterior pituitary. The gonadotropic hormones stimulate the gonads to secrete their sex steroid hormones, and these steroid hormones, in turn, have an inhibitory effect on the secretion of the gonadotropic hormones. This interaction between the anterior pituitary and the gonads forms a negative feedback loop.


Hypothalamus
Gonadotropin-releasing hormone
Anterior pituirary
Luteinizing hormone
Follicle-stimulating hormone
Leydig cells
Sertoli cells
Testosterone
Inhibin
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Interactions Between the Hypothalamus, Pituitary Gland, and Gonads

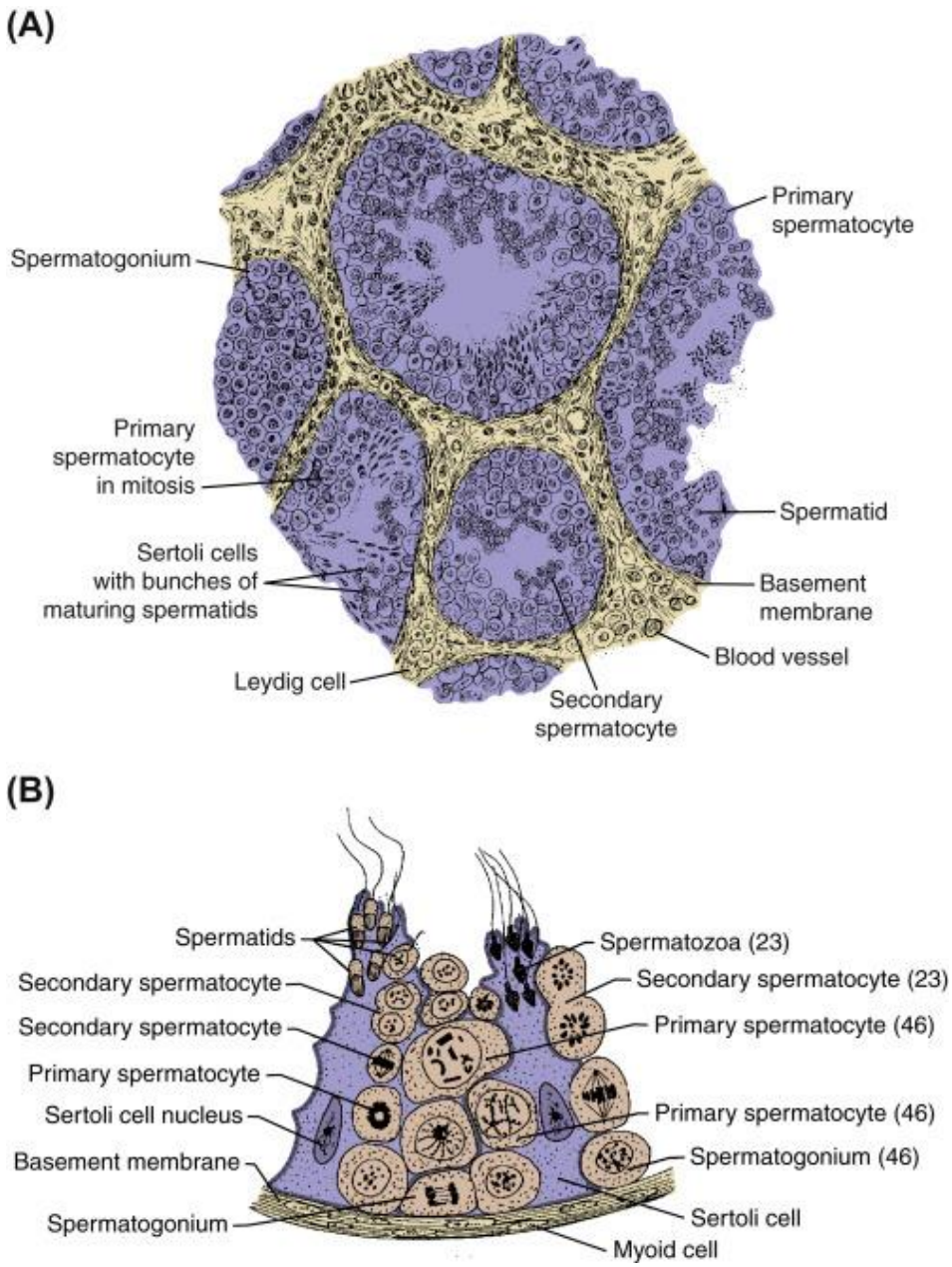
The anterior pituitary produces and secretes two gonadotropic hormones—**FSH (follicle-stimulating hormone) and LH (luteinizing hormone). Although these two hormones are** named according to their actions in the female, the same hormones are secreted by the male's pituitary gland. The gonadotropic hormones of both sexes have three primary effects on the gonads: (1) stimulation of *spermatogenesis or oogenesis* (formation of sperm or ova); (2) stimulation of gonadal hormone secretion; and (3) maintenance of the structure of the gonads (the gonads atrophy if the pituitary gland is removed).

The secretion of both LH and FSH from the anterior pituitary is stimulated by a hormone produced by the hypothalamus and secreted into the hypothalamo-hypophyseal portal vessels.
This releasing hormone is sometimes called LHRH (luteinizing hormone-releasing hormone). Since attempts to Find a separate FSH-releasing hormone have thus far failed, and since LHRH stimulates FSH as well as LH secretion, LHRH is often referred to as **gonadotropin-releasing hormone (GnRH).**

The negative feedback effects of steroid hormones occurs by means of two mechanisms: (1) inhibition of GnRH secretion from the hypothalamus and (2) inhibition of the pituitary's response to a given amount of GnRH. In addition to steroid hormones, the testes and ovaries secrete a polypeptide hormone called **inhibin. Inhibin** is secreted by the Sertoli cells of the seminiferous tubules in males and by the granulosa cells of the ovarian follicles in females. This hormone specifically inhibits the anterior pituitary's secretion of FSH without affecting the secretion of LH.

Male Reproductive System

The Leydig cells in the interstitial tissue of the testes are stimulated by LH to secrete testosterone, a potent androgen that acts to maintain the structure and function of the male accessory sex organs and to promote the development of male secondary sex characteristics. The Sertoli cells in the seminiferous tubules of the testes are stimulated by FSH. The cooperative actions of FSH and testosterone are required to initiate spermatogenesis.


(A)
Primary spermatocyte
Spermatogonium
Primary spermatocyte in mitosis
Spermatid
Sertoli cells with bunches of maturing spermatids
Basement membrane
Blood vessel
Leydig cell
Secondary spermatocyte
(B)
Spermatids
Spermatozoa (23)
Secondary spermatocyte
Secondary spermatocyte (23)
Secondary spermatocyte
Primary spermatocyte (46)
Primary spermatocyte
Sertoli cell nucleus
Primary spermatocyte (46)
Basement membrane
Spermatogonium (46)
Spermatogonium
Sertoli cell
Myoid cell

The testes consist of two parts, or “compartments”—the seminiferous tubules, where spermatogenesis occurs, and the interstitial tissue, which contains the testosterone-secreting *Leydig cells .The seminiferous tubules account for about* 90% of the weight of an adult testis. The interstitial tissue is a thin web of connective tissue (containing Leydig cells) that fills the spaces between the tubules.

With regard to gonadotropin action, the testes are strictly compartmentalized. Cellular receptor proteins for FSH are located exclusively in the seminiferous tubules, where they are confined to the *Sertoli cells. LH receptor proteins are located* exclusively in the interstitial Leydig cells. Secretion of Testosterone by the Leydig cells is stimulated by LH but not by FSH.