



جامعة الأزهر - غزة  
AL-AZHAR UNIVERSITY-GAZA



# Male reproductive system





## Effect of Testosterone on Development of Adult Primary and Secondary Sexual Characteristics

After puberty, increasing amounts of testosterone secretion cause the penis, scrotum, and testes to enlarge about eightfold before the age of 20 years. In addition, testosterone causes the secondary sexual characteristics of the male to develop, beginning at puberty and ending at maturity





## Effect on the Distribution of Body Hair

- Testosterone causes growth of hair
  - ✓ Over the pubis.
  - ✓ Upward along the linea alba of the abdomen sometimes to the umbilicus and above.
  - ✓ Face.
  - ✓ Chest.
  - ✓ less often on other regions of the body, such as the back. It also causes the hair on most other portions of the body to become more prolific.

Before puberty, the body is covered by fine unpigmented hairs called vellus hairs. During adolescence, androgens convert vellus hairs into coarse terminal hairs in androgen-dependent areas.





## Male pattern baldness

- Testosterone decreases the growth of hair on the top of the head
- A man who does not have functional testes does not become bald.
- However, many virile men never become bald because baldness is a result of two factors
  - ✓ Genetic background for the development of baldness
  - ✓ Superimposed on this genetic background, large quantities of androgenic hormones.

long- sustained androgenic tumor develops in a woman who appropriate genetic background, she becomes bald in the same does a man.





## Testosterone effect on the voice and skin

- Hypertrophy of the laryngeal mucosa and enlargement of the larynx
- The effects at first cause a relatively discordant, “cracking” voice that gradually changes into the typical adult masculine voice
- Deep voice
- Testosterone increases thickness of the skin and can contribute to development of acne.
- Increases the rate of secretion by some or perhaps the body’s sebaceous glands

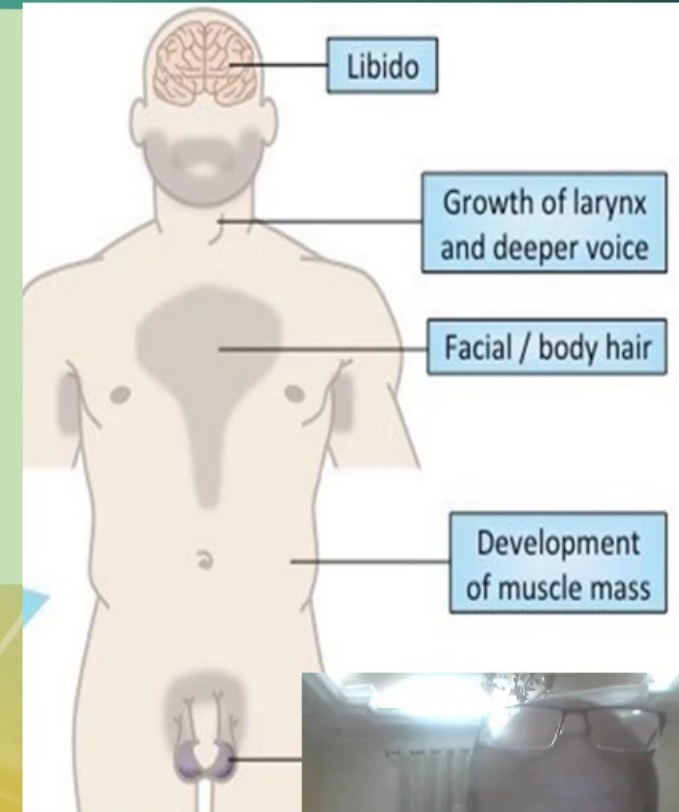




# Functions of testosterone puberty and adulthood

- Body configuration
  - ✓ broad shoulder
  - ✓ narrow pelvis
  - ✓ lengthen
  - ✓ funnel- like shape
  - ✓ muscles enlargement
- Behavioral effects
  - ✓ ++ libido
  - ✓ aggression
  - ✓ active attitudes

Testosterone Increases Protein Formation and Muscle Development. One of the most important male characteristics is development of increasing musculature after puberty, averaging about a 50% increase in muscle mass over that in the female.





## Testosterone effect on electrolyte and water balance

- Increase the reabsorption of sodium in the distal tubules of the kidneys.
- After puberty, the blood and extracellular fluid volumes of the male in relation to body weight increase as much as 5% to 10%.
- Increases bone matrix and causes calcium retention.
  - ✓ calcium retention.
  - ✓ general protein anabolic function of testosterone plus deposition of calcium salts in response to the increased protein.





# Erection

- Proportional to the degree of stimulation, whether psychic or physical.
- Caused by parasympathetic impulses that pass from the sacral portion of the spinal cord through the pelvic nerves to the penis.
- These parasympathetic nerve fibers, in contrast to most other parasympathetic fibers, are believed to release nitric oxide and/or vasoactive intestinal peptide in addition to acetylcholine.
- Nitric oxide activates the enzyme guanylyl cyclase, causing increased formation of cyclic guanosine monophosphate (GMP). The cyclic GMP especially relaxes the arteries of the penis and the trabecular meshwork of smooth muscle fibers in the erectile tissue of the corpora cavernosa and corpus spongiosum in the shaft of the penis
- As the vascular smooth muscles relax, blood flow into the penis is increased, causing release of nitric oxide from the vascular endothelial cells and vasodilation.





# Lubrication

## Is a parasympathetic function

- During sexual stimulation, the parasympathetic impulses, in addition to promoting erection, cause the urethral glands and the bulbourethral glands to secrete mucus.
- This mucus flows through the urethra during intercourse to aid in lubrication during coitus





# Emission and Ejaculation

- Are Functions of the Sympathetic Nerves.
- Emission and ejaculation are the culmination of the male sexual act.
- When the sexual stimulus becomes extremely intense, the reflex centers of the spinal cord begin to emit sympathetic impulses that leave the cord at T12 to L2 and pass to the genital organs through the hypogastric and pelvic sympathetic nerve plexuses to initiate emission, the forerunner of ejaculation.





## Emission and Ejaculation

- Emission begins with contraction of the vas deferens and the ampulla to cause expulsion of sperm into the internal urethra
- Ejaculation the semen from the urethra to the exterior.
- Rhythmic contractions of the pelvic muscles and even of some of the muscles of the body trunk cause thrusting movements of the pelvis and penis, which also help propel the semen into the deepest recesses of the vagina
- Period of emission and ejaculation is called the male orgasm

At its termination, the male sexual excitement disappears almost within 1 to 2 minutes and erection ceases, a process called





# Erectile dysfunction

- also called “impotence,” is characterized by an inability of the man to develop or maintain an erection of sufficient rigidity for satisfactory sexual intercourse.
- Neurological problems, such as trauma to the parasympathetic nerves from prostate surgery, deficient levels of testosterone, and some drugs (e.g., nicotine, alcohol, and antidepressants) can also contribute to erectile dysfunction. In men older than 40 years, erectile dysfunction is most often caused by underlying vascular disease.
- Adequate blood flow and nitric oxide formation are essential for penile erection.
- Vascular disease, which can occur as a result of uncontrolled hypertension, diabetes, and atherosclerosis, reduces the ability of the body's blood vessels, including those in the penis, to dilate. Part of this impaired vasodilation is due to decreased release of nitric oxide





# Erectile dysfunction

- Erectile dysfunction caused by vascular disease can often be successfully treated with phosphodiesterase-5 (PDE-5) inhibitors such as sildenafil (Viagra), vardenafil (Levitra), or tadalafil (Cialis).
- These drugs increase cyclic GMP levels in the erectile tissue by inhibiting the enzyme phosphodiesterase-5, which rapidly degrades cyclic GMP. Thus, by inhibiting the degradation of cyclic GMP, the PDE-5 inhibitors enhance and prolong the effect of cyclic GMP to cause erection





# Abnormal testicular function

- Cryptorchidism 1-undescended testis  
10% newly born. 2% 1<sup>st</sup> year 0.3% puberty

## Effects:

- Sterility if bilateral
- Normal testosterone i.e. normal male characters
- High incidence of cancer testis

Descend of testis depends on MIS & Testosterone i.e. (DHT)

treatment : Before puberty i.e. before degeneration of spermatogonia

- Gonadotropins
- Surgical





## Control of sexual functions by the hypothalamus

- Gonadotropin- releasing hormone (GnRH): is a 10–amino acid peptide secreted by neurons whose cell bodies are located in the arcuate nuclei of the hypothalamus.
- GnRH is secreted intermittently a few minutes at a time once every 1 to 3 hours. The intensity of this hormone's stimulus is determined in two ways:
  - ✓ by the frequency of these cycles of secretion and the quantity of GnRH released with each cycle.
- stimulates release of the two gonadotropins, LH and FSH.



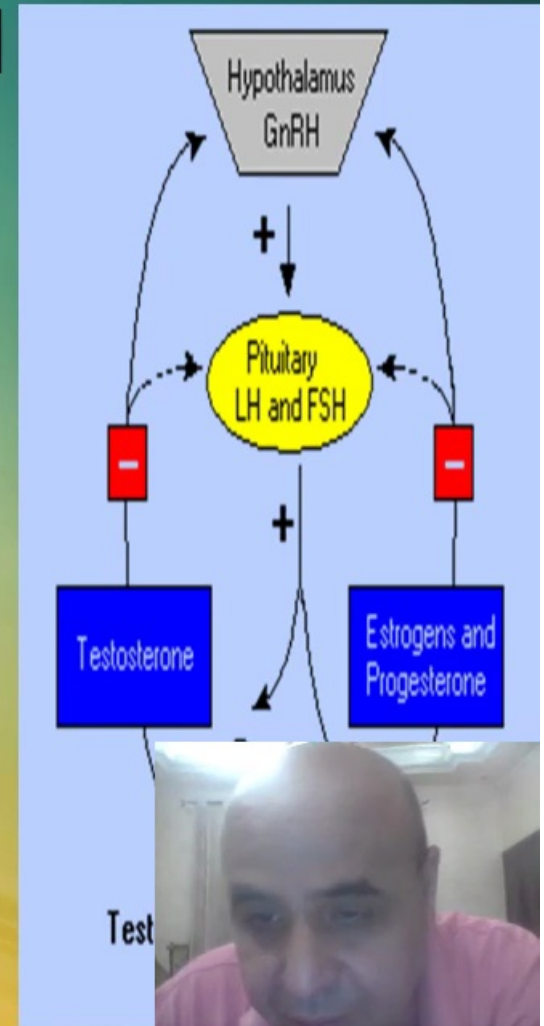


## Gonadotropic Hormones: Luteinizing Hormone and Follicle- Stimulating Hormone

- Gonadotropic hormones, LH and FSH, are secreted by the same cells, called gonadotropes.
- LH and FSH are glycoproteins. They exert their effects on their target tissues in the testes mainly by activating the cyclic adenosine monophosphate second messenger system, which in turn activates specific enzyme systems in the respective target cells.



# Negative Feedback Control





# Inhibin

- Is a glycoprotein, like LH and FSH, with a molecular weight between 10,000 and 30,000.
- from cultured Sertoli cells
- Strong direct effect on the anterior pituitary gland to inhibit FSH secretion
- Negative feedback mechanism for control of spermatogenesis and for control of testosterone secretion.





# Human chorionic gonadotropin

- Secreted by the placenta and circulates in the mother and in the fetus.
- same effects on the sexual organs as LH.
- Testes of the fetus to secrete testosterone.
- Testosterone is critical for promoting formation of the male sexual organs

