



جامعة الأزهر - غزة
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Male reproductive system





Androgens

- Secretion of Testosterone by the Interstitial Cells of Leydig in the Testes
- The testes secrete several male sex hormones, which are collectively called androgens, including testosterone, dihydrotestosterone, and androstenedione.
- Testosterone is so much more abundant than the others that one can consider it to be the primary testicular hormone, although much of the testosterone is eventually converted into the more active hormone dihydrotestosterone in the target tissues
- Testosterone is formed by the interstitial cells of Leydig, which are located in the interstices between the seminiferous tubules and constitute about 5-10 percent of the mass of the adult testes





Androgens

- Male sex hormones produced elsewhere in the body besides the testes.
- The adrenal glands secrete at least five androgens.
- The term “androgen” means any steroid hormone that has masculinizing effects, including testosterone.
- Masculinizing activity of all these androgens is normally so slight.
- In women they do not cause significant masculine characteristics, except for causing growth of pubic and axillary hair





Androgens

- After secretion by the testes, about 97 percent of the testosterone becomes either loosely bound with plasma albumin or more tightly bound with a beta globulin called sex hormone–binding globulin and circulates in the blood in these states for 30 minutes to several hours.
- Degradation and Excretion of Testosterone.
 - ✓ The testosterone that does not become fixed to the tissues is rapidly converted, mainly by the liver, into androsterone and dehydroepiandrosterone and simultaneously conjugated as either glucuronides or sulfates (glucuronides, particularly).
 - ✓ Excreted either into the gut by way of the liver bile or into the urine through the kidneys.





Estrogen in the Male

- Small amounts of estrogens are formed in the male (about one fifth the amount in the nonpregnant female).
- Quantity of estrogens can be recovered from a man's urine.
- The exact source of estrogens in the male is unclear.
- The concentration of estrogens in the fluid of the seminiferous tubules is quite high and probably plays an important role in spermiogenesis.
- This estrogen is believed to be formed by the Sertoli cells by converting testosterone to estradiol.
- Much larger amounts of estrogens are formed from testosterone and androstenediol in other tissues of the body, especially the liver, probably accounting for as much as 80 percent of the total male estrogen production.





Testosterone

- The testes and in the adrenals, the androgens can be synthesized either from cholesterol or directly from acetyl coenzyme
- Plasma level: 300-1000 in males, 30-70 ng/dl in females
- Mode of action: Genomic action
- Testosterone  dihydrotestosterone (DHT)

Testosterone	dihydrotestosterone (DHT)
Less active	More active 10% level of testosterone
Fetus Internal genitalia	Fetus External genitalia
Adult: Bones & muscles	Adult: Skin, Penis, Prostate

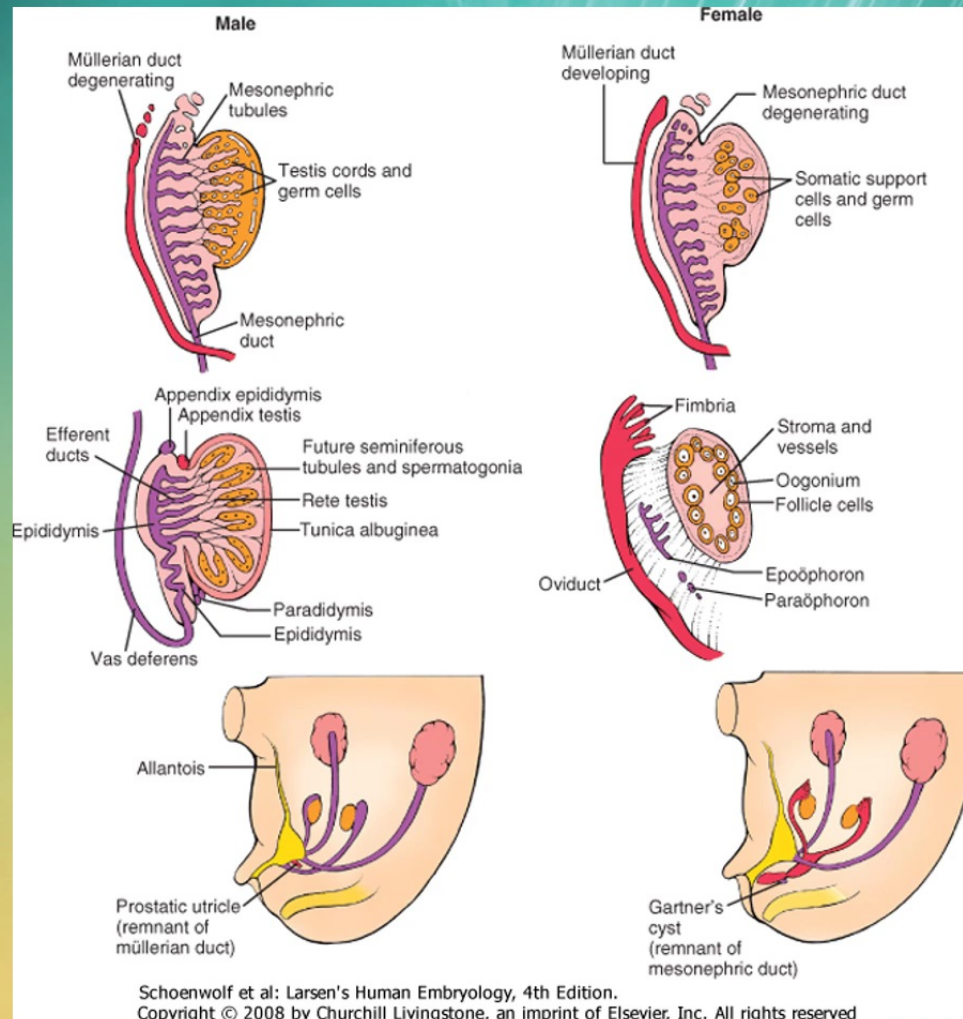




Sex-determining region Y

- Testosterone begins to be elaborated by the male fetal testes at about the seventh week of embryonic life. Indeed, one of the major functional differences between the female and the male sex chromosome is that the male chromosome has the sex-determining region Y (SRY) gene that encodes a protein called the testis determining factor (also called the SRY protein)
- The SRY protein initiates a cascade of gene activations that cause the genital ridge cells to differentiate into cells that secrete testosterone and eventually become the testes, whereas the female chromosome causes this ridge to differentiate into cells that secrete estrogens
- testosterone secreted first by the genital ridges and later by the fetal testes is responsible for the development of the male body characteristics





The sexual differentiation of genetic males begins at the end of the 6th week, when a specific gene on the Y chromosome (*SRY*) is expressed in the somatic support cells. Embryos in which this gene is not expressed develop as females.

The product of this gene, called the **SRY protein**, initiates a developmental cascade that leads to the formation of the testes, the male genital ducts and associated glands, the external genitalia, and the entire constellation of male secondary sex characteristics.





Control of secretion testosterone

(1) intrauterine life ↑ sex differentiation 7th week

(A) Development of gonads:

Origin: Bipotential primordial gonads

before sexual development

Control: absence or presence of sex determining region of Y chromosome

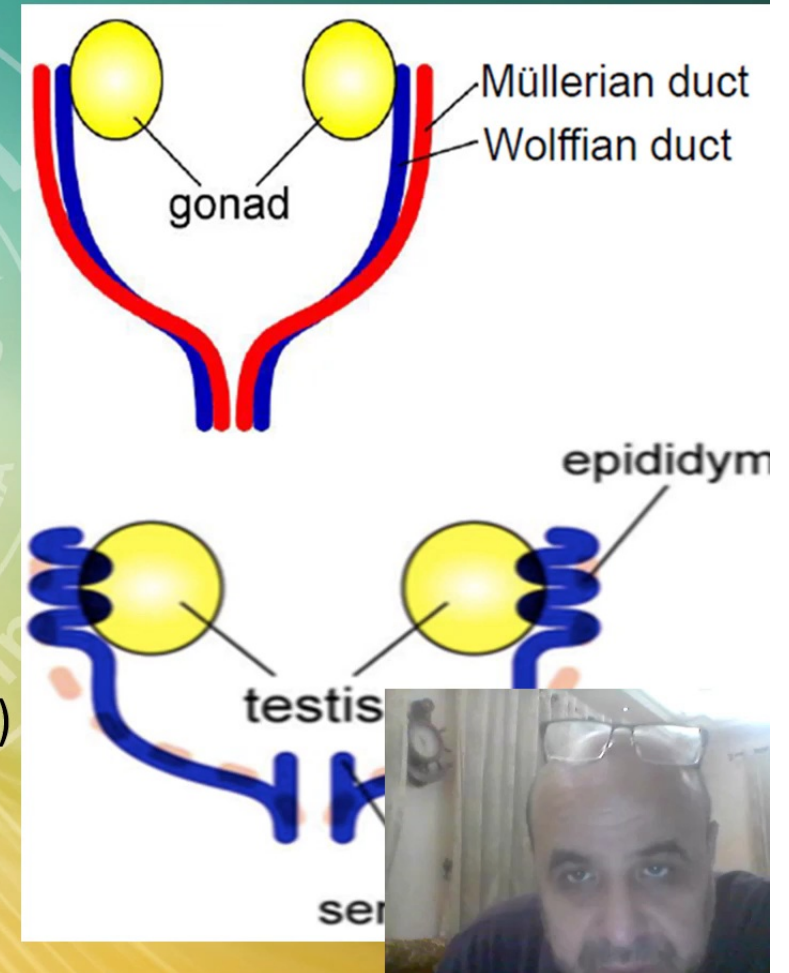
(B) Development of ducts:

Origin: Wolffian and Mullerian ducts

Control: Testosterone and

Mullerian inhibitory substance (of Sertoli cell)

Mullerian Inhibiting Substance (MIS)/AMH regresses formation of the Mullerian ducts in males





Control of secretion testosterone

- 2) neonatal period ↓ Testosterone secretion stops
Due to – GnRH & LH
- (3) Puberty ↑ Testosterone is secreted
in response to GnRH & LH
- (4) After 60 years ↓ Testosterone secretion declines





Functions of testosterone

A- Intrauterine life: 3 Ds

1-Development of:

- Wolffian duct to epididymis, vas deference & seminal vesicles
- Urogenital sinus & tubercle to prostate penis
- Inhibition of female external genitalia (DHT)

2- Differentiation of male brain:

- Gonadotropins secretion is continuous not cyclic
- Aggression

3- Descent of testicles in scrotum (DHT)





Functions of testosterone puberty and adulthood

B- Masculinizing effect

1- Primary sex organ

Spermatogenesis

2- Secondary sex organs anabolic

a. Seminal vesicles, bulbourethral glands

(Testosterone)

b. Penis & scrotum & Prostate (DHT)

General metabolic effect

(1) Protein anabolic

Muscles & bones

(2) Secondary to Protein

- Salt & water retention

- Growth spurt then epiphyseal closure

