



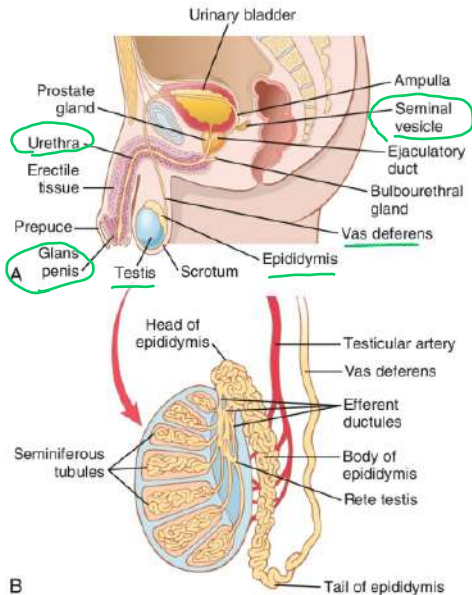
# PHYSIOLOGY

Lecture 8+9

**DONE BY : Abdallah Ghwiry**

# Reproductive and Hormonal Functions of the Male

بسم الله نبدأ،، رح يكون التلخيص عن اخر موضوع لمادة الميد و كالعادة رح تكون السلايدات باللون الاسود و الشرح والتوضيح باللون الازرق والمعلومات الخارجيه باللون الاحمر



**Figure 81-1.** **A,** The male reproduction system. **B,** The internal structure of the testis and the relation of the epididymis. (A, Modified from Bloom V, Fawcett DW: Textbook of Histology, 10th ed. Philadelphia: WB Saunders, 1975. B, Modified from Guyton AC: Anatomy and Physiology. Philadelphia: Saunders College Publishing, 1985.)

من أهم الأعضاء التناسلية عند الذكور هو **Testis** و المسؤول عن تكوين الحيوانات المنوية و لكنها **immature** و من ثم تنقلها نحو **epididymis** و هناك بصير الها **mature + storage** ، حتى نتعرف اكثر على موقع **testis** في الصورة المجاورة

## ⊙ Primary Sex Organs

**Testes** : composed of up to 900 coiled seminiferous tubule spermatogenesis

## ⊙ Accessory Sex Organs

1. Seminal vesicles
2. Prostate gland
3. Urethra
4. Penis

أما لو أخذنا **sagittal section of the testis** فرح نشوف :

**A-seminiferous tubules** : spermatogenesis المكان الي بصير فيه

**B-rete testis** :

زي كأنه وسيط بنقل sperm من seminiferous tubules الى efferent ductules

**C-efferent ductules** :

بتنقل sperm الى head of epididymis

بالإضافة لذلك عنا نوعين من الخلايا موجود في interstitium of testis

1- leydig cells that secrete testosterone

2- sertoli cells that help in spermatogenesis

نحكي هسا عن وظيفة كل عضو

بالبداية **testis** من اسمها رح تنتج testosterone من خلال **Leydig cells** ( نذكر انه اخذنا ب الاندوكراين ال testosterone ينتج من cholesterol ) و بضيف انه ينتج الحيوانات المنوية

**Sertoli Cells** و الي يتم جوا **immature** sperm

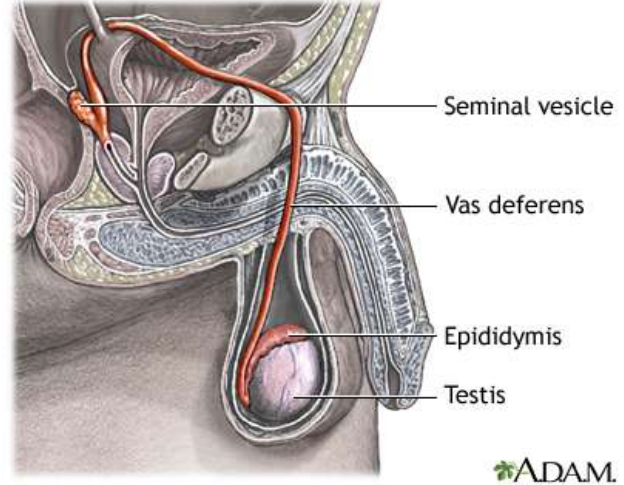
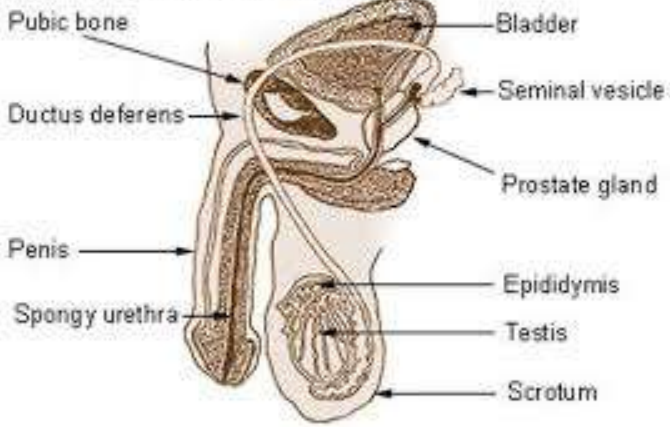
اما عن ال duct ، لازم نعرف المسار الي رح يمشي الحيوان المنوي من خلاله ، ببدا من **testis** و يرجع بأكد انه **immature** بعد هيك بروح على **epididymis** و هناك بصير شغلتين مهمات الي همة

**maturatation + storage** و بعد هيك بمشي من خلال **vas deferens** ( في نسبة قليلة من

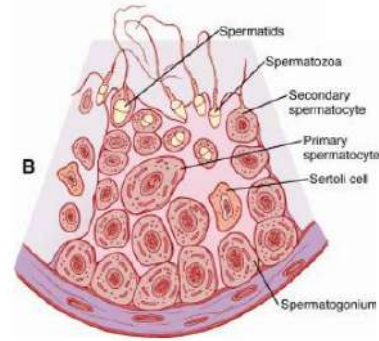
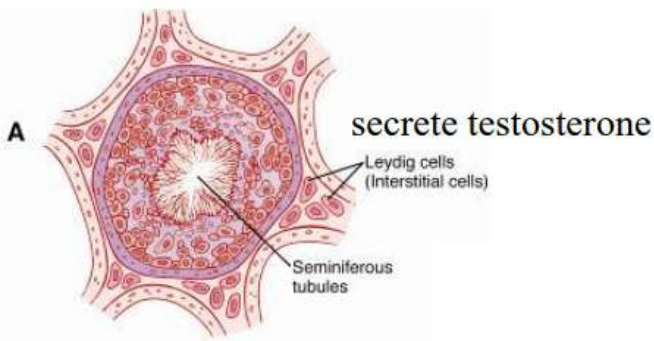
الحيوانات المنوية بتتخزن فيها بس الغالبية في **epididymis** )

المهم ، بضل مكملة لحتى توصل **common ejaculatory duct** ، هاي بتصب في **prostatic urethra** ، طيب انا حكيت انها **common** معناها في اشي ثاني بشتك معها و بصب في **prostatic urethra** الي هو **seminal vesicles** و هذا بنتج 60% من السائل المنوي ،، بعد هيك جوا **prostatic urethra** رح ينفرز **prostatic fluid** من **prostate gland** و بشكل 30% من السائل المنوي ،، طيب بعد هيك بتمشي باتجاه **Membranous urethra** هناك بنتج **bulbourethral glands** زي **mucous for makes sexual intercourse less painful** و هيك بتكمل حتى نهاية **penis**

### Male Reproductive System



- **Testes** : produce sperm and male sex hormone testosterone.
- **Ducts** : transport, store, and assist in maturation of sperm.
- **Accessory sex glands** : secrete most of the liquid portion of semen.
- **Penis**: contains the urethra, a passageway for ejaculation of semen and excretion of urine.



بدنا نحكي اكثر عن **Sertoli Cells** و تحديد دورها في **Spermatogenesis**

- بالبداية اهم اشي توفر كل ما تحتاجه الخلية من طاقة و تغذية حتى تقدر تقوم بوظيفتها
- عملية تكون الحيوانات المنوية بدخل فيها كثير من الانزيمات و الهرمونات ف رح تساعد بتوفيرها
- احنا حكينا انه **testosterone** بنتج من **leydig cell** و الي يعتبر **lipophilic** معناها بحتاج ناقل حتى يقدر يتحرك براحته و هون رح تكون **Sertoli Cells** بروتين ناقل اسمه **androgen-binding protein (ABP)** ( هسا اخذنا **FSH** و **LH** واحنا منعرف مصدرهم من **Pituitary Anterior** من خلايا اسمها **gonadotropin** و الي بحفزها **GnRH** بيطلع من **Hypothalamus** ،، المهم انه **LH** بتأثر و بتحفز **leydig cell** بينما **FSH** بتأثر على **Sertoli Cells**

● يساعد على نقل sperm نحو interstitial

● جهاز المناعة مش متعرف على sperm و بالتالي وجوده بالدم مصيبة لانه رح يعمل immune response و بالتالي Sertoli Cells منعبرها حاجز بمنع وصول sperm للدم Blood Testies Barrier

كمان من المواد الي بنتتجها Sertoli Cells

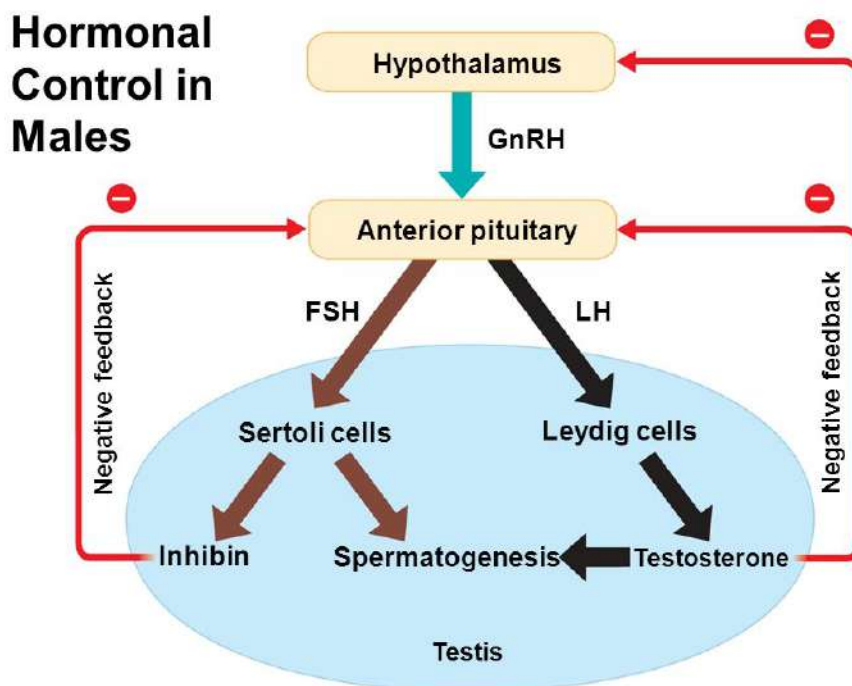
○inhibin: as negative feedback to inhibit FSH secretion

○Activin: function not clear

○MIS (Mullerian-inhibiting substance)

و وظيفة يمنع تكون mullerian ducts في male ( بمنع تكوين internal females organ )

○Estrogen: is thought to have a role in spermatogenesis in males

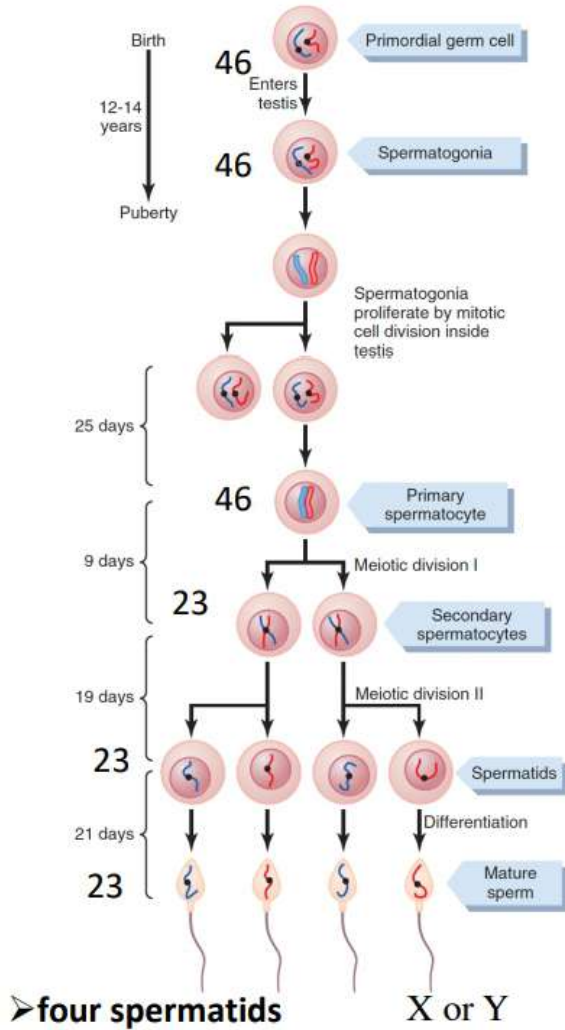


### Role of Sertoli Cell in Spermatogenesis

- Supporting and nourishing the germ cells + Phagocytosis
- Providing hormonal substances necessary for spermatogenesis
- Secreting androgen-binding protein (ABP): binds testosterone and helps maintain a high concentration of testosterone (stimulated by FSH)
- Releasing sperms into the lumen of seminiferous tubules (spermination) :sperm are released from their connections to sustentacular cells.
- Blood Testies Barrier: The germ cell line is completely invested by cytoplasm of surrounding Sertoli cells» » Blood Testes Barrier

## Functions of Sertoli Cells:

- Synthesize and Secret the following
- Secretes inhibin: inhibits FSH secretion. (regulator of spermatogenesis).
- Secretes Activin: function not clear. (regulator of spermatogenesis)
- MIS (Mullerian-inhibiting substance): causes regression of mullerian ducts in males during fetal life.
- Estrogen: role not known, possibly controlling testosterone production.



primordial germ cell أثناء embryonic life تنتقل  
 cell الى testis على شكل spermatogonia بخل  
 حتى مرحلة البلوغ ،، بعد البلوغ تنتقل  
 spermatogonia الى central lumen (عن طريق  
 sertoli cells ) هسا هي بتكون 2n (فيها 64  
 chromosomes) بتنقسم انقسام متساوي mitosis  
 بتنتج خليتين ،، وحدة حتى نكرر العملية و الثانية  
 حتى ننتج حيوانات منوية طبعا الخليتين الناتجات  
 بتكون 2n و منسميهم primary spermatocytes  
 \*2n essentially means that the cell has the  
 full number of chromosomes which is  
 46 chromosomes in humans..while 1n  
 means that the cell has half the full number  
 of chromosomes which is 23 chromosomes  
 in humans

بعد هيك بتدخل الخلية ب انقسام منصف meiosis  
 بتكون على مرحلتين 1/2 meiosis بتنتج 4 خلايا  
 1n اسمهم spermatids و الي يعتبروا immature  
 sperm بعد هيك بتنتقل الى epididymis و هناك  
 بصير maturation sperm

need 74 day

## Spermeogenesis

is the process by which spermatids become matured spermatozoa.

Changes e during spermeogenesis:

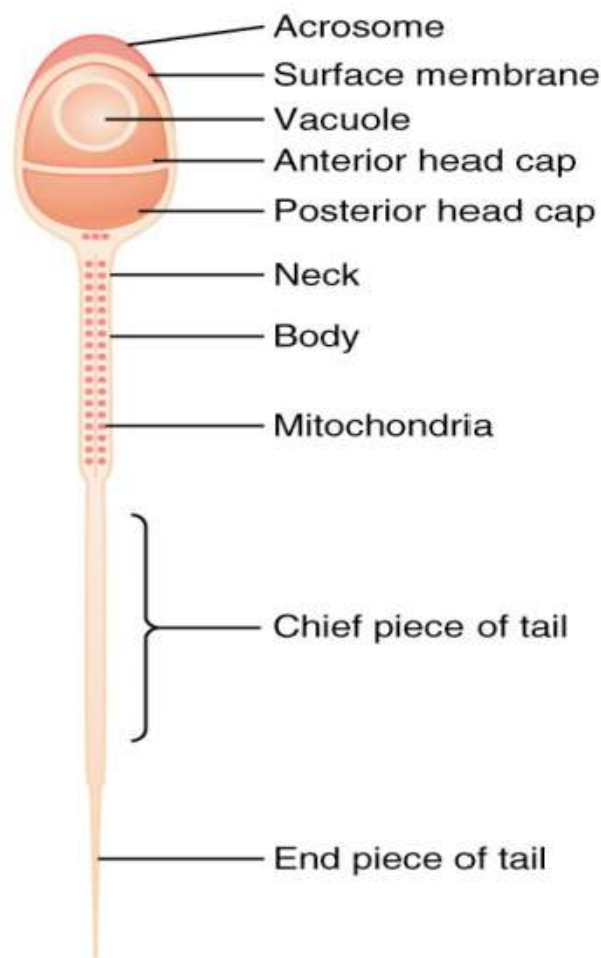
- Condensation of nuclear material
- Formation of acrosome, mitochondrial spiral filament and tail structures
- Removal of extra volume of nonessential cytoplasm.

## Hormonal Factors Stimulates Spermatogenesis

1. Testosterone » secreted by Leydig cells → growth and division of the testicular germinal cells
2. Luteinizing hormone (LH) » stimulates the Leydig cells to secrete testosterone.
3. Follicle-stimulating hormone (FSH) → stimulates the process of spermiogenesis GnRH » stimulates anterior pituitary gland to produce luteinizing hormone (LH) and follicle stimulating hormone (FSH)
4. Estrogens → formed from testosterone by the Sertoli cells when stimulated by FSH » probably also essential for spermiogenesis.
5. Growth hormone (as well as most of the other body hormones) → controlling metabolic functions of the testes.

Growth hormone » promotes early division of the spermatogonia

Dwarfs » spermatogenesis is severely deficient or absent, thus causing infertility.



## Structure of the Human Spermatozoon

**Sperm:** designed to reach and penetrate the secondary oocyte in order to achieve fertilization and create a zygote.

**head** » contains condensed nucleus with 23 chromosomes+ thin cytoplasm.

**Acrosome**» covers the head and contains enzymes (hyaluronidases & proteolytic enzymes) to help with penetration.

**Tail= flagellum** » 3 parts

(1) central à microtubules = axoneme

(2) thin cell membrane covering the axoneme

(3) mitochondria à ATP for locomotion

The principal piece and end piece make up the tail used for movement (velocity 1-4 mm/min)

حكينا قبل انه **Sperm mature and storage** في **epididymis** بس حتى نحافظ عليه لمدة طويلة و ما يستهلك يكون في **inhibitory proteins** بتمنع **last stage of maturation**

هسا الحيوانات المنوية نشاطها يكون افضل في **alkaline environments** و لذلك **life span in male genital is month** و لكن في **female genital tract** و لأنه **acidic** ف **life span 1-2 day**

اما بخصوص درجة الحرارة ف كلما زادت درجة الحرارة قلت **life span** و زادت **activity of sperm** و العكس صحيح ، وهون بظهر حكمة ربنا عز وجل ليش الحيوانات المنوية تخزن خارج جسم الانسان في **scrotum**

### Maturation of Sperms

- **Seminiferous tubules** » tubule of the epididymis
- **Sperms at early portions of epididymis**» nonmotile & cannot fertilize an ovum.
- **After 18- 24 hours presence in epididymis**» sperms develop capability of motility, even though several inhibitory proteins in the epididymal fluid still prevent final motility until after ejaculation.

○ **The Sertoli cells and the epithelium of the epididymis** » secrete a special nutrient fluid that is ejaculated along with the sperm.

**fluid contains:**

**hormones (testosterone and estrogens),enzymes,other nutrients that are essential for sperm maturation.**

**Stored at epididymis (mainly) & vas deferens for 1 month in depressed state)**

**Frequent ejaculation** » few days storage

**After ejaculation à maturation of sperm**» become motile and capable of fertilizing the ovum

هناك حكايا فوق عن مجموعة عوامل بتساعد على تخزين الحيوانات المنوية داخل epididymis زي ال alkaline و inhibitor proteins وغيرها و هدفها نحافظ على الحيوانات المنوية لأطول فترة ممكنة و الاستفادة منها وقت حاجتها ،، طيب لنفرض اجا وقت حاجتها و صار لازم تؤدي وظيفتها و توصل للبويضة في مجموعة عوامل رح تساهم بهاي العملية الي منسميها Capacitation of spermatozoa

○ ما داخل female genital tract في fluid بيفصل كل inhibitory substances عن sperm و بالتالي رح تزود activity

○ حكاينا قبل انه ال head بحوي على المادة الوراثية و بغطيه acrosomal و الي يعتبر cholesterol ،، لما يدخل female genital tract رح يصير ضعيف و بالتالي كل المكونات الي بداخل head رح تطلع و وقتها بقدر sperm penetrates ovum

○ زيادة Ca permeability >>> رح تزود من حركة sperm و بنفس الوقت release of acrosomal enzymes

## Maturation of Sperms

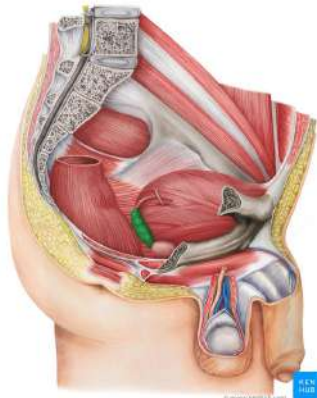
**Capacitation: A process to render the sperms competent to fertilize the ovum/ hypermotile.**

- Occurs when sperm is expelled coming in contact with the fluids of the female genital
- Normally requires from 1 to 10 hours.

## Changes leading Capacitation of Spermatozoa

- various inhibitory factors that suppress sperm activity → washed by uterine and fallopian tube fluids
- Loss of cholesterol vesicles (tough & prevent enzymatic release) at acrosome of sperm
- Increase permeability of flagella to Ca ions cause increase in motility
- Ca ions enhances the release of enzymes by the acrosome enhancing the penetration of ovum

طيب هسا بالنسبة لل Seminal vesicles موجود ٢ على كل جهة ، موقعها ورا prostatic gland ، بتفرز seminal fluid في common ejaculatory duct بالتشارك مع Vas deferens





## Seminal Vesicles

60% of total semen.

Functions of seminal fluid :

- Nutrition to sperms » Fructose,,Other substances: citric acid, PG
- Clotting of semen

Immediately after ejaculation » clotting of semen » conversion of fibrinogen into fibrin.

- Fertilization

Prostaglandin » enhances fertilization of ovum by:

1. Increasing the receptive capacity of cervical mucosa for sperms
2. Initiating reverse peristaltic movement of uterus and fallopian tubes»

increasing rate of semen transport (oxytocin is also responsible for this process).

بالنسبة لل clotting فنفس فكرة blood clotting ، هسا وجود fibrinogen يتحول الى fibrin  
coagulum يعطي لل semen تماسك اكبر و هذا يساعد يوصل لل female genital tract ،  
بنفس الوقت في fibrinolysin موجود ب prostatic fluid يعمل على dissolves of fibrin after  
15-30 minutes of ejaculation

## Prostate Gland

30% of total semen.

Functions of prostatic fluid-Ca, citrate, phosphate

- Maintenance of sperm motility

pH<6 àNON-MOTILE SPERM

Vas deference & female genital tract are acidic.Prostatic fluid provides optimum pH for the motility of sperms.

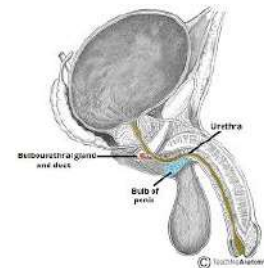
- Clotting of semen

clotting enzymes present in prostatic fluidà convert fibrinogen (from seminal vesicles) into coagulum--> holding the sperms in uterine cervix.

- Lysis of coagulum

The coagulum is dissolved by fibrinolysin of prostatic fluid (15-30 min after ejaculation), so that the sperms become motile.

prostate-specific antigen (PSA)» hydrolyse sperm motility inhibitors.



- Bulbourethral (Cowper's) glands: secrete an alkaline fluid during sexual arousal that neutralizes acids from urine and mucus for lubrication

## Semen:

Contains fluids from seminal vesicles, prostate, vas deference and mucus glands, such as bulbourethral gland

### Milky fluid

fructose, vit B, C, E, electrolytes: Na,K, Mg,Ca, Cl, HPO<sub>3</sub>

LMW polypeptides, proteins

pH = 7.5 final

Each ejaculation contains approximately 2-6 ml, 35-200 sperm, avg 120 m/ml,  
Avg 400 million/ejaculation(< 20 million = infertile)

Reach fallopian tube 30-60 min

### Factors affecting sperm activity

medium at velocities of 1 to 4 mm/min.

1-neutral and slightly alkaline medium » increase activity  
depressed in mildly acidic medium.

strong acidic medium » death

2- temperature » activity increases with increasing T

Optimum 2°C below the internal temperature.

On cold days» scrotal reflexesà pulling the testes close to the body

Warm days» scrotum descend

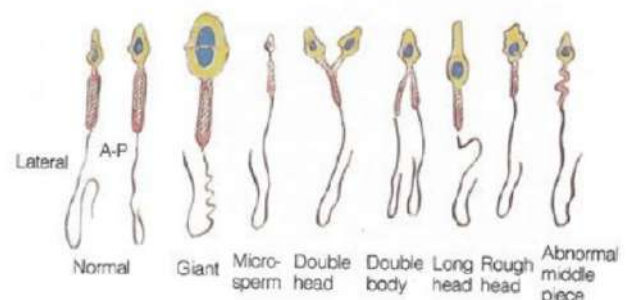
excessive temperature -> degeneration of cells of seminiferous tubules

3-rate of metabolism» Proportional

the life expectancy of ejaculated sperm in the female genital tract is only 1 to 2 days.

### Qualities of semen required for fertility

	Minimum required
Volume	2 mL
Sperm count	20 million/mL
Number of sperms /ejaculation	40 million
Alive sperms	75%
Motile sperms	50%
normal shape and structure	30%



## Abnormal Spermatogenesis and Male Fertility

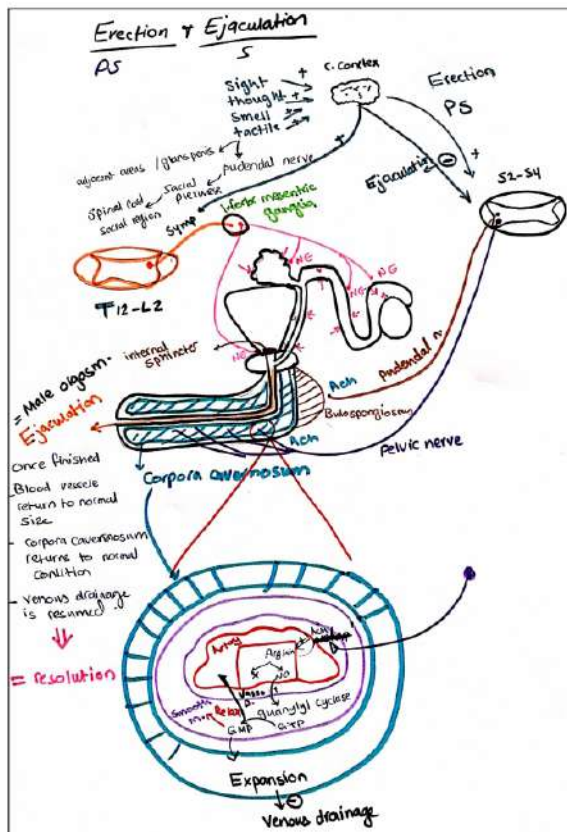
●Mumps» bilateral orchitis (inflammation) of the testes resulting from mumps » sterility

●Cryptorchidism

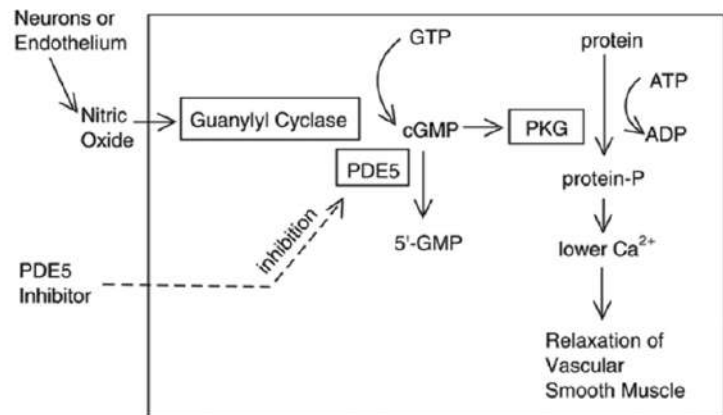
congenital disorder ->failure of one or both the testes to descent from abdomen into scrotum.=undescended testes--> prone for testicular cancer.

### Treatment

testosterone or gonadotropic hormones (which stimulate Leydig cells) causes descent of testes, Surgery



### Regulation of Smooth Muscle Relaxation and Effect of PDE5 inhibitors



هسا erection يتحفز عن طريق parasympathetic اما ejection عن طريق sympathetic,,, ال erection بيتحفز عن طريق الاستجابة ل Sight, smell, thought, tactile و غالبا ل glans penis و adjacent area و بيتنقل التأثير عن طريق pudendal nerve to sacral plexuses to spinal cord sacral region cord غالبا s2-4 بعد هيك من scarl بطلع pelvic nerve بروح ل shaft و بروح لل contracte tissue of penile area غالبا ل corpora cavernosa, and the corpus spongiosum و هذولة بكونوا spongy structure فبالثالي ممكن يصير اله expansion or shrinkage

هسا pelvic nerve رح يفرز ACH جو ال blood vessels و بكسر arginine الى nitric oxide بعمل vasodilation ,, بروح على smooth muscle المحيطة و بشتغل على انزيم اسمه guanine cyclase بحول GTP الى cGMP و الي رح يعمل second messenger يعمل Relaxation of smooth muscle by second messenger (عن طريق منع دخول Ca) بالإضافة انه بعمل more expansion in corpora cavernosa بعطي مجال لاكبر كمية blood بالإضافة انه بضغط على venous و يمنع رجوع الدم

هنا cGMP بتكسر عن طريق Phosphodiesterase-5 ( ادوية Sildenafil/Viagra ) بتمنع شغل PDE5 و بالتالي رح اضل cGMP متوفرة و تزود erection  
اما بخصوص ejaculation فلما توصل threshold رح تثبط كل erection parasympathetic بتصير على level T12-L2 بطلع presynaptic الى inferior mesenteric ganglia و من ثم إلى epididymis و vas deferens و seminal vesicles و internal sphincter urethra كلهم بعمل contraction عن طريق NE و بالذات لل sphincter حتى ما تسمح semen يوصل لل bladder و كمان عن طريق pudendal nerve بروح على Bulbourethral (Cowper's) glands بساعد على squeezing

بعد ما تخلص ejection بوقف كل العمليات السابقة و بتنعكس سواء ب تكسير cGMP او تقليل الضغط على Venous و برجع الجسم للوضع الطبيعي

### Male sexual response

**Erection: controlled by parasympathetic nervous system**

**Incr. Parasympathetic and dec. sympathetic activity to penile arterioles = vasodilation of the arterioles and erection**

**Parasympathetic postganglionic fibers release Ach**

-- muscarinic receptors on endothelium -- produce NO -- also released by nerve terminals-- veins are compressed causing reduction in venous return

-- pressure in corpus cavernosum higher than blood pressure

-- NO » PKG » dec » Ca<sup>++</sup> » relaxation

○ **Emission: movement of ejaculate into proximal part of urethra under sympathetic control -- causes sequential peristaltic contraction of smooth muscle of vas deferens**

-- closing of bladder sphincter

○ **Ejaculation: spinal reflex -- triggered by entry of semen into urethra causes nerve impulses to activate perineal muscles -- forcibly expel semen from urethra**

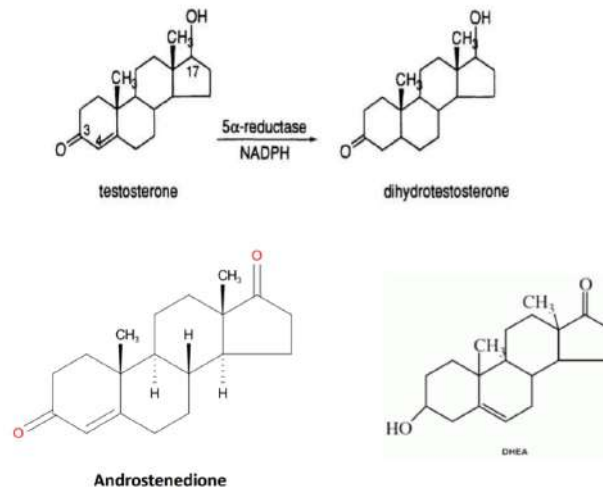
○ **Orgasm: culmination of sexual excitation**

**Detumescence: (flaccidity) NE from sympathetics, endothelin= contraction of smooth muscle and inc venous outflow**

# Part 2

## Lecture 9

# Testosterone and other male sex hormones



هسا testosterone مصدره الاساسي androgen و يعتبر steroid hormone و lipophilic و بالتالي ال receptor is inside cell و بتأثر على gene expression ، بتأثر على كل خلايا الجسم و لكن بشكل أساسي على genital system

- Androgens» masculinizing effects

- Androgen secretion sites

1-testes

2-adrenals (<5% of total androgens in male)

- Interstitial cells of Leydig in the testesà secrete androgens (testosterone, DHT & androstenedione)

- Testosterone is the most abundant male testicular androgen

- DHT is the active form of T.

- T is secreted in:

1- newborn male infant (Only for the first few months of life)

2- adult male after puberty

- Germinal epithelium of the testes is more sensitive for radiation or excessive heat than Leydig cells» impaired spermatogenesis but normal testosterone production.

After secretion by testes» T circulates in blood in these states for 30 min-several hours:

1-loosely bound with plasma albumin

2-tightly bound with sex hormone binding globulin

3-Free (3%)» most important biologically

T fate:

1-transferred to tissuesàconverted into DHT (prostate gland in adult and the external genitalia of male fetus)

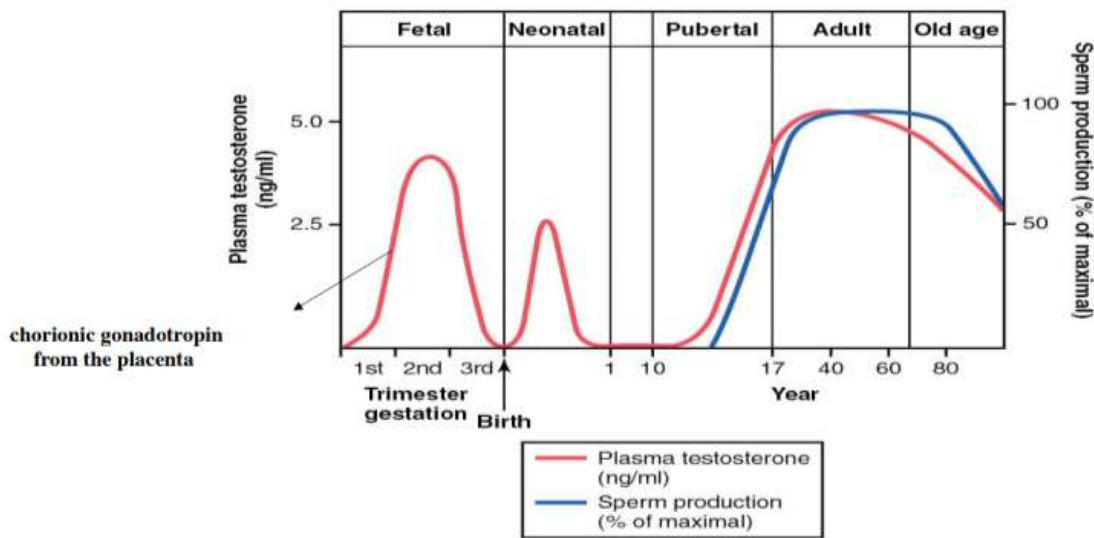
2- degradation & excretion

## Production of Estrogen in the Male.

- small amounts of estrogens are formed in the male
- Sertoli cells secrete E. testosterone → estradiol
- high [estrogens] seminiferous tubules
- important role in spermiogenesis

Much larger amounts (80%) of estrogens are formed from T and androstenediol in other tissues of the body, especially the liver.

The different stages of male sexual function as reflected by average plasma testosterone concentrations (red line) and sperm production (blue line) at different ages.



(Modified from Griffin JF, Wilson JD: The tests. In: Brady PC, Rosenberg LE (eds): Metabolic Control and Disease, 8th ed. Philadelphia: WB Saunders, 1990.)

ملاحظ بالمخطط فوق عدم وجود testosterone اثناء childhood و ايضا انخفاضه مع تقدم العمر

وظائف Testosterone  
رح نقسمها ل primary و secondary

### ● primary effect :

يعتبر ال testosterone مهم جدا في development of male genital organ و الي بحفز انتاجها وجود الكروموسوم Y بالإضافة إلى human chorionic gonadotropin or hCG و الي ينتج من placenta

### ●secondary effect

° hair growth :

as in the face,chest,abdomen,neck,groin area,upper limbs & lower limbs

°muscle mass & bones:

وجدوا انه testosterone بزود 50% من الكتلة العضلية و ايضا بزود bone thickness عن طريق collagen synthesis و بالإضافة إلى bone mineralization و بدخل في تكوين pelvic و الفروقات مع female pelvic

°voice

hypertrophy of laryngeal mucos بصير الصوت خشن عن طريق

°male pattern hair loss

°increase RBCs

°increase ECV volume

مشابه لعمل Aldosterone

°skin

رح يزيد من thickness of keratinocytes و ايضا بزود من sebum secretion و هذا بفسر ظهور حب الشباب عند البلوغ

°increase BMR

°male genital system

°fat distribution

### Functions of Testosterone During Fetal Development

- seventh week of embryonic life
- testosterone secreted first by the genital ridges
- later by the fetal testes

#### • Functions:

##### 1-Development of the male body characteristics:

Formation of penis ,scrotum, prostate gland, seminal vesicles, & male genital ducts at the same time suppressing the formation of female genital organs

**NO TESTESTERONE» » NO MALE GENITALIA**

2-Descends testis to scrotum» undescended testes» T/GnRH» stimulates descent when inguinal canal permit that

if inguinal canal not permit

●Pubertal growth of penis, scrotum, and testes to 8X that , surgery is first choice

●Development of secondary sexual characteristics of the male & spermeiogenesis

releasing GnRH in male pulsatile

##### Functions of testosterone secondary characteristics:

1) body hair distribution

(pubis, face, chest, back, linea alba, etc)

in pubic hair , male the triangle base at

bottom and triangle tip at the top where in

female base at top and triangle tip on bottom

Male Pattern Baldness» T ↓ growth of hair on the top of the head (androgen & genetic factors)

2) voice

hypertrophy of laryngeal mucosa and larynx» masculine voice



### 3) skin

- ↑ thickens skin
- ↑ ruggedness of subcutaneous tissues
- ↑ sebaceous glands secretion and oil production» acne

### 4) Protein & muscle development

↑ muscle mass ↑ protein

Synthetic androgens

### 5) Bone

Increases Bone Matrix» due to protein anabolic function & calcium Retention

◇Earlier closure of epiphyses

Effects of pelvis

narrow the pelvic outlet

lengthen pelvis

cause a funnel-like shape

increase the strength of the entire pelvis for load bearing.

◇Used in female to treat osteoporosis

### 6) Increase metabolic rate

7) Increase RBC number : may be due to increase metabolic demands

8) Increase the reabsorption of Na in the distal tubules of the kidneys.

9) acute vasodilation

### Testosterone in aging

decrease slowly after age 40

decreased bone formation, muscle mass,

decreased growth of facial hair, appetite,

decreased libido

LH not changed; FSH increased with aging in men

Testosterone role in pathologies : Increase in LDL, decrease in HDL ,,, Implicated in coronary heart disease,? hypertension

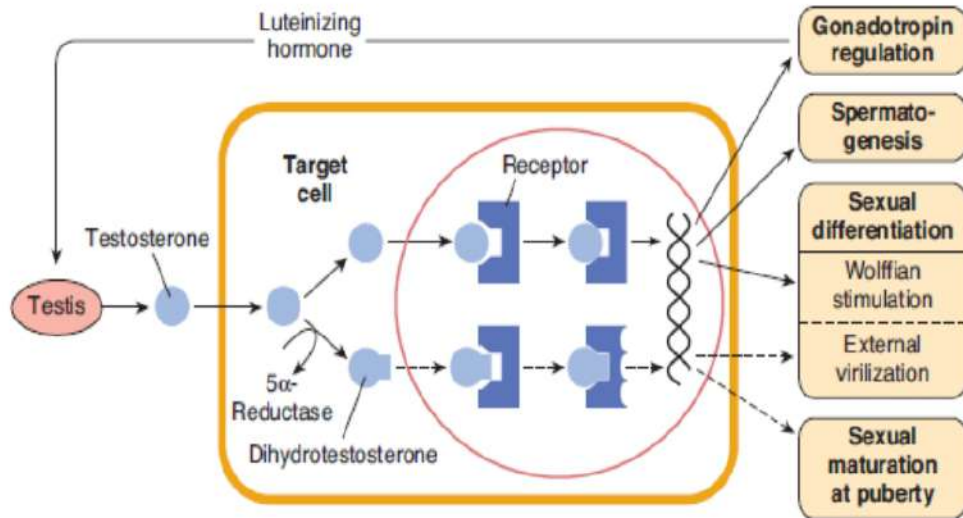
Dihydrotestosterone (DHT) function (Active form )

• Fetal development of penis, penile urethra, scrotum, prostate

• Pubertal growth of scrotum, prostate, pubic hair, sebaceous glands

Prostatic secretion

**Schematic diagram of the actions of Testosterone (solid arrows) and Dihydrotestosterone (dashed arrows)**

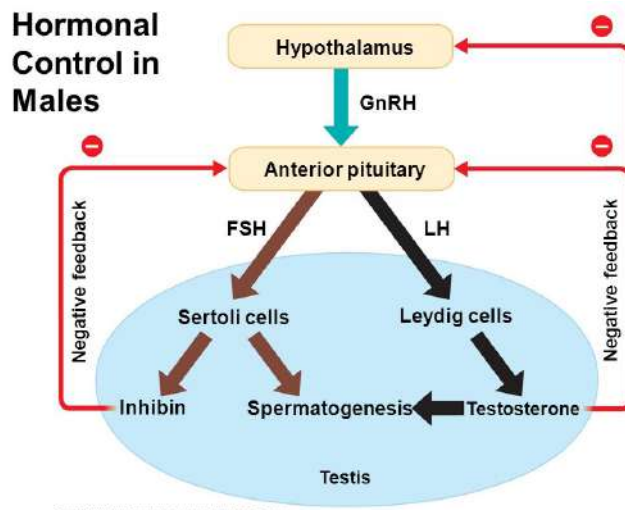


**Control of male sexual functions by hormones from hypothalamus & anterior pituitary gland**

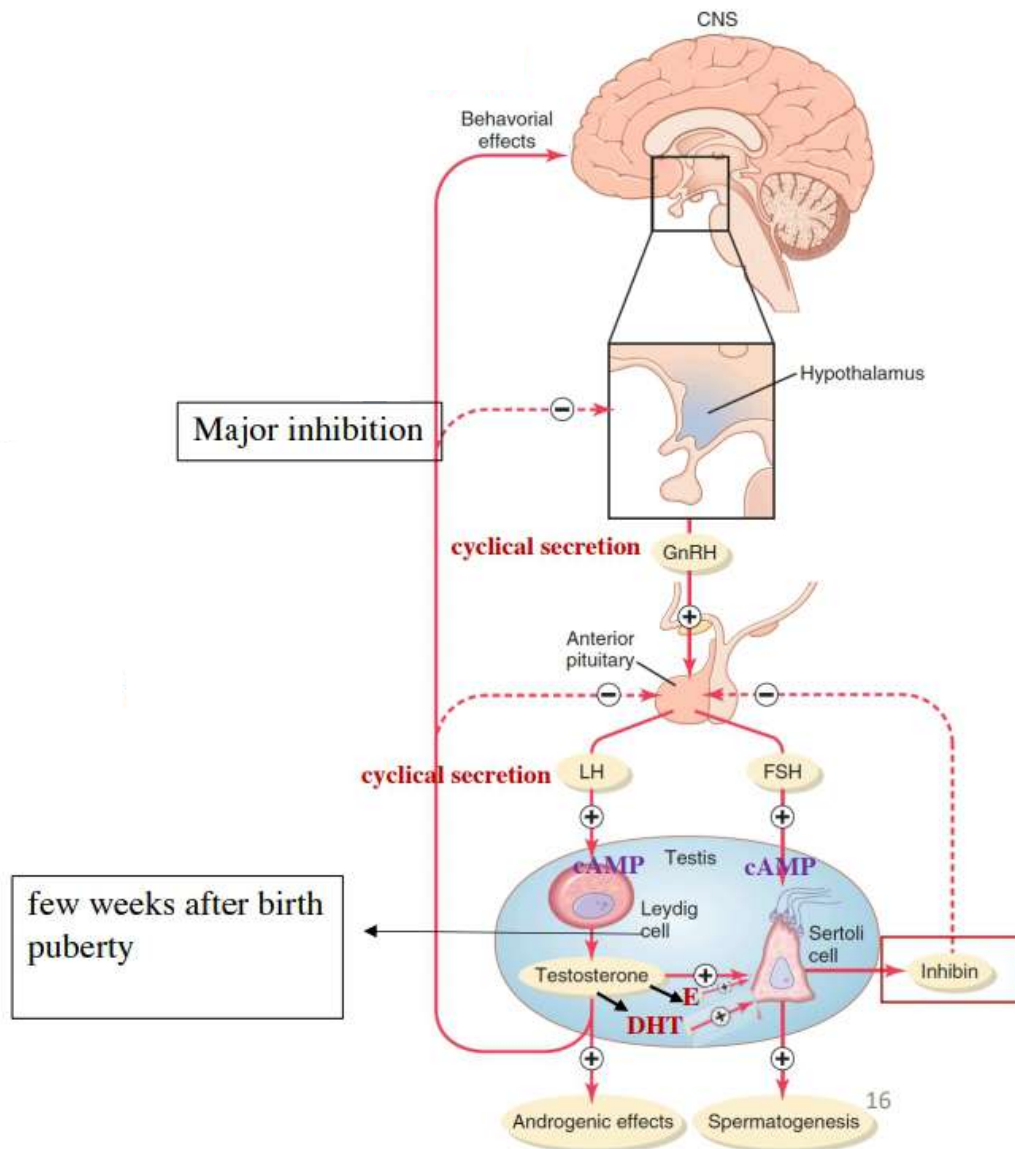
♣ In fetal and neonatal life (till about 10 weeks after delivery) testosterone secretion is stimulated by the placental chorionic gonadotropins (hCG). {same effects on the sexual organs as LH.} Thereafter, secretion is extremely low till puberty and adulthood and is stimulated by Pituitary gonadotropins.

♣ At puberty gonadotropin releasing hormone (GnRH) stimulates cells in the anterior pituitary gland to produce luteinizing hormone (LH) and follicle stimulating hormone (FSH).

- LH stimulates cells in the testes to produce testosterone » spermatogenesis.
- FSH stimulates spermatogenesis.



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## Puberty:

- During childhood » no secretion of GnRH
- During childhood, the slightest secretion of any sex steroid hormones exerts a strong inhibitory effect on hypothalamic secretion of GnRH.
- At puberty, the secretion of hypothalamic GnRH breaks through the childhood inhibition and adult sexual life begins.

## Pathologies

## Dihydrotestosterone

●benign prostatic hypertrophy -- also caused by DH

Urinary obstruction and treated with 5alpha-reductase inhibitor

●cancer of the prostate -- treated with androgen receptor antagonist, estrogen, radiotherapy, radical prostatectomy

●tumors of testis -- interstitial cell tumors: produce large amounts of testosterone

●germinal epithelial tumors: teratoma-produce no hormones-hCG **rarely**

Hypogonadism in males **give positive pregnancy test**

## Causes

1. Congenital nonfunctioning of testes
2. Under-developed testes due to absence of hCG in fetal life
3. Cryptorchidism, associated with partial or total degeneration of testes
4. Castration **remove of testis**
5. Absence of androgen receptors in testes
6. Disorder of the gonadotropes (cells secreting gonadotropins) in anterior pituitary
7. Hypothalamic disorder.

Stage	Signs & symptoms
Fetal	<ul style="list-style-type: none"><li>• none of the male sexual characteristics develop. Instead, female organs are formed <b>even if have male genital organ</b></li></ul>
before puberty	<ul style="list-style-type: none"><li>• Eunuchism → infantile sex organs &amp; sexual characteristics</li><li>• height is slightly greater than that of normal man (bone epiphyses are slow to unite)</li><li>• Thin bone</li><li>• Weak muscles</li><li>• Childlike voice</li><li>• No loss of hair on the head</li><li>• No normal adult masculine body hair distribution</li></ul>
after puberty	<ul style="list-style-type: none"><li>• Sexual organs regress slightly in size but not to a childlike state</li><li>• Slight voice regression</li><li>• Loss of masculine hair production</li><li>• Loss of thick masculine bones</li><li>• Loss of the musculature of the virile male.</li><li>• Sexual desires loss</li><li>• Erection is conserved</li><li>• No ejaculation (degeneration of semen forming-organs)</li></ul>

ال eunuchism عبارة عن صغر حجم الاعضاء التناسلية و الطول يكون عالي

بعد puberty بتكون اعراض اقل تأثير

Erectile dysfunction: age 40-70 years, 52% of men

Due to:

Diabetes Mellitus, hypertension, reduced HDL

vascular disorder

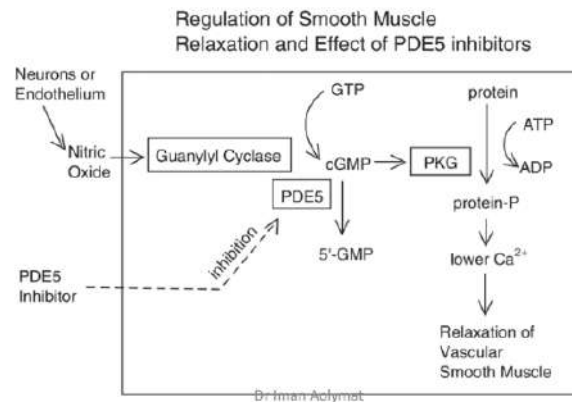
Radiation, surgery for prostate cancer

Lower spinal cord injury

stress -- unemployment, performance anxiety

Drugs: diuretics, antidepressants, antilipidemics, antihypertensives, EtOH, cocaine, marijuana

phosphodiesterase-5 inhibitors: sildenafil  
citrate, vardenafil, tadalafil



Androgen therapy

Vacuum constriction devices -- noninvasive

°draw venous blood into penis

°constriction ring prevents venous return

Injections of PGE1

Surgical implantation of prosthesis

Sex therapy

نهاية التلخيص

باعتذر عن أي خطأ في التلخيص و في حال وجد رح انضيفه على correction zone بالتوفيق