

# The male Reproductive Systems

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# INTRODUCTION

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- The organs of reproduction are grouped as *gonads* (produce gametes and secrete hormones), *ducts* (transport, receive, and store gametes), and *accessory sex glands* (produce materials that support gametes).
- *Gynecology* is the specialized branch of medicine concerned with the diagnosis and treatment of diseases of the female reproductive system. *Urology* is the study of the urinary system but also includes diagnosis and treatment of diseases and disorders of the male reproductive system.

# The Reproductive Systems

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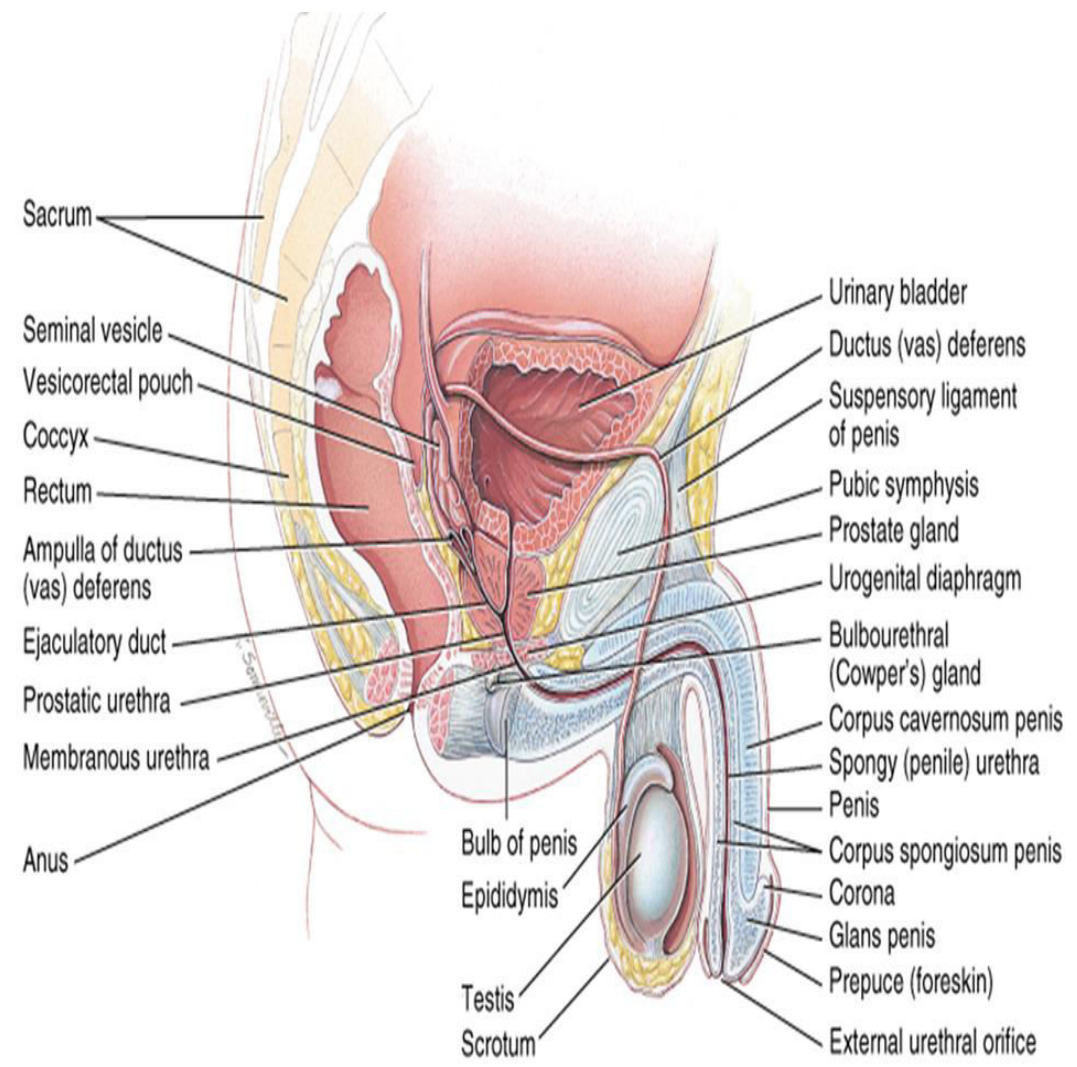


- Sexual reproduction produces new individuals
  - germ cells called gametes (sperm & 2nd oocyte)
  - fertilization produces one cell with one set of chromosomes from each parent
- Gonads produce gametes & secrete sex hormones
- Reproductive systems
  - gonads, ducts, glands & supporting structures
  - Gynecology is study of female reproductive system
  - Urology is study of urinary system & male reproductive system

# MALE REPRODUCTIVE SYSTEM

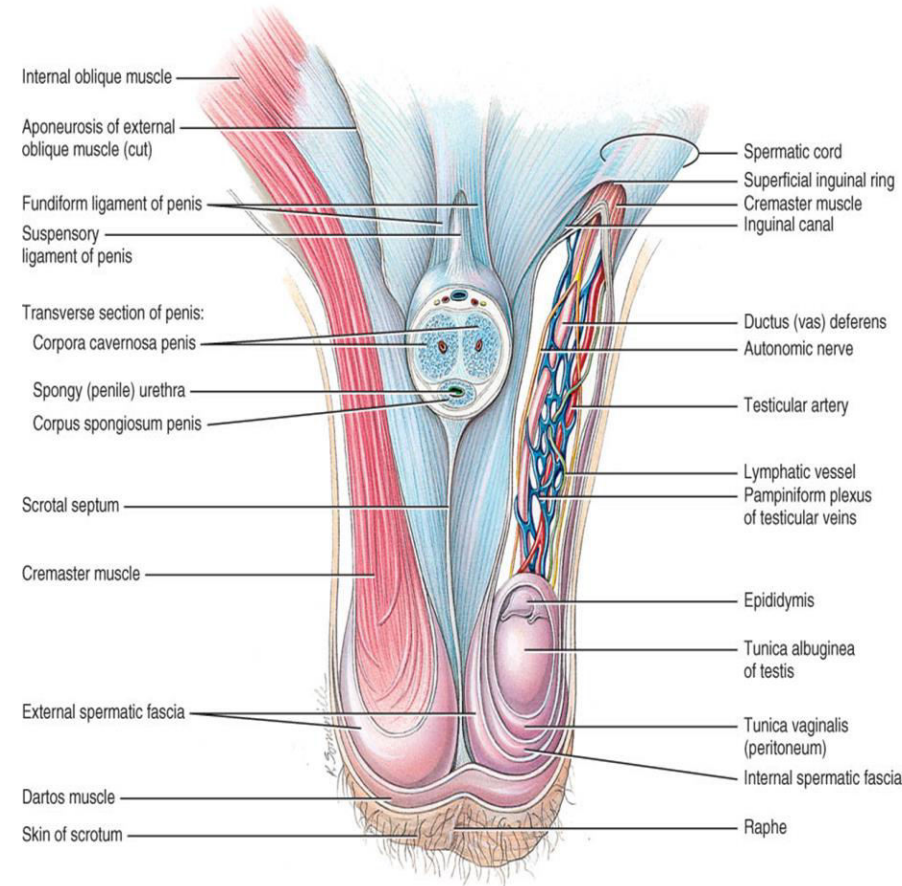
•The male structures of reproduction include the:

1. *testes*
2. a system of *ducts* (ductus epididymis, ductus deferens, ejaculatory duct, urethra)
3. *accessory sex glands* (seminal vesicles, prostate gland, bulbourethral glands)
4. several *supporting structures*, including the *penis*.



# Scrotum

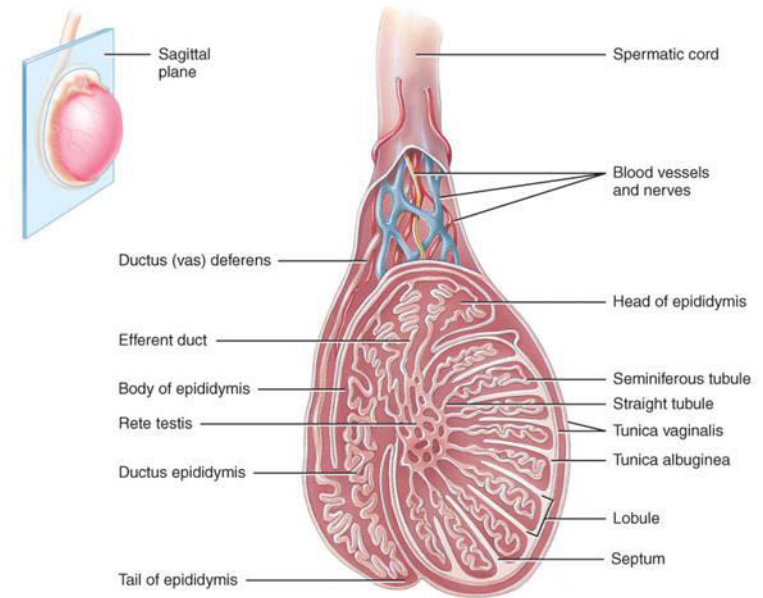
- The *scrotum* is a cutaneous outpouching of the abdomen that supports the testes.
- internally, a vertical septum divides it into two sacs, each containing a single testis.
- Skin contains dartos muscle causes wrinkling
- Temperature regulation of testes:
  1. sperm survival requires 3 degrees lower temperature than core body temperature so the testis located inside the scrotum out side the body.
  2. cremaster muscle in spermatic cord
    - elevates testes on exposure to cold & during arousal
    - warmth reverses the process



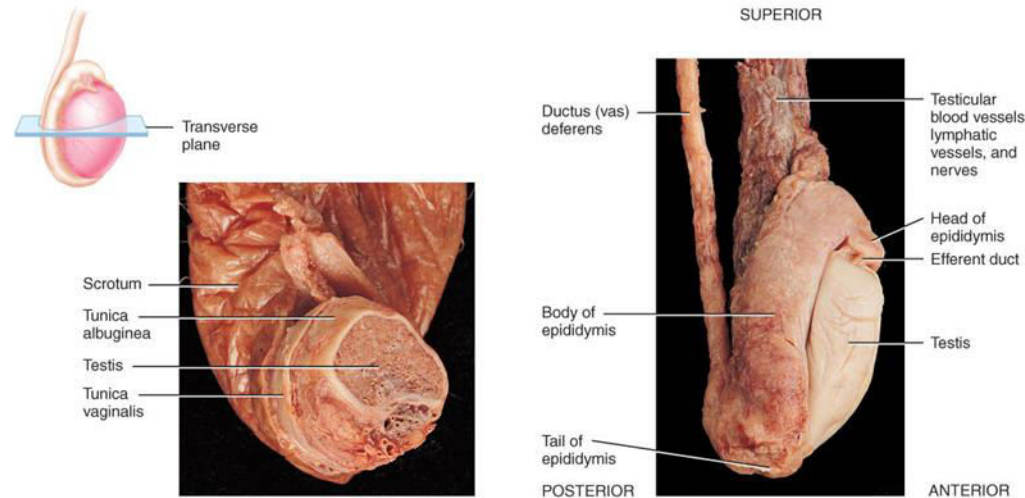
Anterior view of scrotum and testes and transverse section of penis

# Testes

- The *testes*, or *testicles*, are paired oval-shaped glands (gonads) in the scrotum measuring 2 in. by 1 in .
- The testes contain *seminiferous tubules* (in which sperm cells are made).



(a) Sagittal section of a testis showing seminiferous tubules

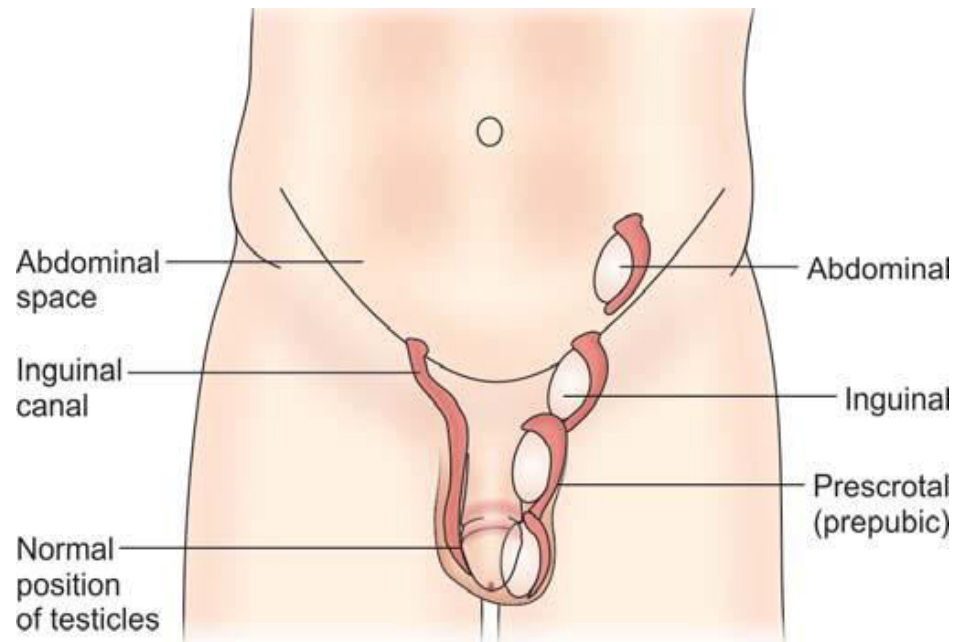


(b) Transverse section

(c) Testis and associated structures (lateral view)

# Descent of Testes

- Develop near kidney on posterior abdominal wall
- Descends into scrotum by passing through inguinal canal
  - during 7th month of fetal development
- Failure of the testes to descend is called *cryptorchidism*; it may involve one or both testes.

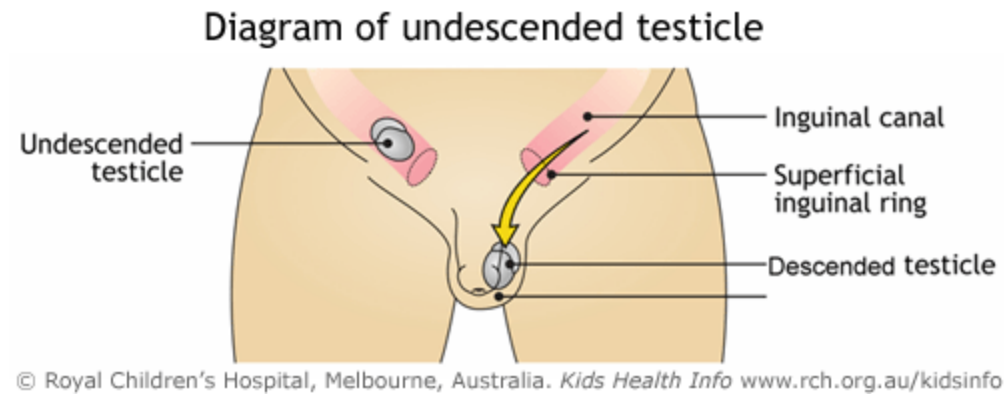




# Cryptorchidism

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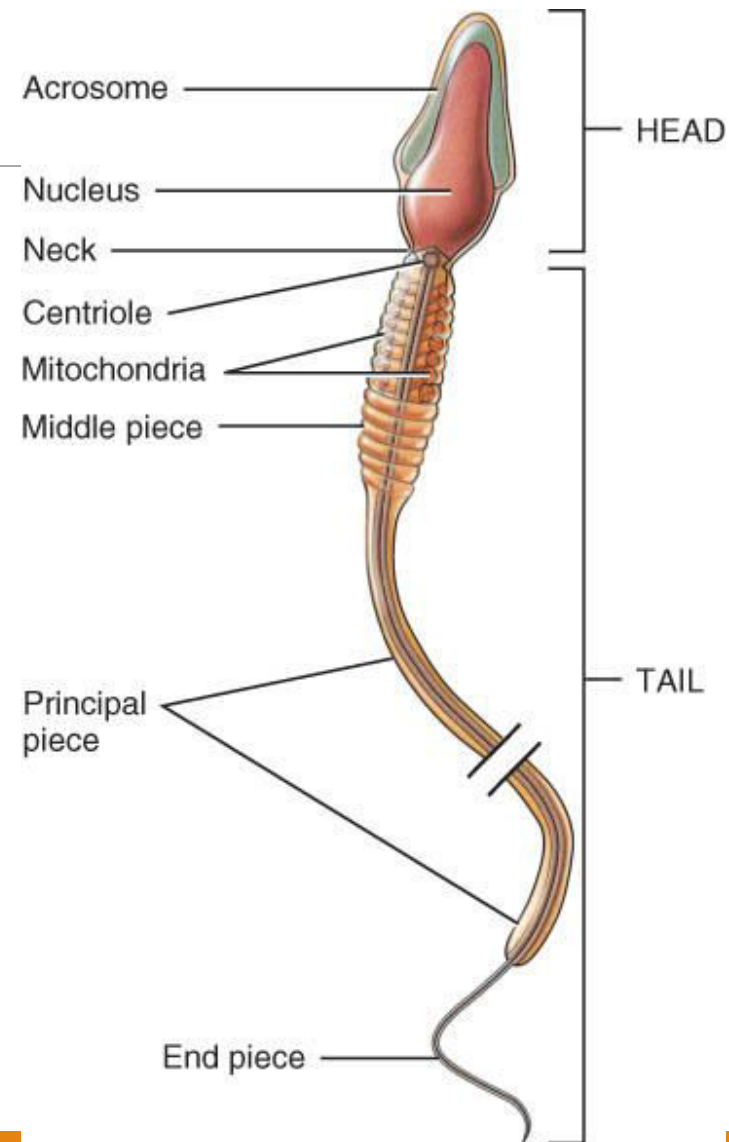
- Testes do not descend into the scrotum
- 3% of full-term & 30% of premature infants
- Untreated bilateral cryptorchidism results in sterility & a greater risk of testicular cancer
- Descend spontaneously 80% of time during the first year of life
  - surgical treatment necessary before 18 months



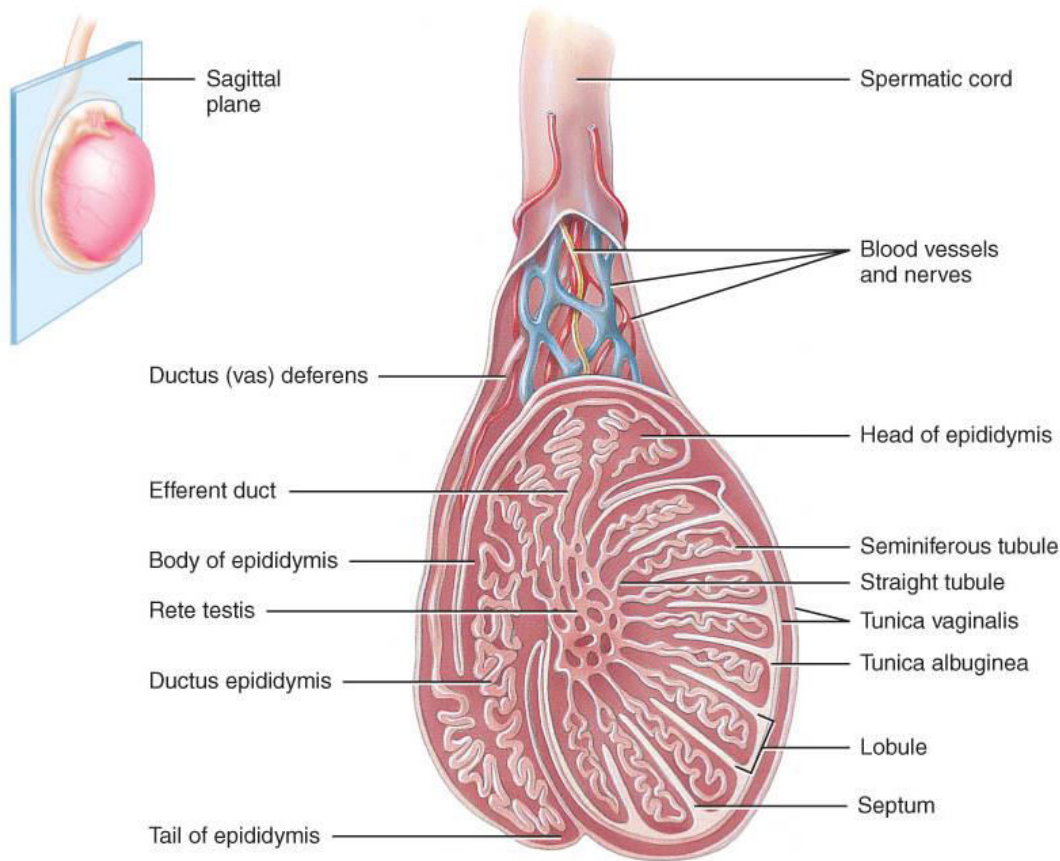


# Sperm Morphology

- Adapted for reaching & penetrating a secondary oocyte
- Head contains DNA & acrosome (hyaluronidase and proteinase enzymes)
- Midpiece contains mitochondria to form ATP
- Tail is flagellum used for locomotion
  
- They are produced at the rate of about 300 million per day and, once ejaculated, have a life expectancy of 48 hours within the female reproductive tract.



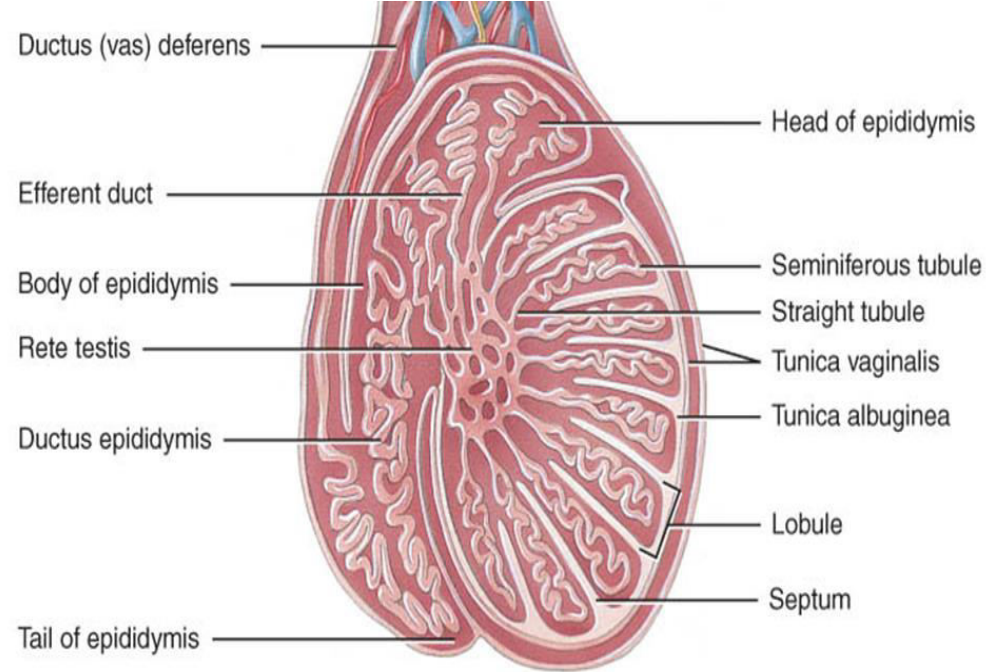
# Pathway of Sperm Flow through the Ducts of the Testis



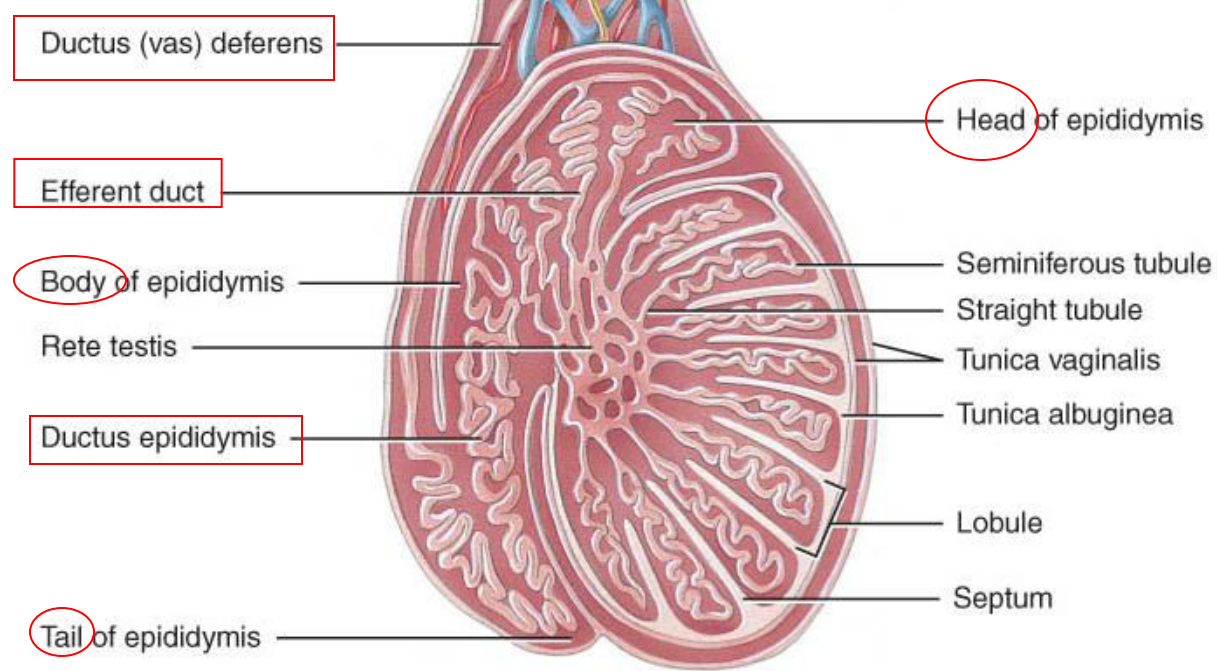
1. Seminiferous tubules
2. Straight tubules
3. Rete testis
4. Efferent ducts
5. Ductus epididymis
6. Ductus (vas) deferens

# Epididymis

- The *epididymis* is a comma-shaped organ that lies along the posterior border of the testis.
- Sperm are transported out of the testes through the efferent ducts in the epididymis which empty into a single tube called the *ductus epididymis*.
- The ductus epididymis is the site of sperm maturation and storage; sperm may remain in storage here for at least a month, after which they are either expelled or degenerated and reabsorbed.



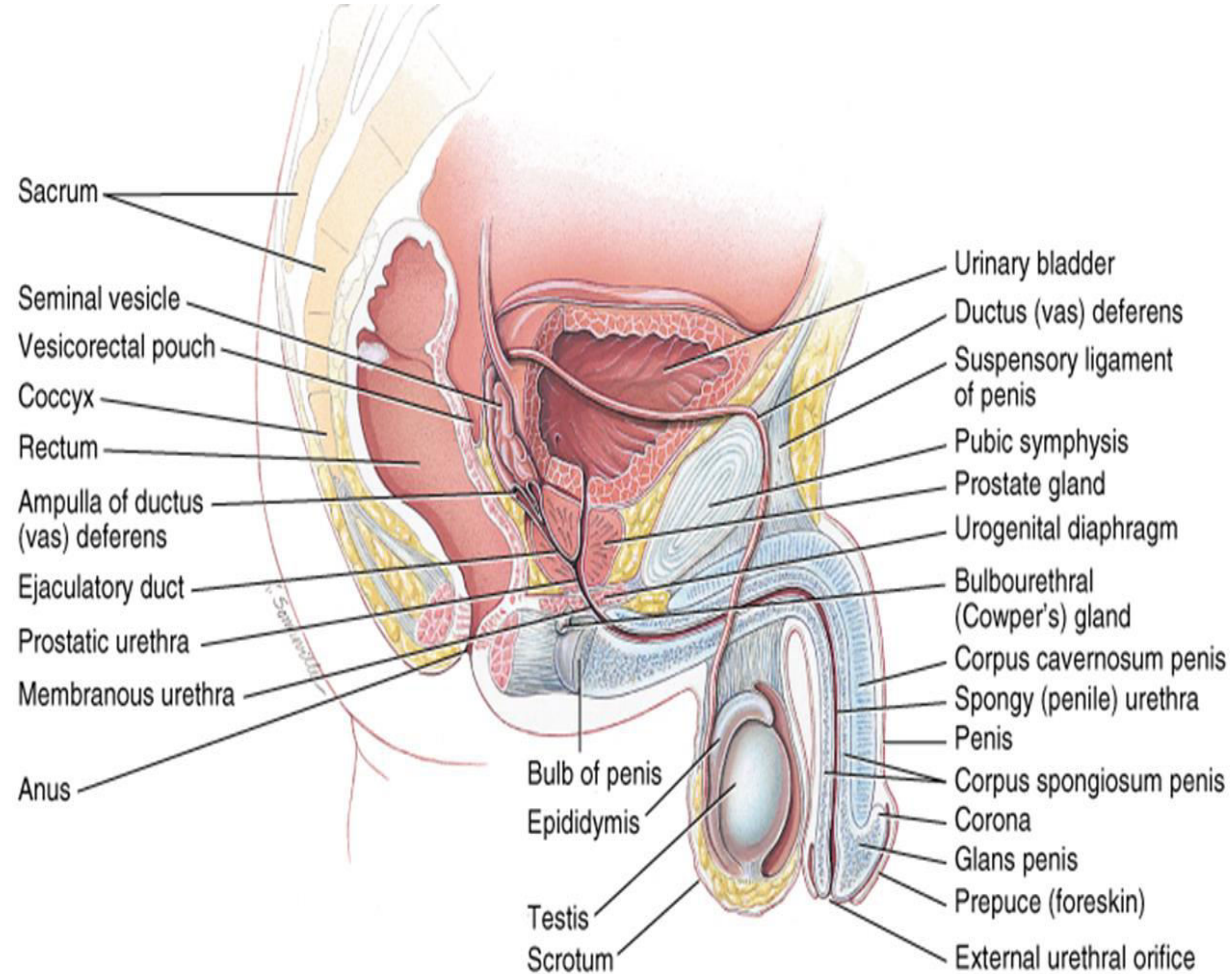
# Epididymis



- 1.5in long along posterior border of each testis
  - Head, body and tail region
  - Multiple efferent ducts become a single ductus epididymis in the head region
    - 20 foot tube if uncoiled
  - Tail region continues as ductus deferens

# The ductus (vas) deferens

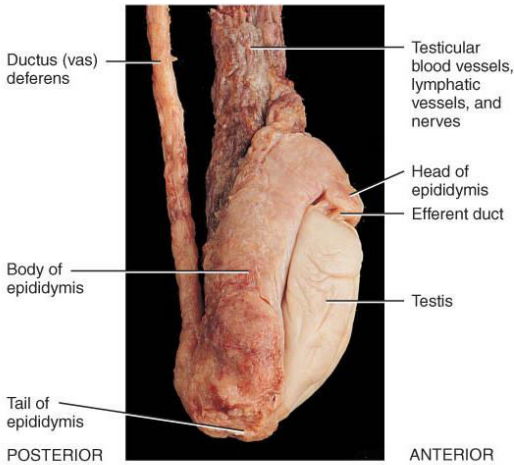
- The *ductus (vas) deferens*, or *seminal duct*, stores sperm and propels them toward the urethra during ejaculation.
- Pathway of 18 inch muscular tube
- ascends along posterior border of epididymis
- passes up through spermatic cord.
- reaches posterior surface of urinary bladder
- empties into prostatic urethra with seminal vesicle
- convey sperm along through peristaltic contractions



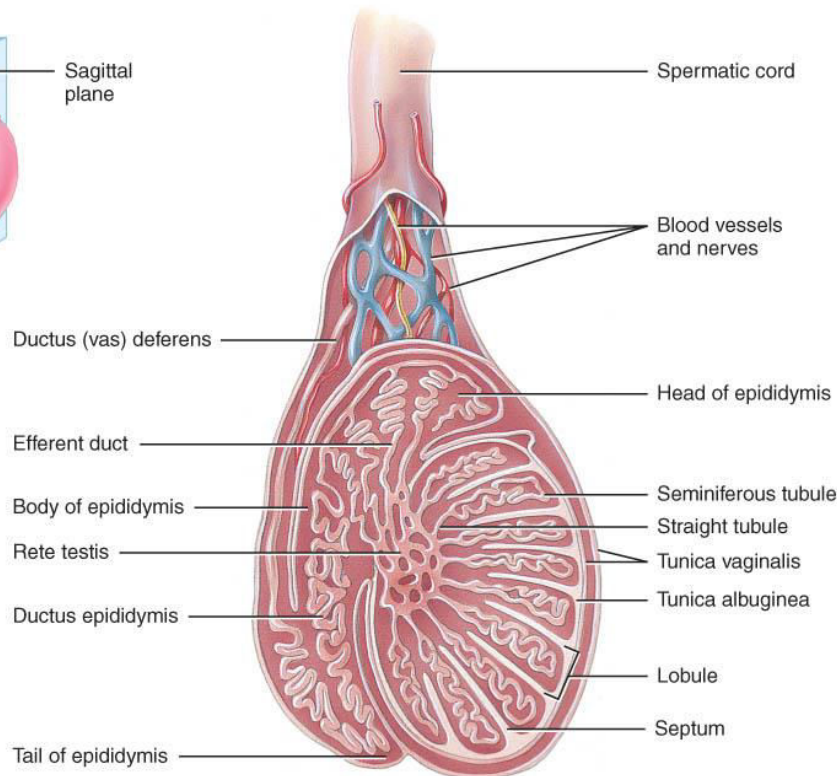
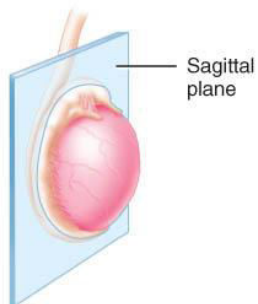


SUPERIOR

# Spermatic Cord



(c) Testis and associated structures (lateral view)

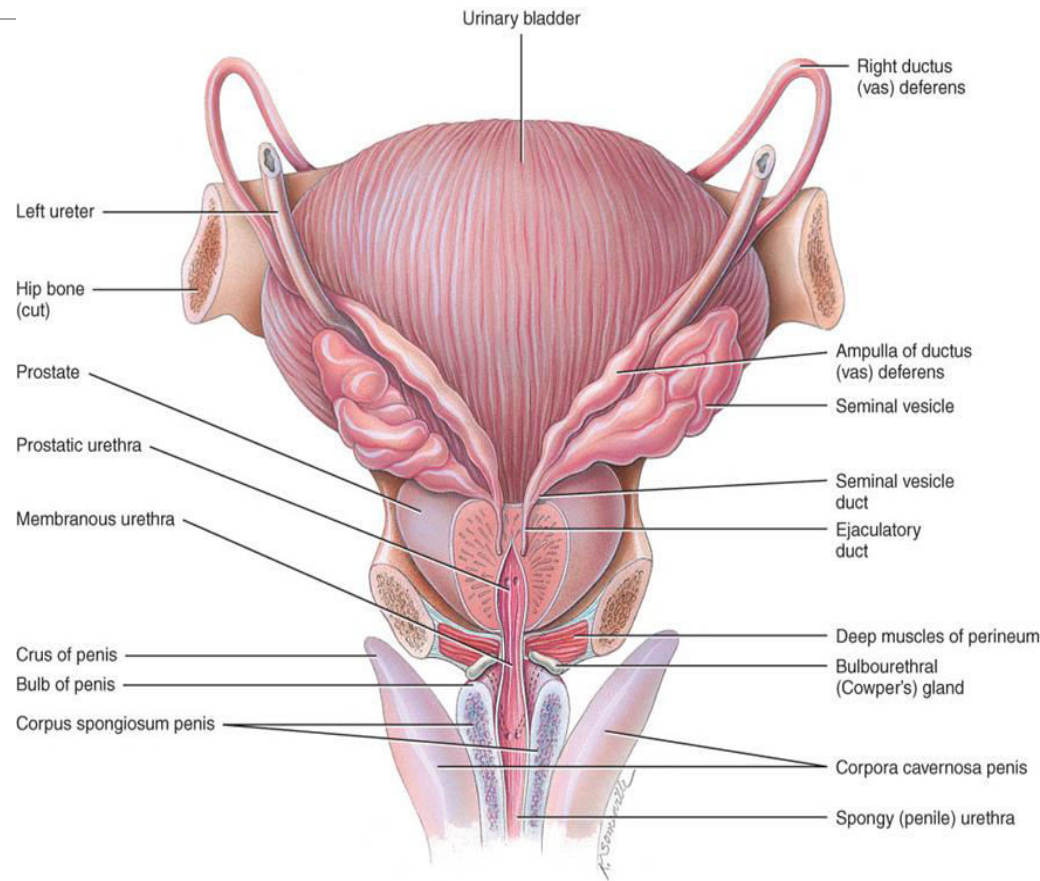


(a) Sagittal section of a testis showing seminiferous tubules

- The spermatic cord is a supporting structure of the male reproductive system.
- All structures passing to and from the testes
  - testicular artery
  - pampiniform plexus of veins
  - autonomic nerves
  - lymphatic vessels
  - ductus (vas) deferens
  - cremaster muscle

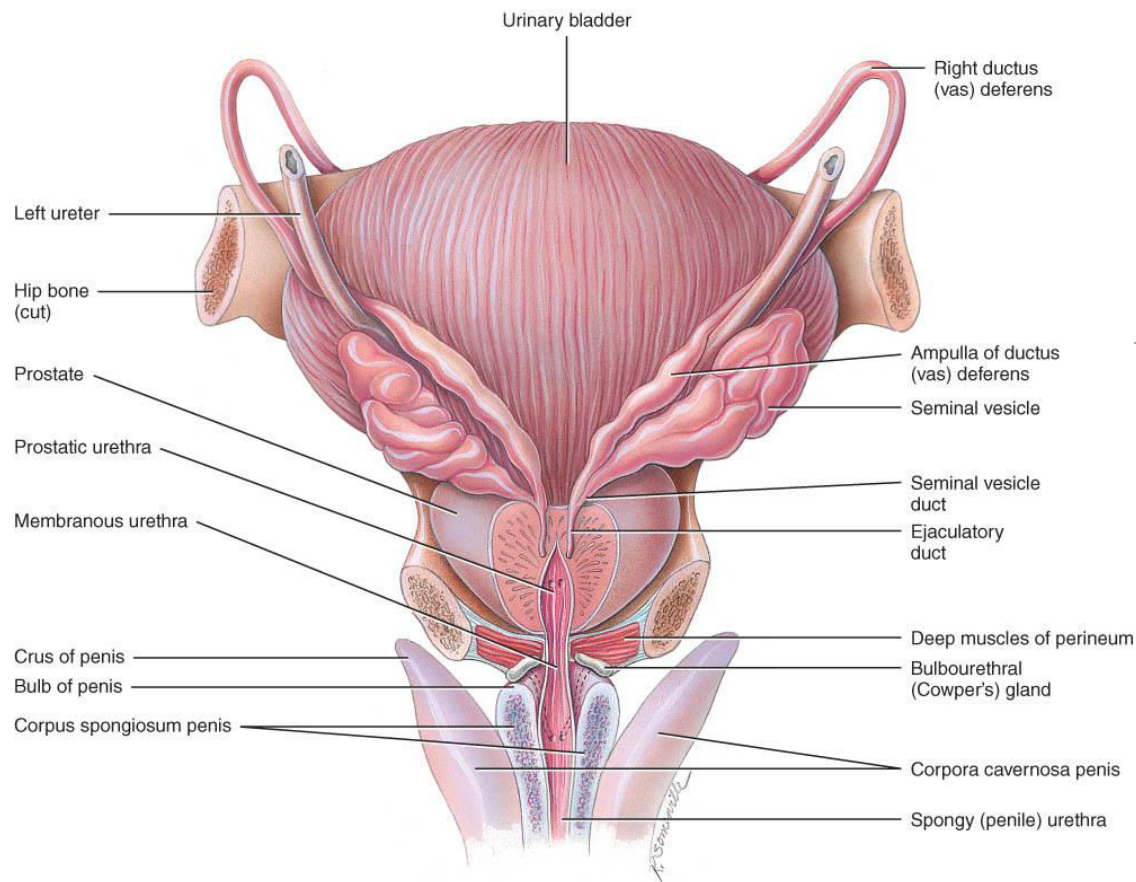
# The ejaculatory ducts & urethra

- **The *ejaculatory duct*** are formed by the union of the ducts from the seminal vesicle and ductus deferens; their function is to eject spermatozoa into the prostatic urethra.
- **The *male urethra*** is the shared terminal duct of the reproductive and urinary systems which serves as a passageway for semen and urine. The male urethra is subdivided into three portions: prostatic, membranous, and spongy (cavernous).



Posterior view of male accessory organs of reproduction





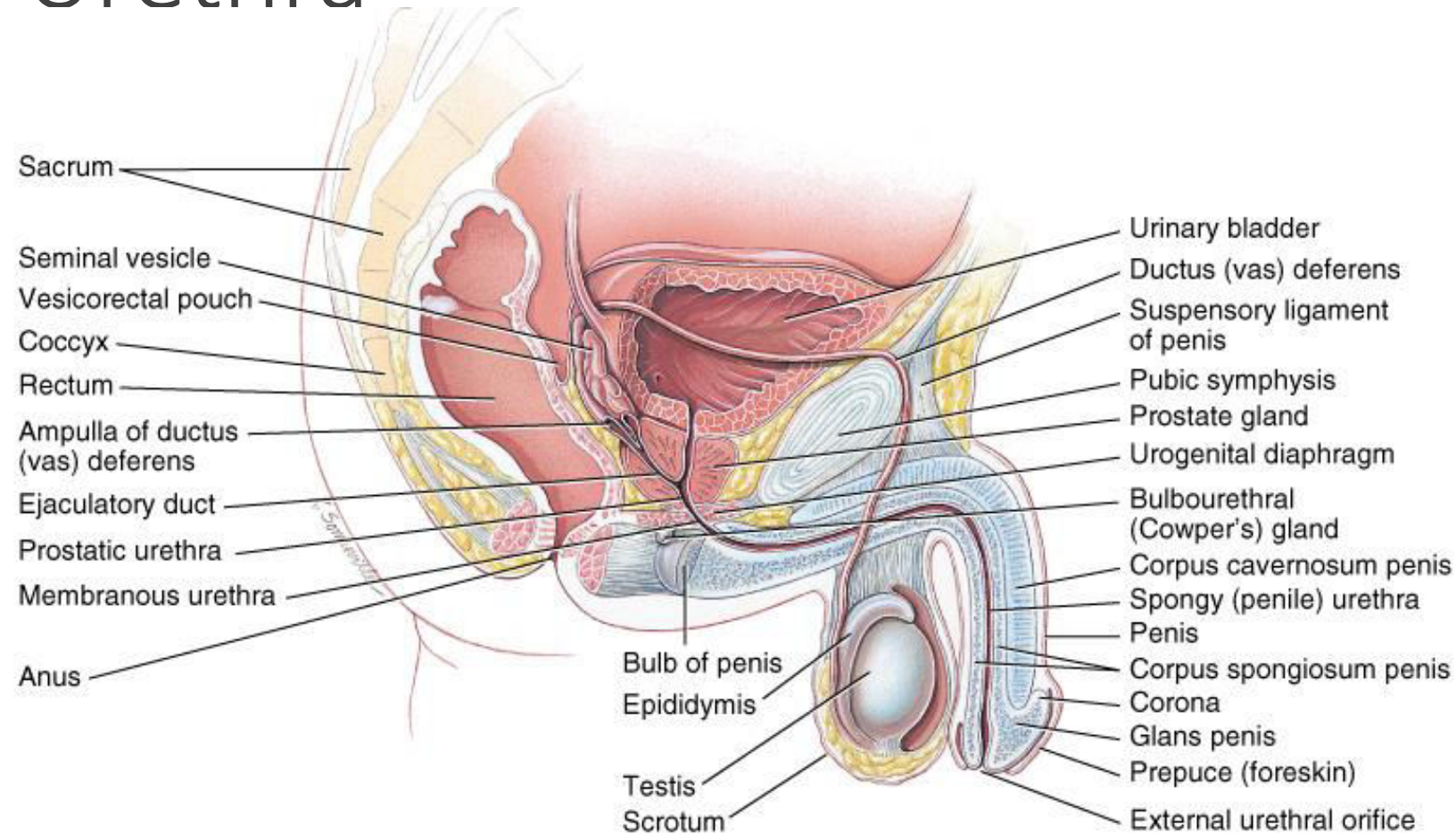
Posterior view of male accessory organs of reproduction

# Ejaculatory Ducts

## Posterior View

- Formed from duct of seminal vesicle & vas deferens
- About 1 inch long
- Adds fluid to prostatic urethra just before ejaculation

# Urethra



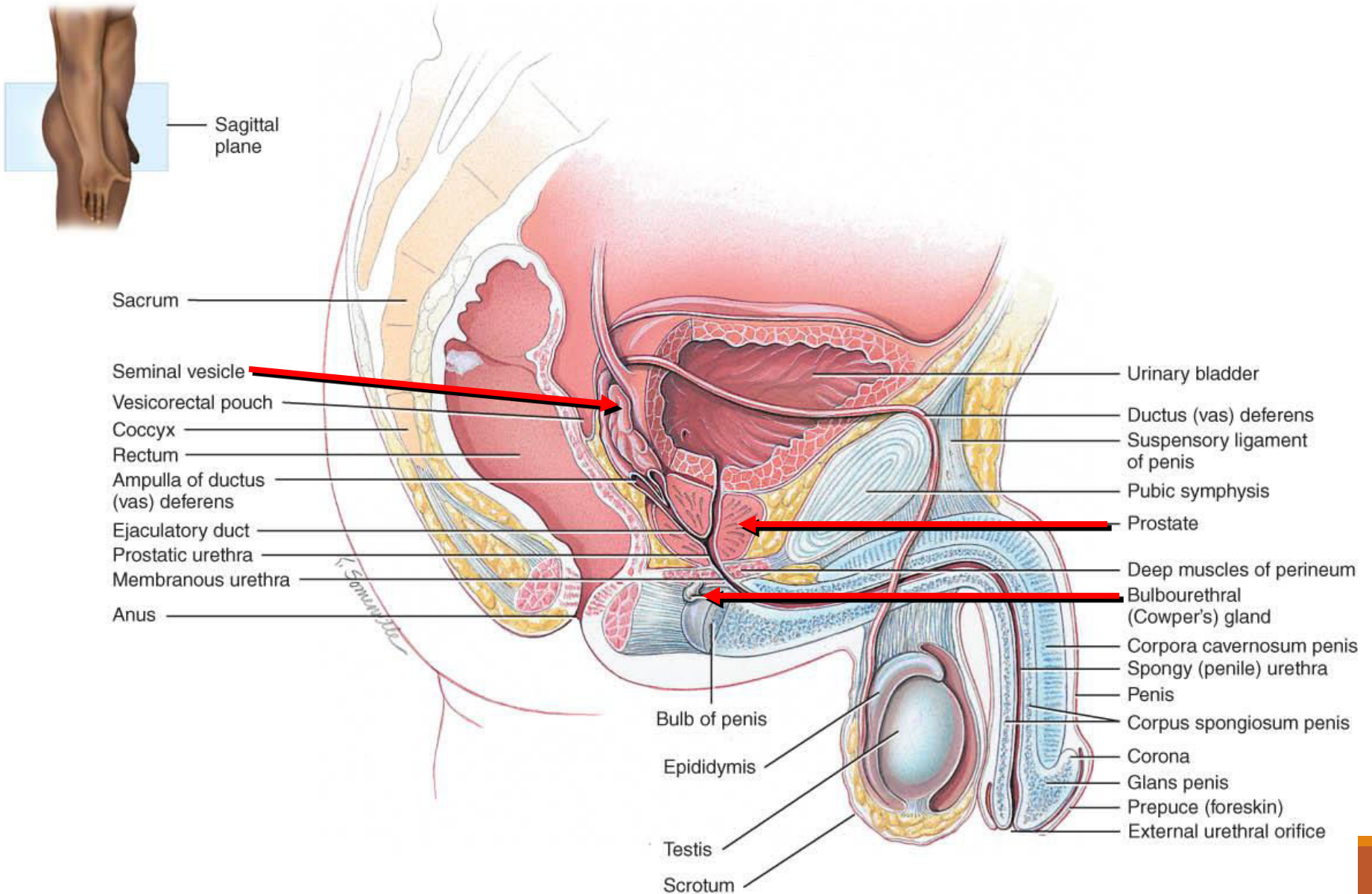
- 8 inch long passageway for urine & semen
  - Prostatic urethra (1 inch long)
  - Membranous urethra (passes through UG diaphragm )
  - Penile (spongy) urethra (through corpus spongiosum)

# Accessory Sex Glands

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1. The seminal vesicles
2. The prostate gland
3. Bulbourethral or Cowper's Glands

# Accessory Sex Glands



# Seminal vesicles

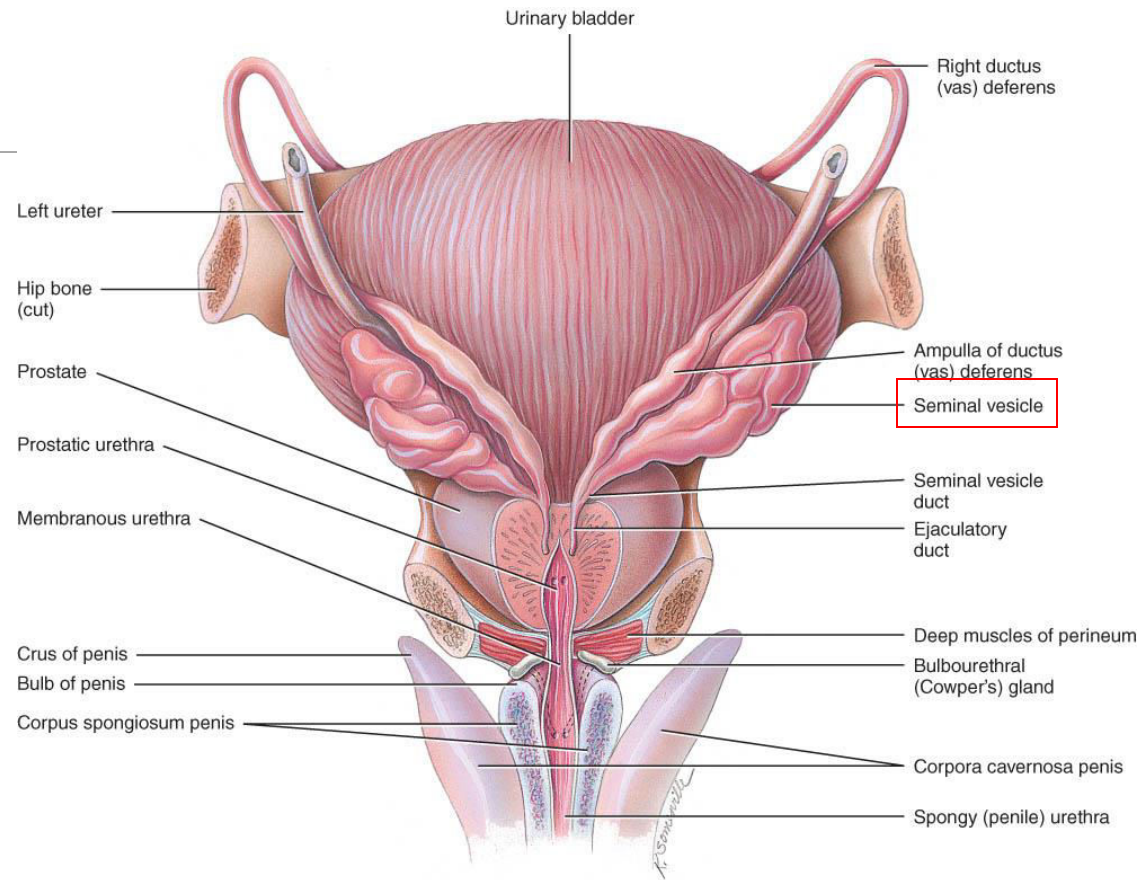
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- The *seminal vesicles* secrete an alkaline, viscous fluid that contains fructose, prostaglandins, and clotting proteins.
- The alkaline nature of the fluid helps to neutralize acid in the male urethra and female reproductive tract.
- The fructose is for ATP production by sperm.
- Prostaglandins contribute to sperm motility and viability.
- Semenogelin is the main protein that causes coagulation of semen after ejaculation.



# Seminal Vesicles

- Pair of pouchlike organs found posterior to the base of bladder
- Alkaline, viscous fluid
  - neutralizes vaginal acid & male urethra
  - fructose
  - prostaglandins
  - coagulation proteins



Posterior view of male accessory organs of reproduction  
**POSTERIOR VIEW**

# The *prostate gland*

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- Is a donut shaped gland about the size of a golf ball which is inferior to the urinary bladder and surrounds the prostatic urethra.
- It secretes a milky, slightly acidic fluid that contains:
  - citric acid, which can be used by sperm for ATP production
  - acid phosphatase
  - several proteolytic enzymes, including:  
which liquefy coagulated semen.



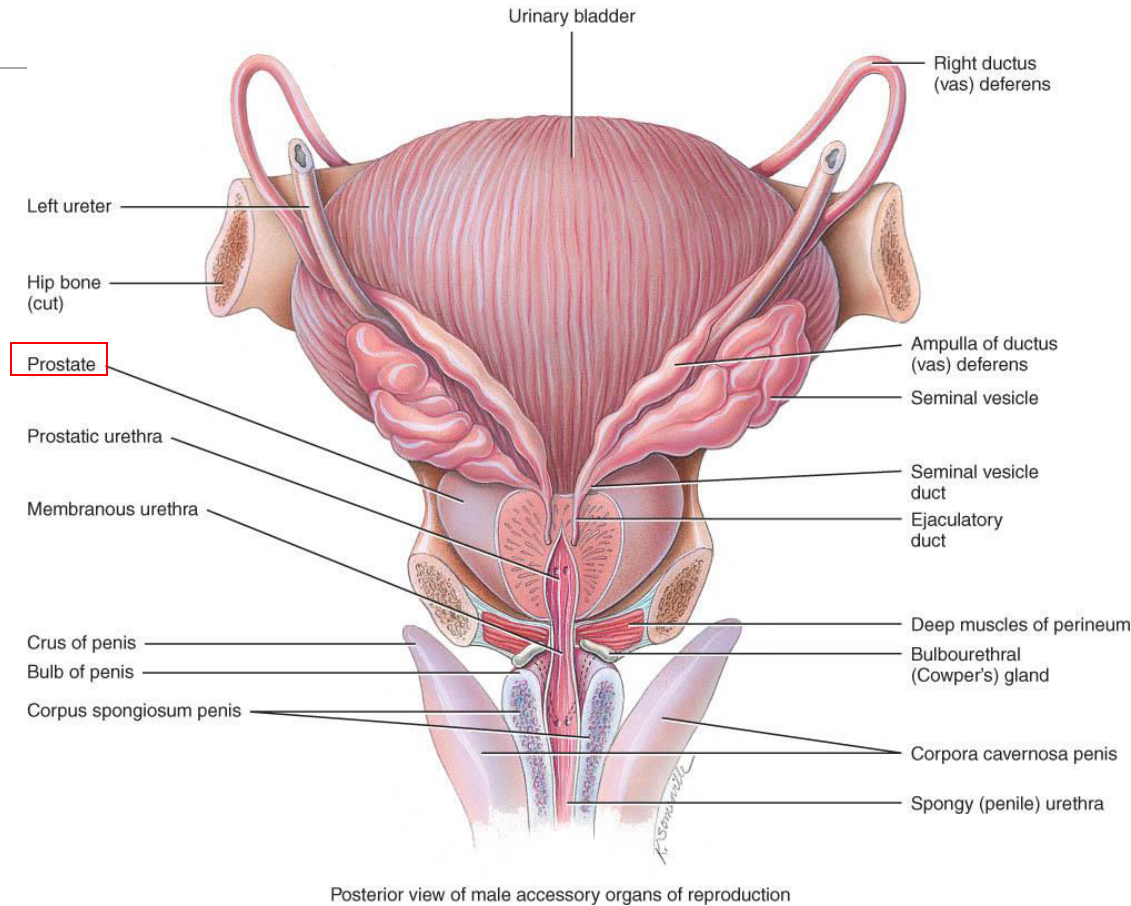
# Prostate Gland

## Single organ

- size of chestnut
- inferior to bladder
- pH 6.5 fluid
- citric acid
- enzymes for seminal liquefaction

## Many duct openings

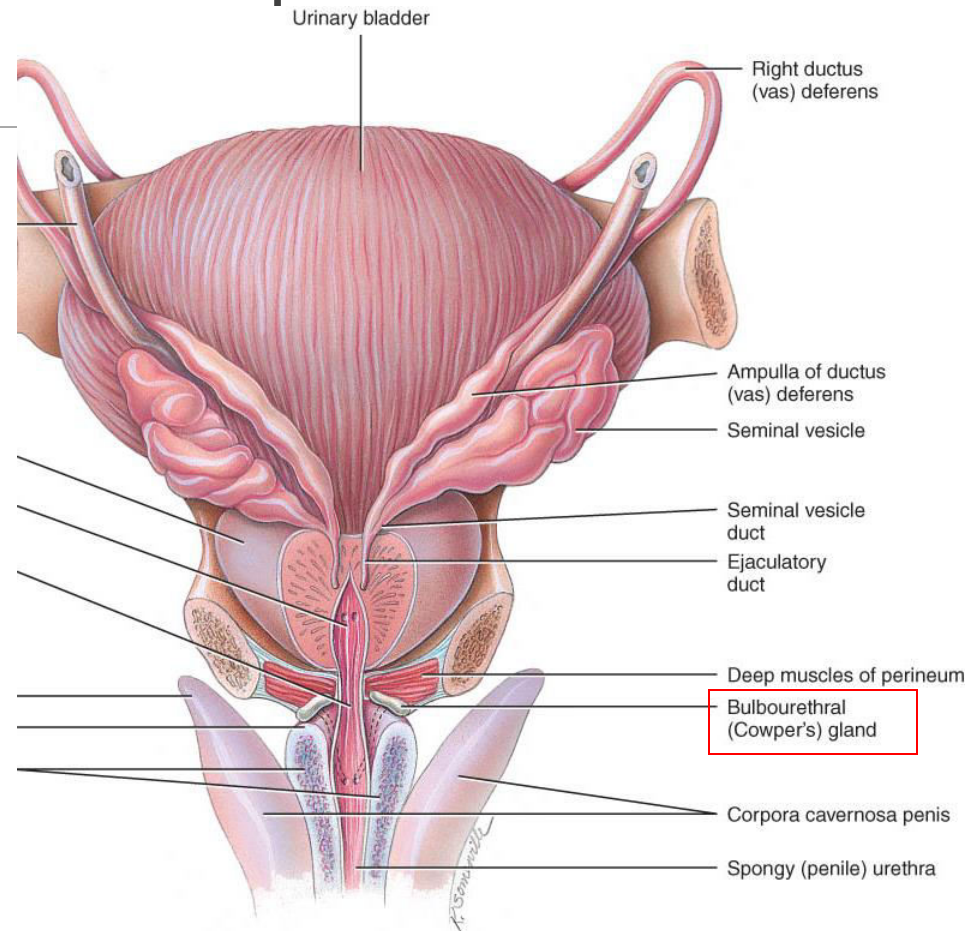
## Enlarges with age



## Posterior View

# Bulbourethral or Cowper's Glands

- The bulbourethral (Cowper's) glands
- mucus for lubrication and an alkaline substance that neutralizes acid.
- Paired, pea-sized gland within the urogenital diaphragm
- alkaline mucous
- connects to spongy urethra



Posterior view of male accessory organs of reproduction

Posterior View

# Secretions - Summary

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- *Semen (seminal fluid)* is a mixture
- spermatozoa and accessory sex gland secretions that provides the fluid in which spermatozoa are transported, provides nutrients, and neutralizes the acidity of the male urethra and female vagina
- antibiotic, seminal plasmin, and prostatic enzymes that coagulate and then liquefy semen to aid in its movement through the uterine cervix.
- Once ejaculated, liquid semen coagulates within 5 minutes due to the presence of clotting proteins from the seminal vesicles. After about 10-20 minutes, semen re-liquifies because of proteolytic enzymes produced by the prostate gland break down the clot.

# Semen Statistics

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- Mixture of sperm & seminal fluid
  - slightly alkaline, milky appearance, sticky
- Typical ejaculate is 2.5 to 5 ml in volume
- Normal sperm count is 50 to 150 million/ml
- Coagulates within 5 minutes
- Reliquifies in 15 minutes
- Semen fertility analysis----bad news if sperm show lack of forward motility, low count or abnormal shapes.

# Penis

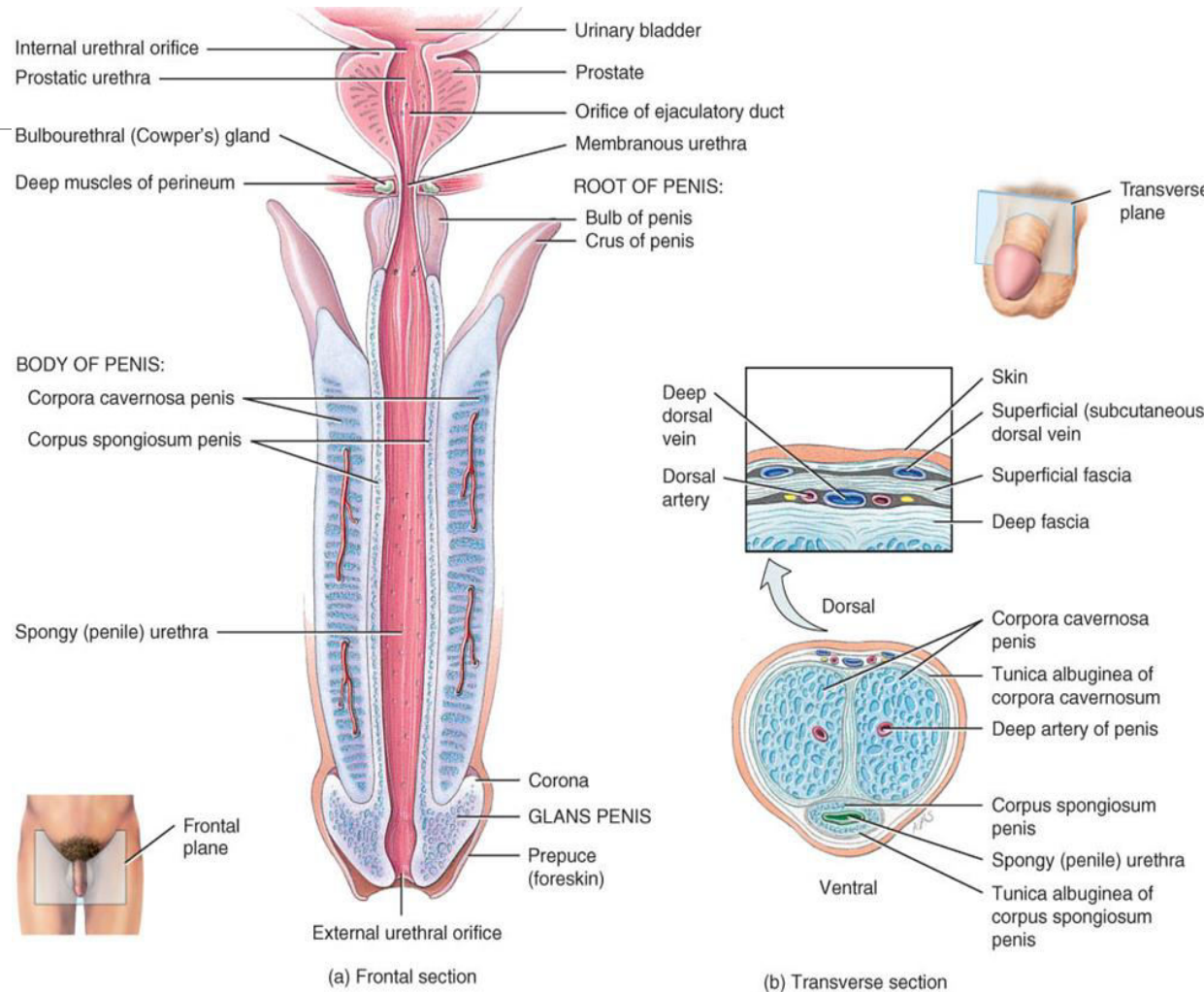
The penis contains the urethra and is a passageway for the ejaculation of semen

Body composed of three erectile tissue masses:

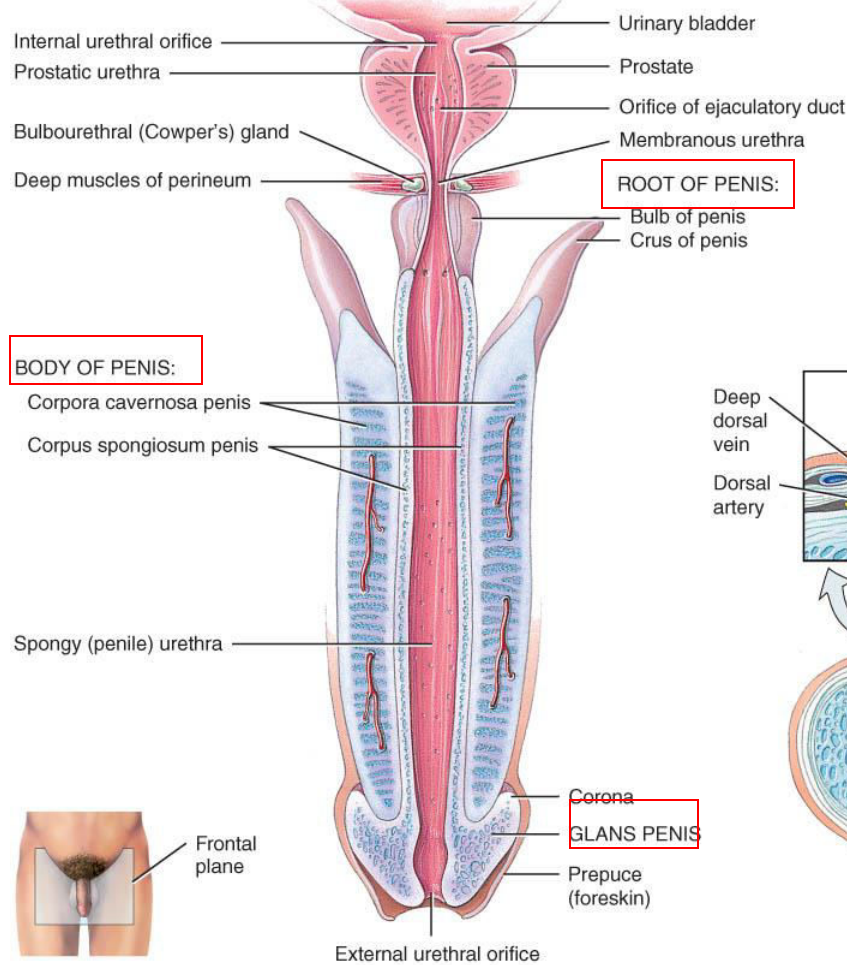
- paired corpora cavernosa penis
- unpaired corpus spongiosum penis

Four anatomical parts

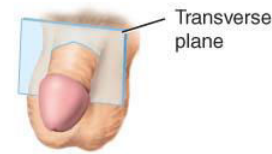
- root = bulb + crura
- body
- glans penis







(a) Frontal section

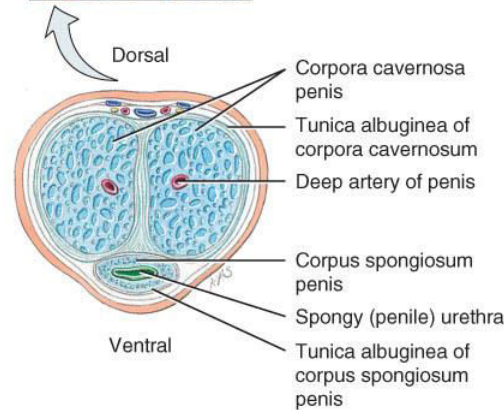
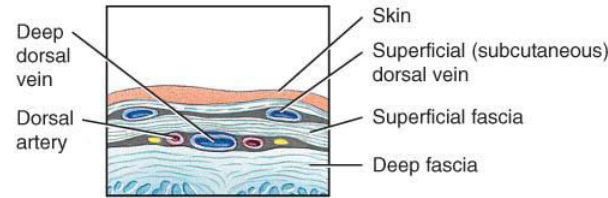


Transverse plane

# Anatomy of the Penis

**BODY OF PENIS:**

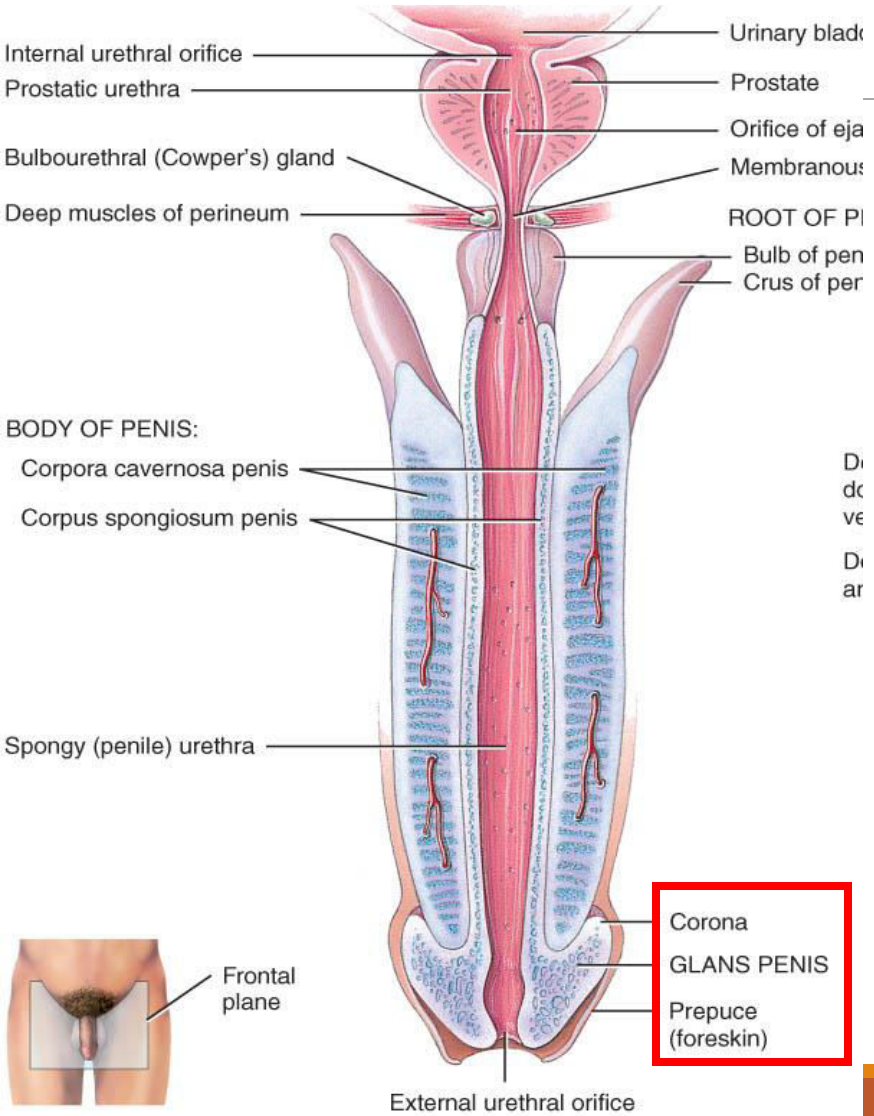
Corpora cavernosa penis  
Corpus spongiosum penis



(b) Transverse section

- Passageway for semen & urine
- Body composed of three erectile tissue masses filled with blood sinuses
- Composed of: root, body & glans penis

# Glans Penis



- Enlarged distal end of corpus spongiosum
- The distal end of the unpaired corpus spongiosum is the *glans penis*.
- External urethral orifice is spiral small slit
- The prepuce, or foreskin, covers the uncircumcised *glans penis*.

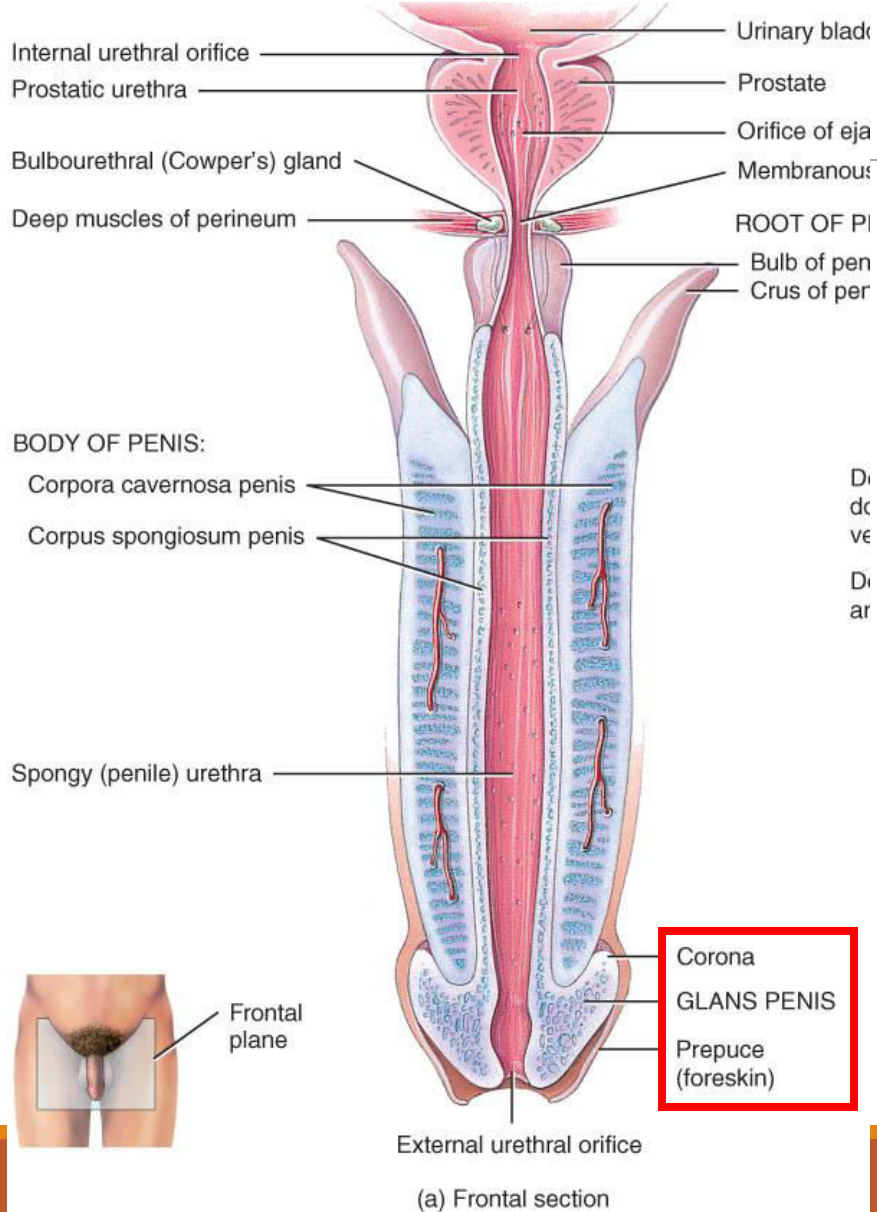
Corona  
GLANS PENIS  
Prepuce (foreskin)

External urethral orifice

(a) Frontal section



# Circumcision



- Removal of prepuce
- Possibly lowers UTIs, cancer & sexually transmitted disease

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