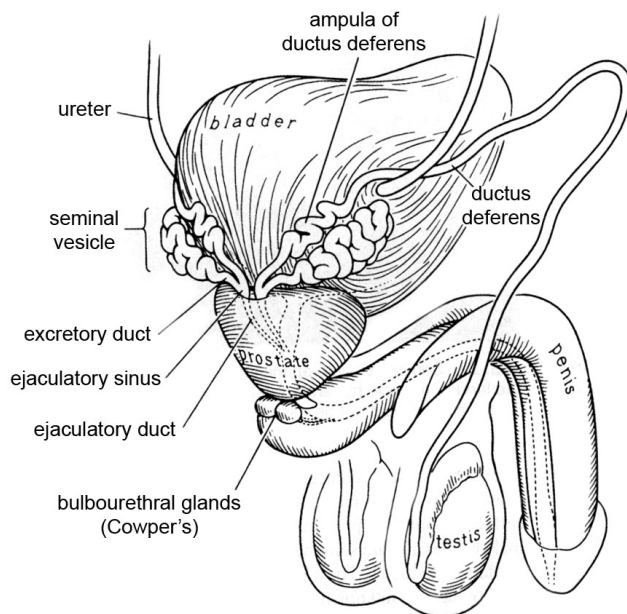


Male reproductive system

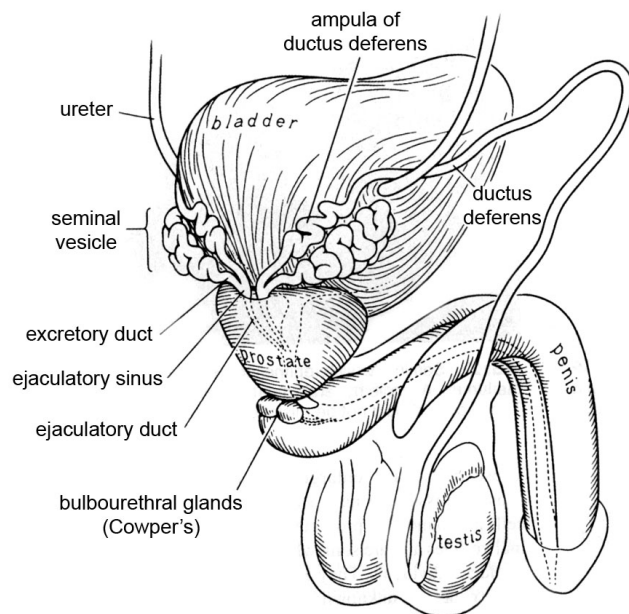


Objectives

Students should be able to:

1. Recognise the main structures of a section of functional testis.
2. Identify the levels of the epididymis according to their cellular structural variations and have an understanding of their function.
3. Discuss the structure and function of the efferent duct system and the accessory glands.
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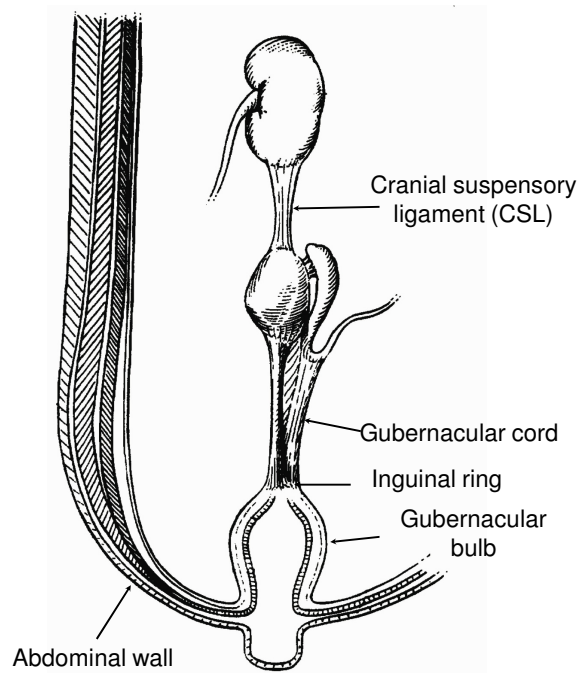
Male reproductive system



Peripheral components:

- Male gonads
- Genital excurrent ducts
- Accessory sex organs

Testicular descent



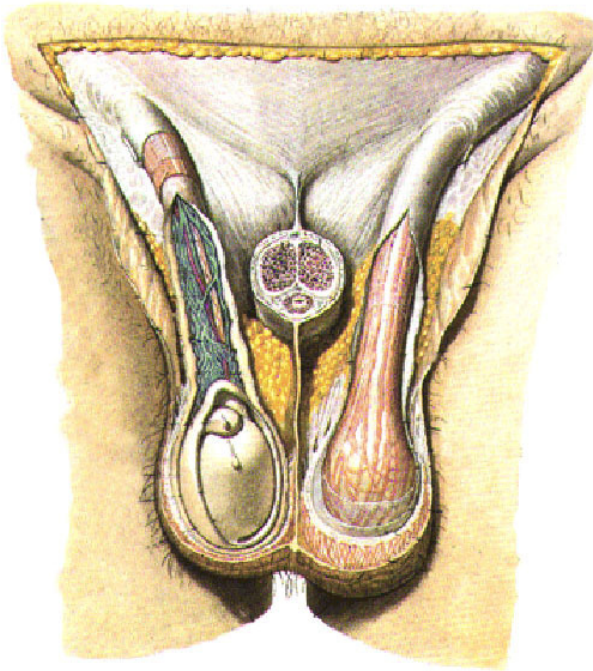
Transabdominal phase

- Androgen-dependent regression of CSL
- *InsI3*-mediated gubernaculum outgrowth

Inguinoscrotal phase

- Dilation/masculinisation of inguinal canal
- Androgen-mediated gubernaculum regression

Spermatic cord

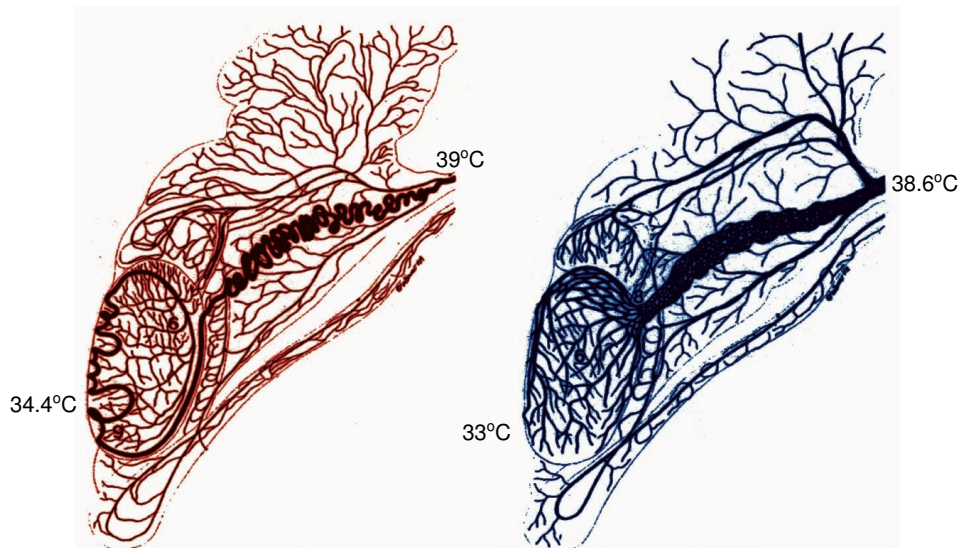


Result of testicular migration

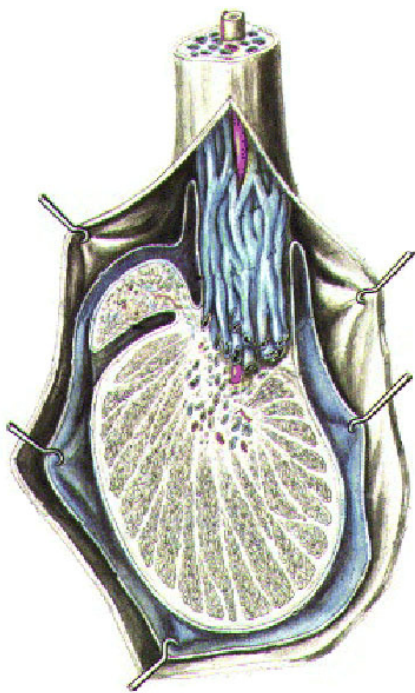
Encompasses

- vas deferens
- testicular artery
- veins (form *pampiniform plexus*)
- lymphatic vessels
- sympathetic nerve fibres
- genitofemoral nerve (genital branch)
- bundles of cremaster muscle

Counter-current heat exchange in spermatic cord



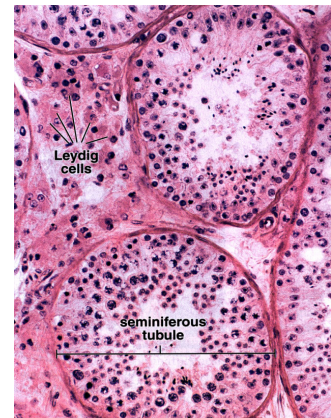
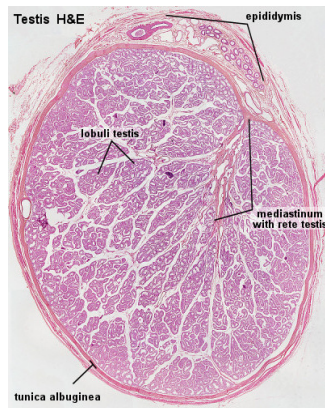
Testicle



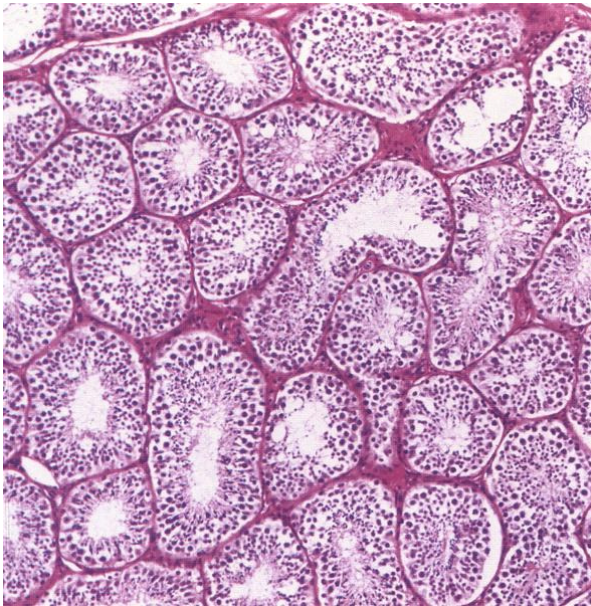
- visceral layer of tunica vaginalis
- tunica albuginea
- tunica vasculosa

- Forms *mediastinum testis* along the posterior surface

- Septa separate parenchyme into 250 - 300 lobules

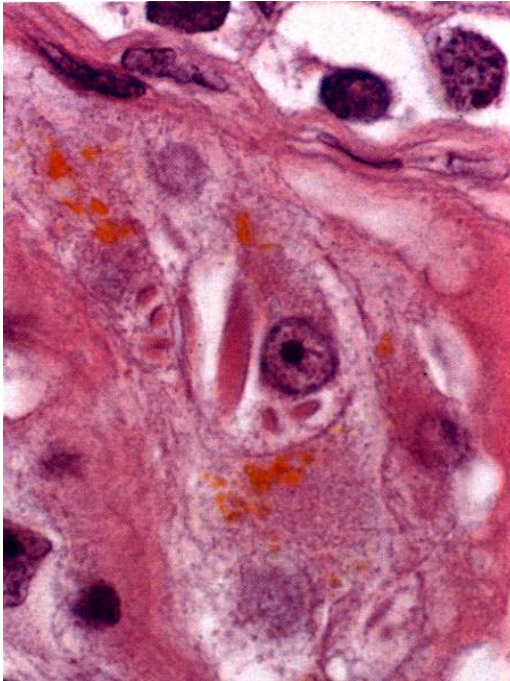


Interstitial tissue

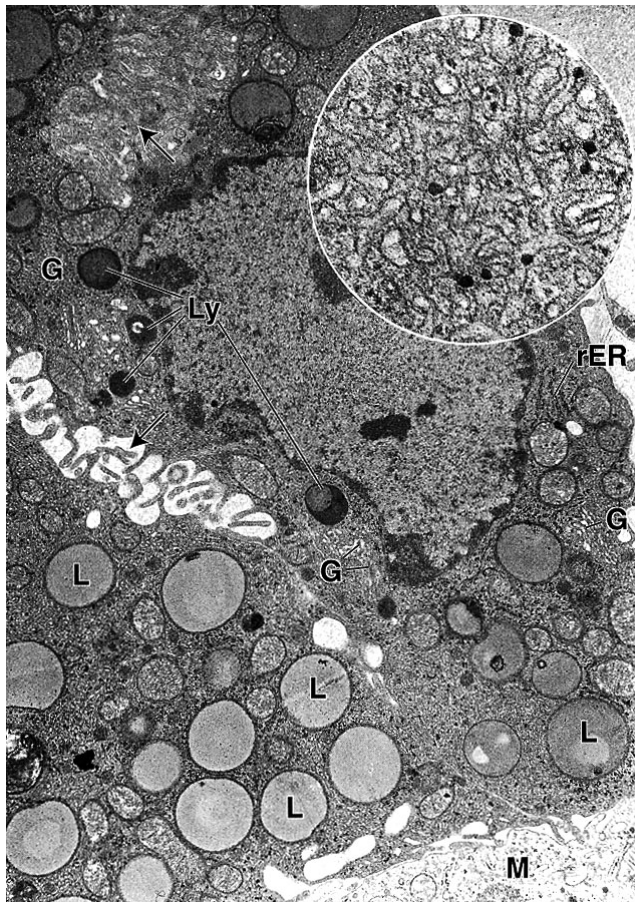


- Loose connective tissue
- Fills up spaces between seminiferous tubules
- Accounts for 25-30% of testicular mass
- Contains blood/lymph vessels, nerves, mast cells, macrophages, Leydig cells

Leydig cells



- Site of testicular steroidogenesis - synthesise and secrete testosterone.
- Occur in clusters, are variable in size and richly supplied by capillaries.
- Have a 'foamy' appearance due to the presence of lipid droplets and granules.

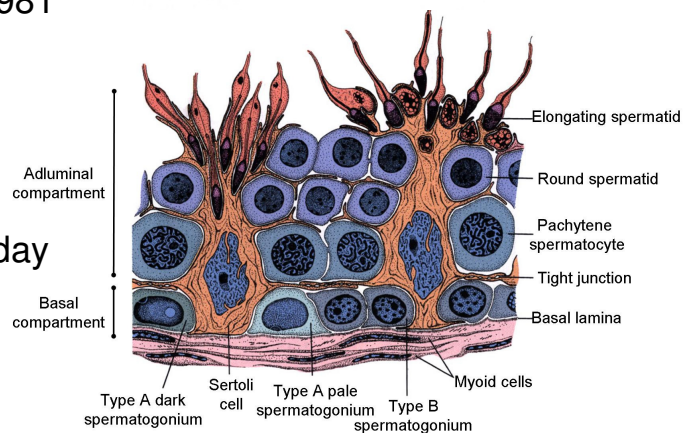
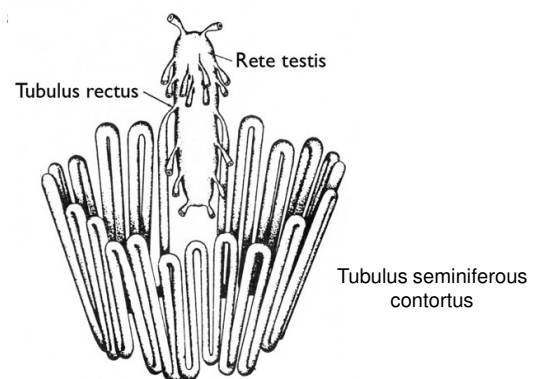


Leydig cells: ultrastructural signs of steroid synthesis

- Abundant sER
- Mitochondria with tubulovesicular cristae
- Multiple lipid droplets

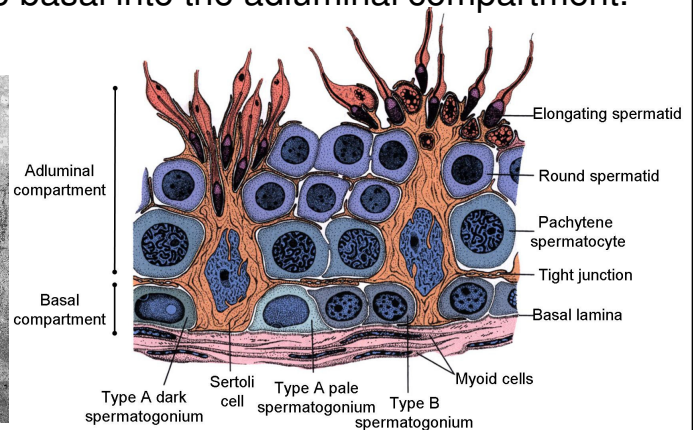
Seminiferous tubules

- Loop structure
- One to four in each lobule
- 20-25 m/g of testis
- Total length between 299 and 981 meters (~540 m) in each testis
- Lined with spermatogenic epithelium
- Release $45 - 207 \times 10^6$ sperm/day



Sertoli cells

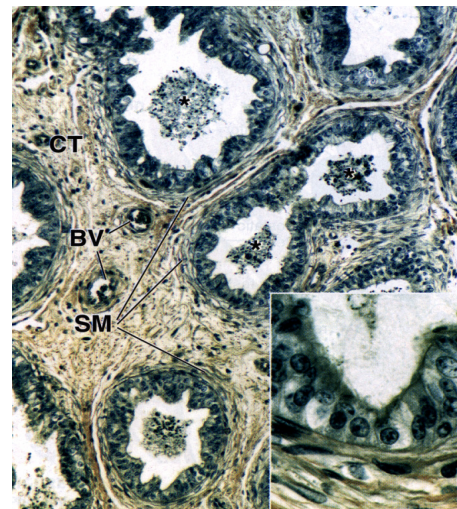
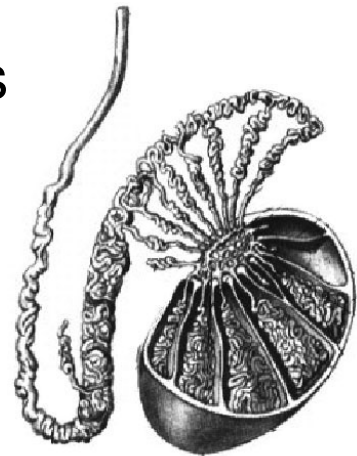
- Nondividing, comprise 10-15% of the tubular epithelium
- SC extend from the basement membrane to the luminal surface of the seminiferous epithelium.
- Lateral processes of SC are interconnected by tight junctions, which, with surrounding peritubular cells are the structural basis of the blood testis barrier.
- Tight junctions are temporarily open to permit the passage of spermatogenic cells from the basal into the adluminal compartment.



- Developing germ cells sequestered beyond blood-testis barrier.

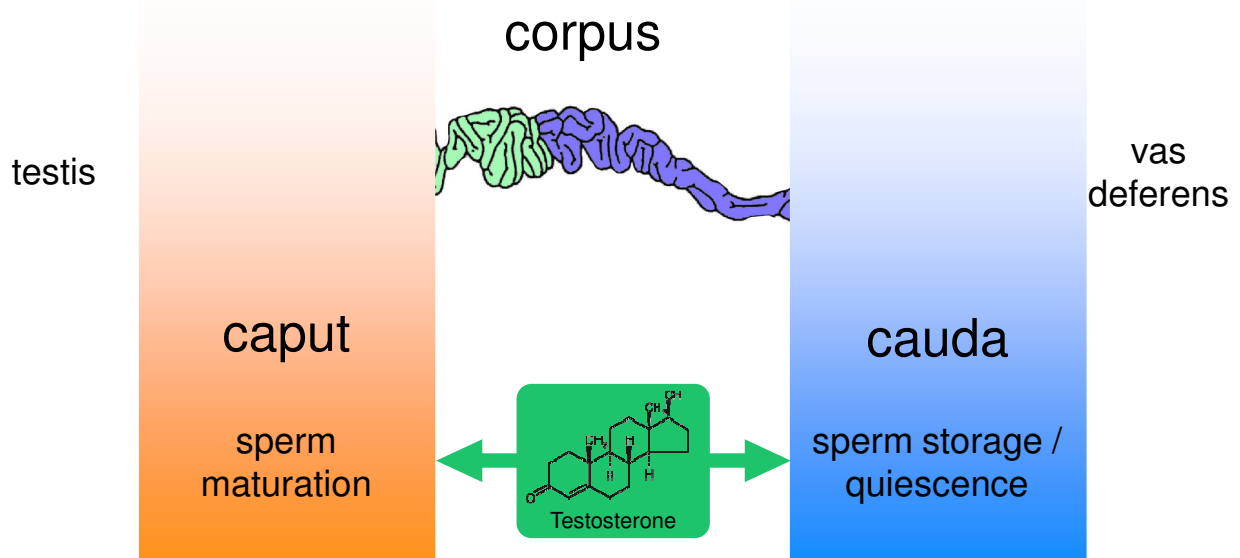
Ductuli efferentes

- Up to 20 coiled tubules arise from rete testis
- Pseudostratified columnar epithelium
- Mesonephric tubules derivatives
- Oestrogen ($ER\alpha$)-dependent fluid/solute reabsorption
- Comprise a major part of the human caput epididymidis



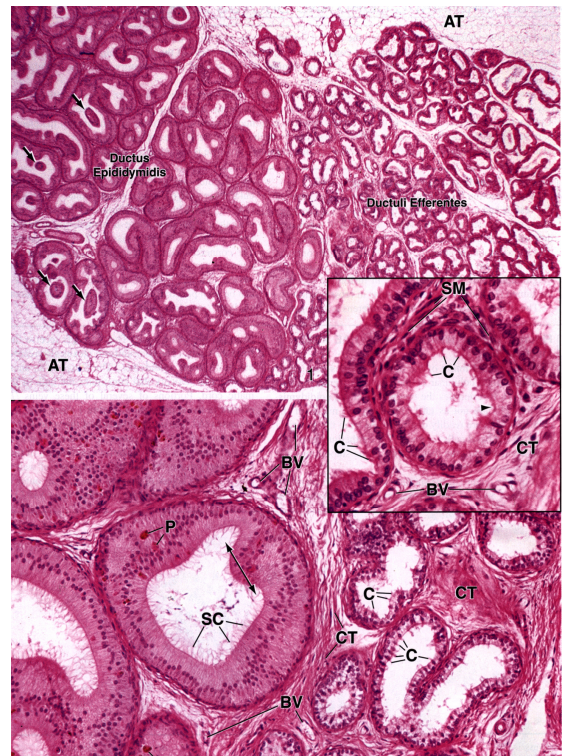
Epididymis

from Greek *Epididymis* = *epi* 'upon' + *didymos* 'testicle' (from *duo* 'two')

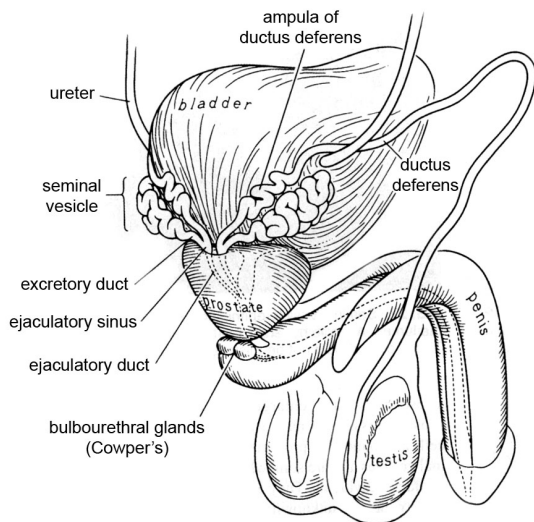


Epididymis

- Columnar pseudostratified - tallness decreases caudally, while lumen dilates
- Principal cells (65-80%) - bear stereocilia; also narrow, apical, clear, basal and halo
- Tight junctions sequester maturing sperm - *blood-epididymis barrier*
- Peristaltic contractions move the spermatozoa towards the corpus/cauda
- Caudal smooth muscle fibres contract only during sexual stimulation concurrently with the contraction of the vas deferens



Vas deferens



- Fibromuscular tube that is continuous with the epididymis.
- Enters the abdominopelvic cavity through the inguinal canal and passes along the lateral pelvic wall.
- Crosses over the ureter and the urinary bladder, down toward the prostate gland.
- Lined with pseudostratified columnar epithelium and similar to epididymis, cells have long stereocilia.
- The lamina propria is rich in elastic fibres and the muscularis is well developed.

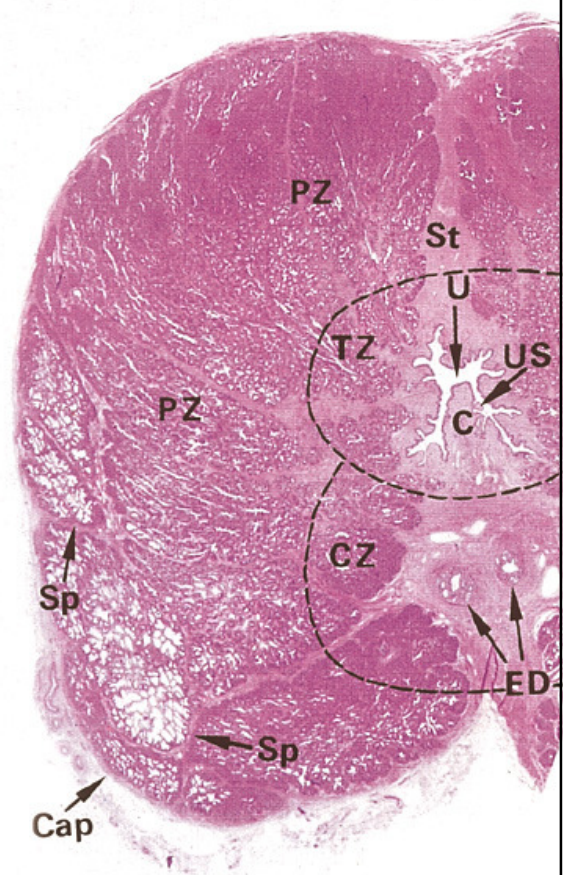
Seminal vesicles

- Coiled tubular structure with irregular diverticula
- Lined with pseudostratified columnar epithelium
- Secretion
 - makes up 70% of seminal plasma
 - rich in fructose, prostaglandins, semenogelin (viscosity)
- The mucosa shows thin, branched folds.
- The muscularis consists of inner circular and outer longitudinal layers of smooth muscle.

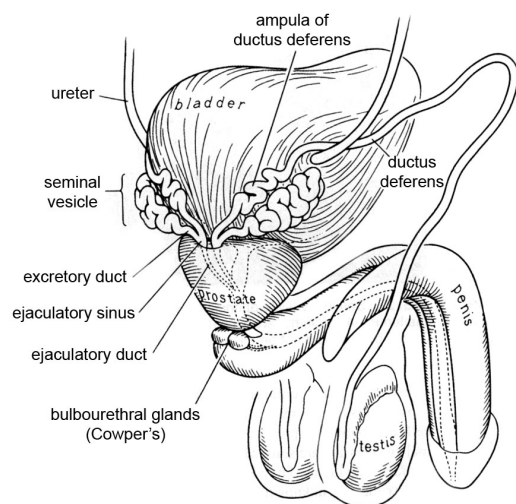


Prostate

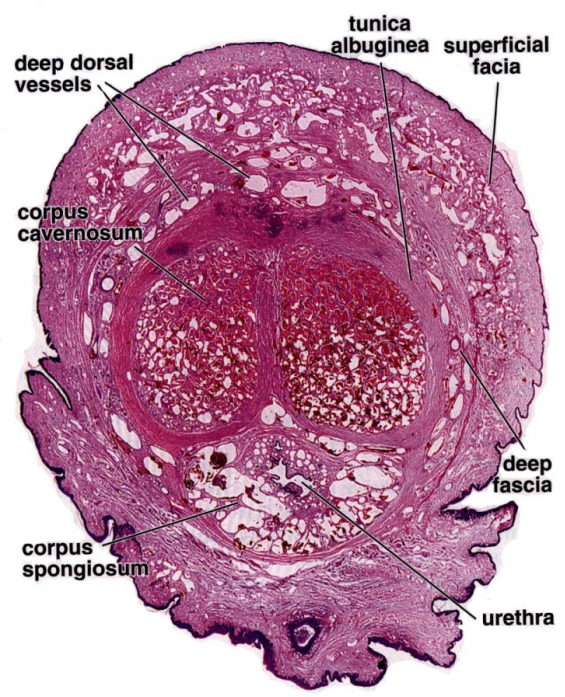
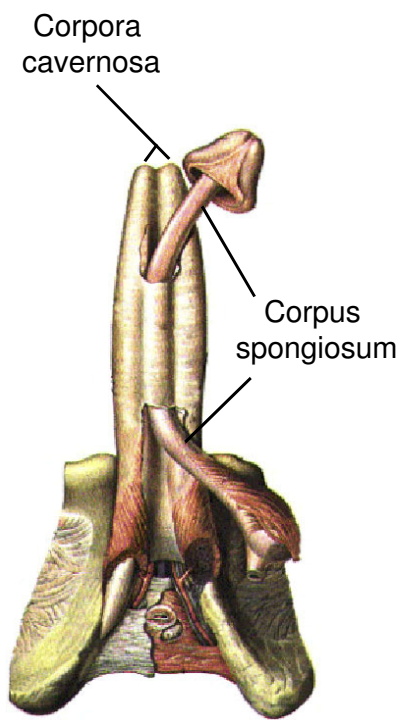
- Compound tubuloalveolar gland
- Developed fibromuscular stroma
- Double layered epithelium
- Thin and milky alkaline secretion (~20% of seminal plasma) containing citrate, zinc, polyamines (spermine), LDH, prostatic specific antigen (PSA)
- Four zones:
 - transition zone (hyperplasia)
 - central zone
 - peripheral zone (carcinoma)
 - anterior fibromuscular stroma



Bulbourethral glands



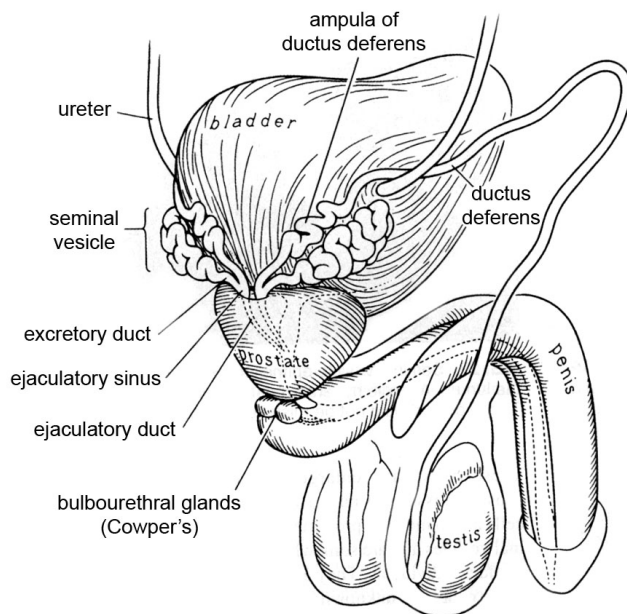
- The paired bulbourethral (Cowper's) glands are small, about the size of a pea, and located near the base of the penis.
- A short duct from each gland enters the proximal end of the penile urethra.
- In response to sexual stimulation, the bulbourethral glands secrete an alkaline mucus-like fluid. This fluid neutralizes the acidity of the urine residue in the urethra and helps to neutralise the acidity of the vagina.
- Provides some lubrication for the tip of the penis during intercourse.



Urethra and Ejaculation

- The urethra is the passageway for sperm and fluids from the reproductive system and urine from the urinary system, sphincters contract tightly to keep urine from entering the semen.
- The male urethra is divided into three regions:
 - Prostatic urethra (contains sperm/secretions from prostate and SV).
 - Membranous urethra, which passes through the pelvic floor.
 - Penile urethra, extends the length of the penis contains secretions from the BU glands.
- Emission - principally through $\alpha 1$ -adrenergic stimulation of SM, as sperm passes through the ejaculatory ducts and is mixed with fluids from SV, prostate and BU to form semen/ejaculate
- Ejaculation proper - rhythmic contractions of striated perineal muscles and SM of urethra and semen ejaculated

Male reproductive system



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