

**The University Of Jordan
Faculty Of Medicine**



Histology of Male reproductive system

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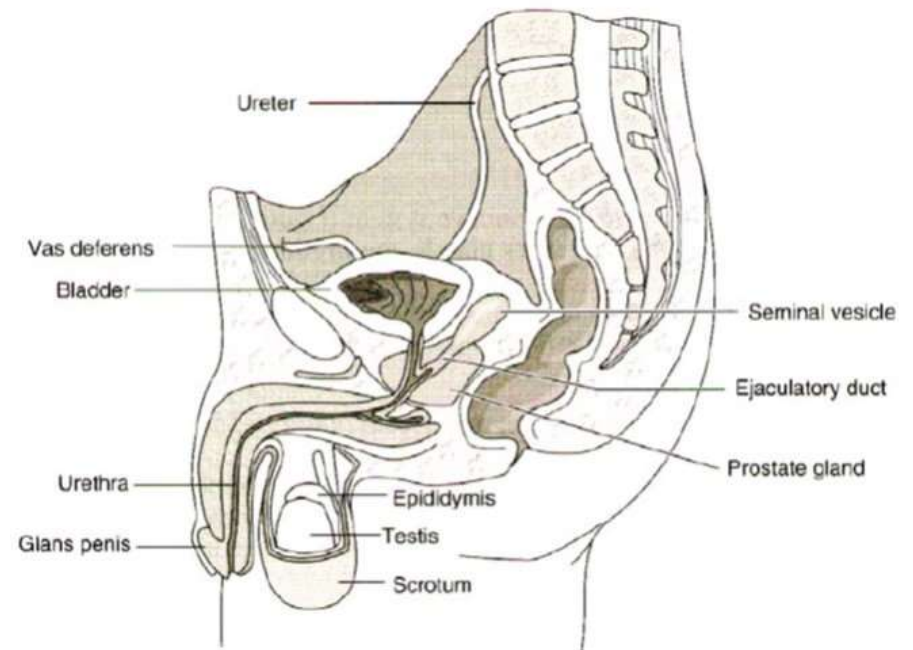
Components of the male reproductive system

- **Primary sex organ:**

- Paired testis

- **Secondary sex organs:**

- **Genital ducts** (Epididymis ,Vas Deference and Ejaculatory duct)
- **Accessory glands** (the paired seminal vesicles, the single prostate gland and two bulbourethral glands)
- The penis



Male reproductive system

Primary sex organ

Testis

Function :

1. Produce Spermatozoa
2. Synthesis of male sex hormone

Accessory Glands

Two Seminal Vesicles
One Prostate
Two Bulbourethral

Manufacture and secrete the seminal fluid

Accessory Ducts

Epididymis
Vas Deference
Ejaculatory duct

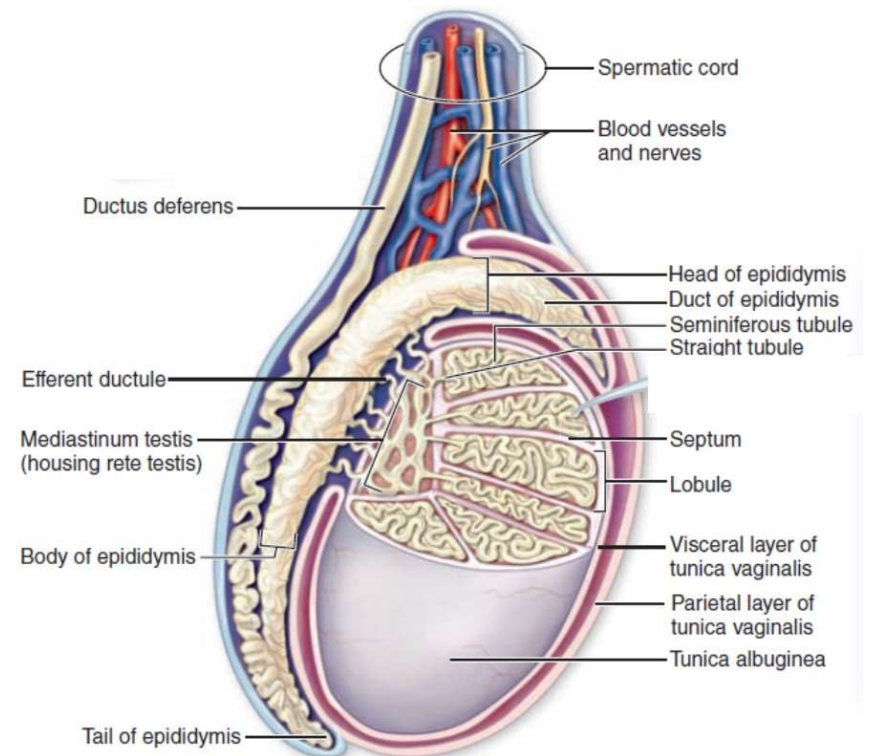
Passage of sperm and seminal fluid

Copulatory Organ

Penis

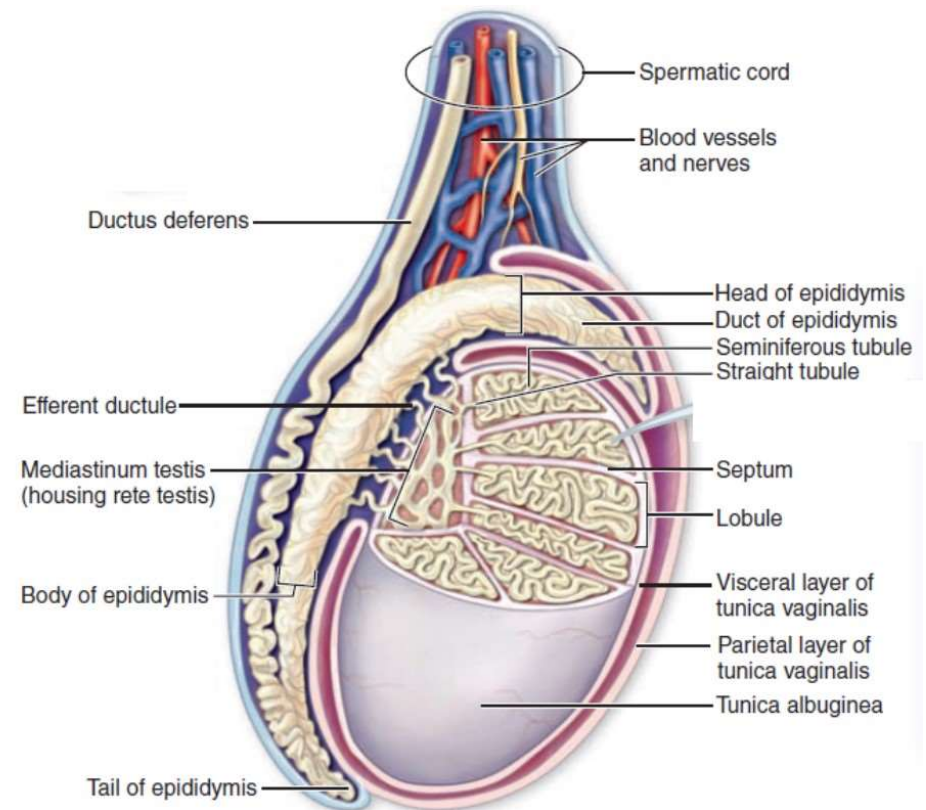
Testis

- Located outside the body cavity, in the scrotum
- Ovoid in shape
- Covered by tunica vaginalis (visceral and parietal layers) on its anterolateral surface
- **Functions:**
 - 1-Production of the spermatozoa
 - 2-Production of the male sex hormones (testosterone)



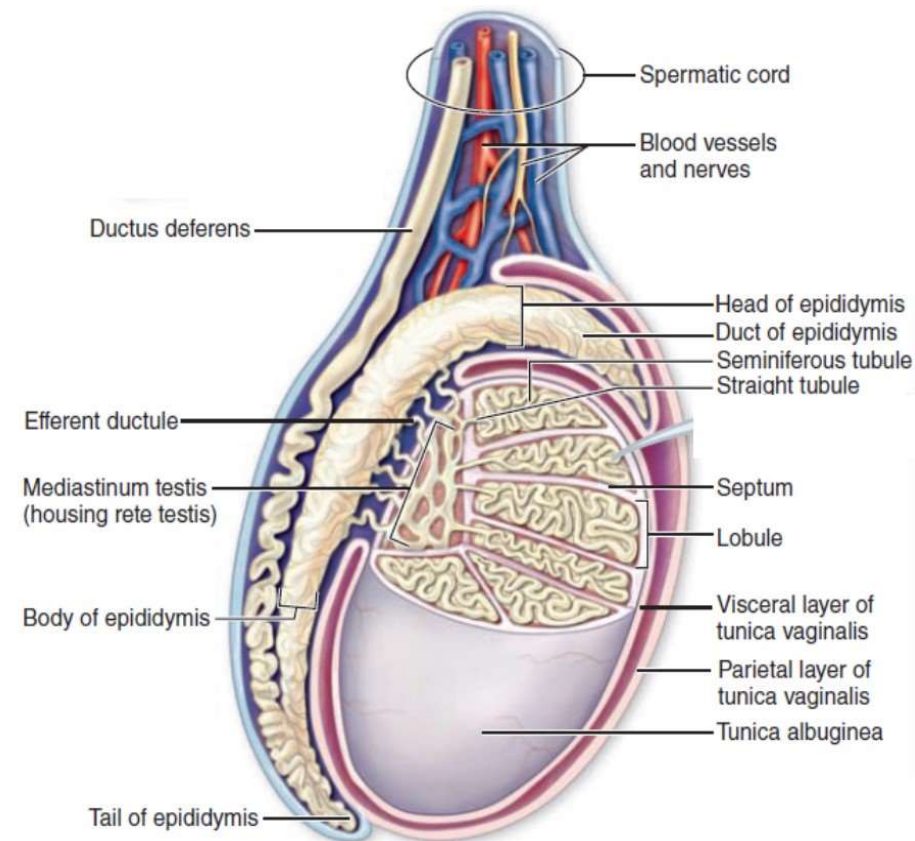
Testis - Capsule and mediastinum

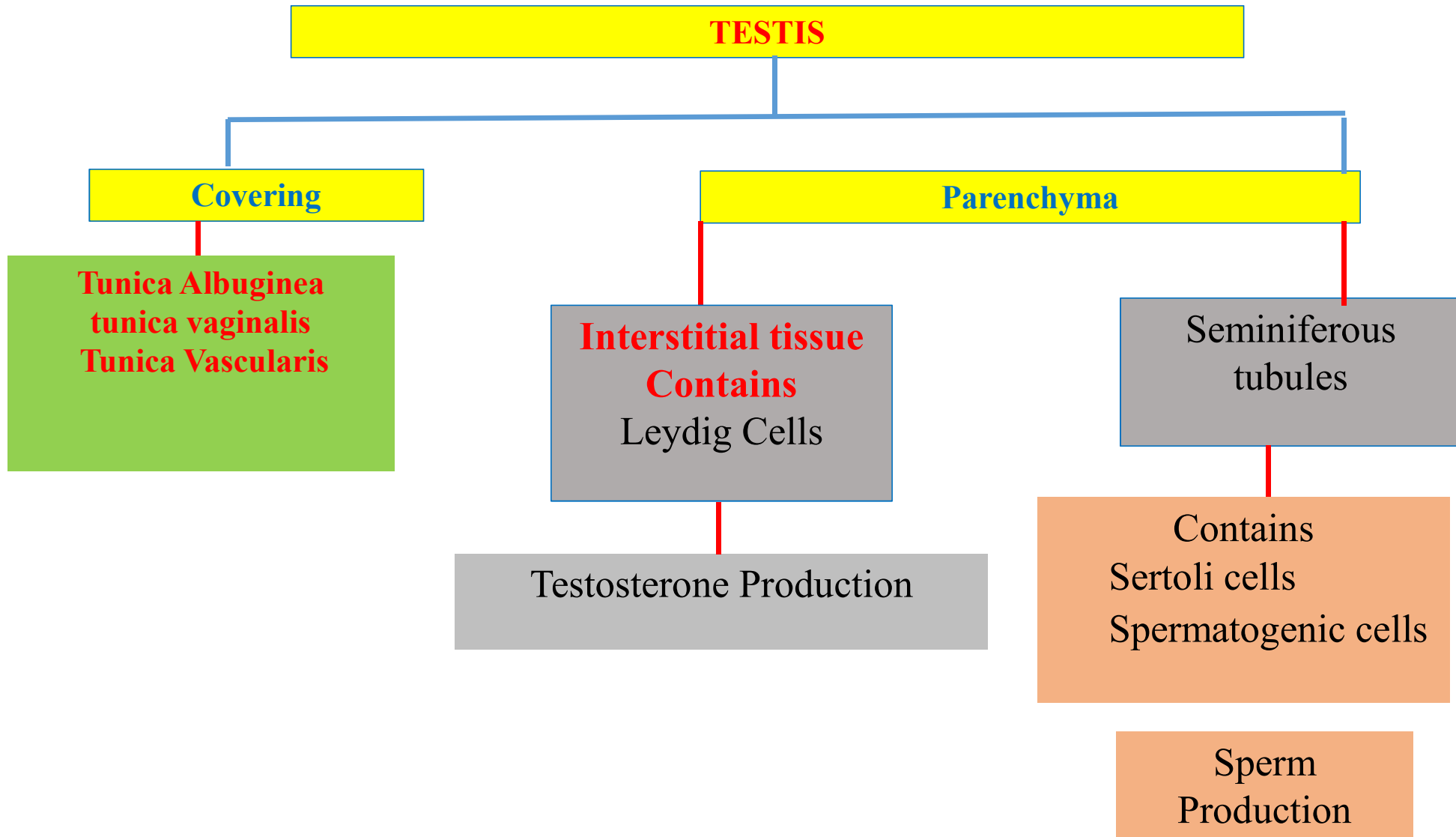
- Covered by dense irregular collagenous connective tissue capsule (tunica albuginea)
- The tunica albuginea thickens along the posterior surface to form the mediastinum testis
- Fibrous septa project from the mediastinum testis and form pyramid-shaped lobules



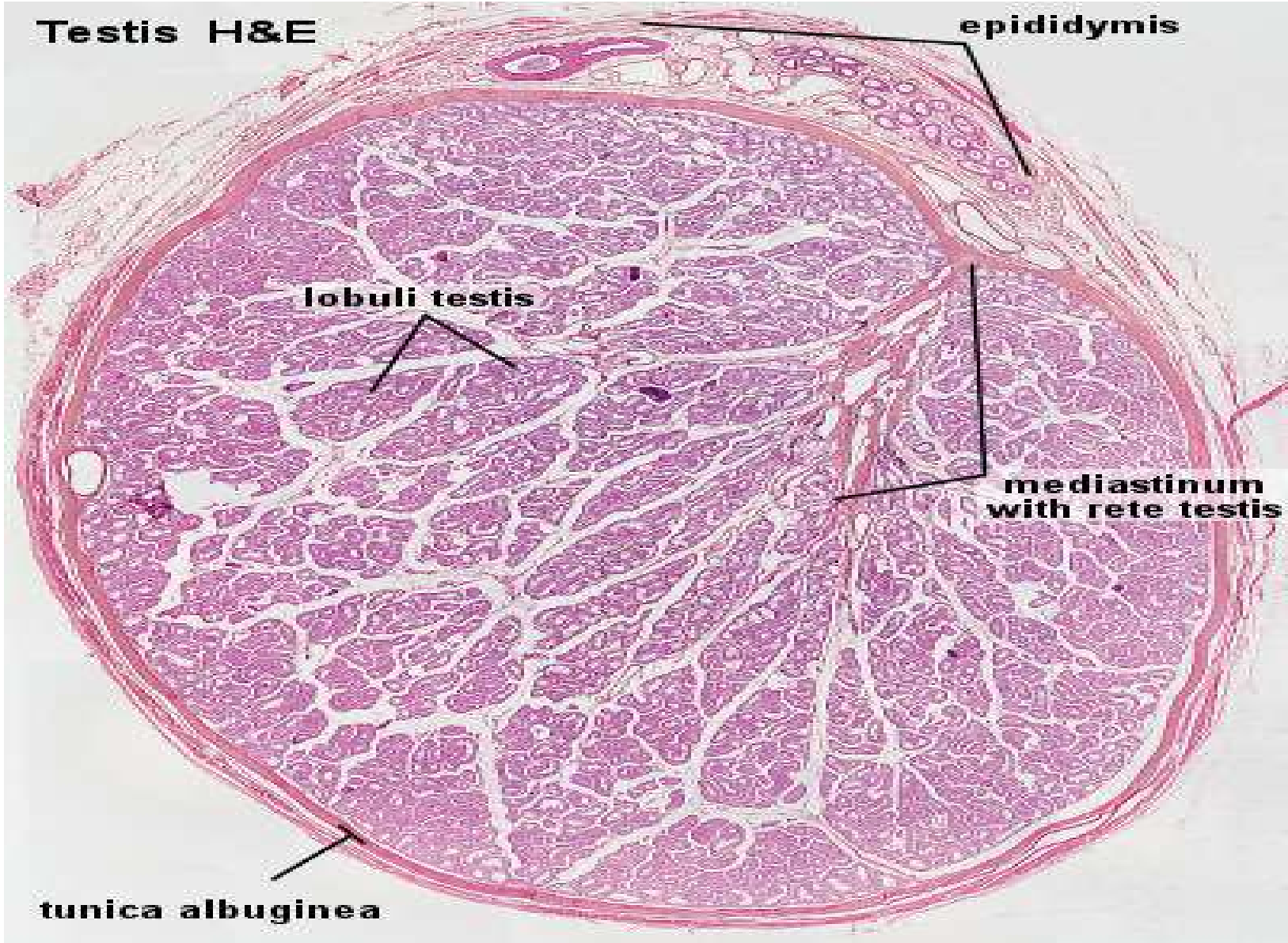
Testis - Lobules

- Each contains 1-4 seminiferous tubules
- Each seminiferous tubule forms a lobe that ends in a short straight tubules
- Seminiferous tubules are surrounded by extensive capillary bed





Testis H&E



epididymis

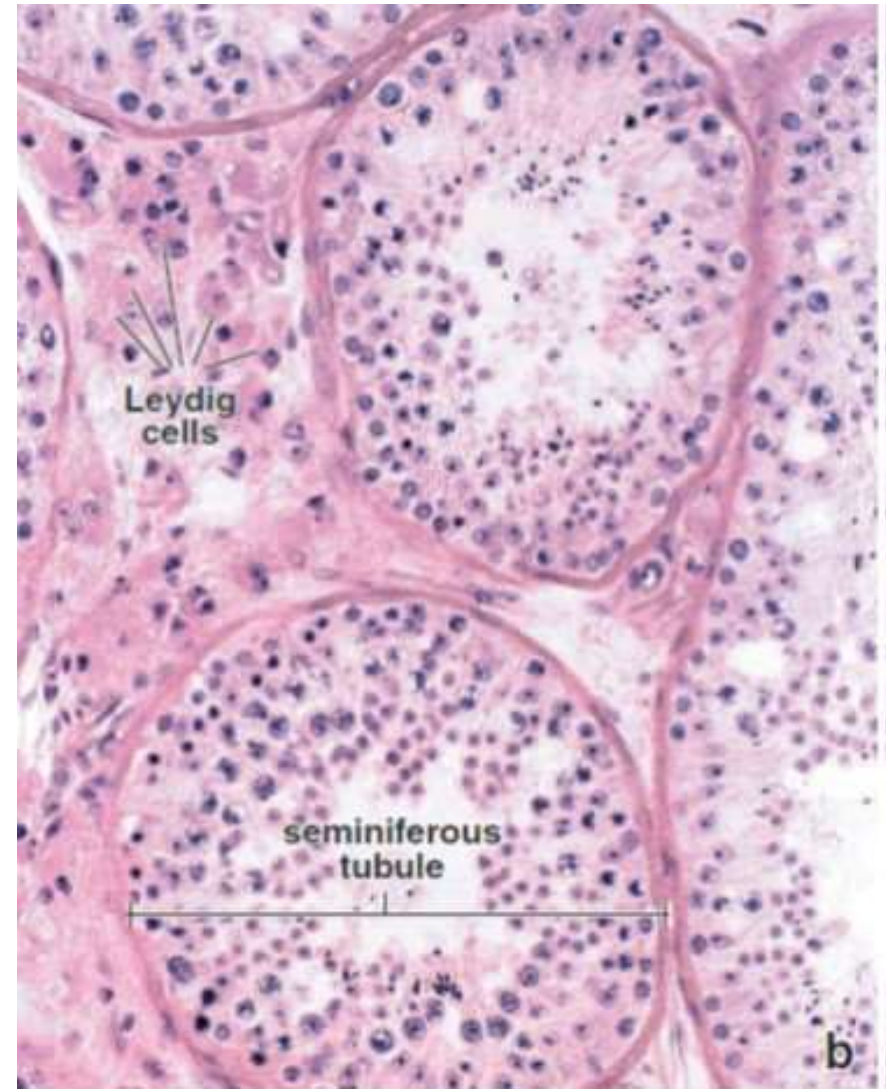
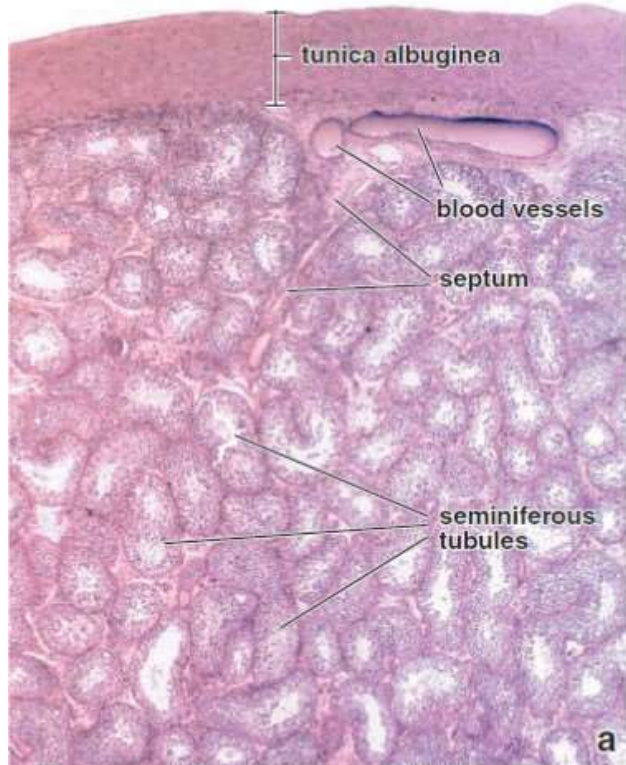
lobuli testis

**mediastinum
with rete testis**

tunica albuginea

Testis – Interstitial tissue

- Loose connective tissue between the seminiferous tubules
- Contains the interstitial cells of Leydig



Testis H&E

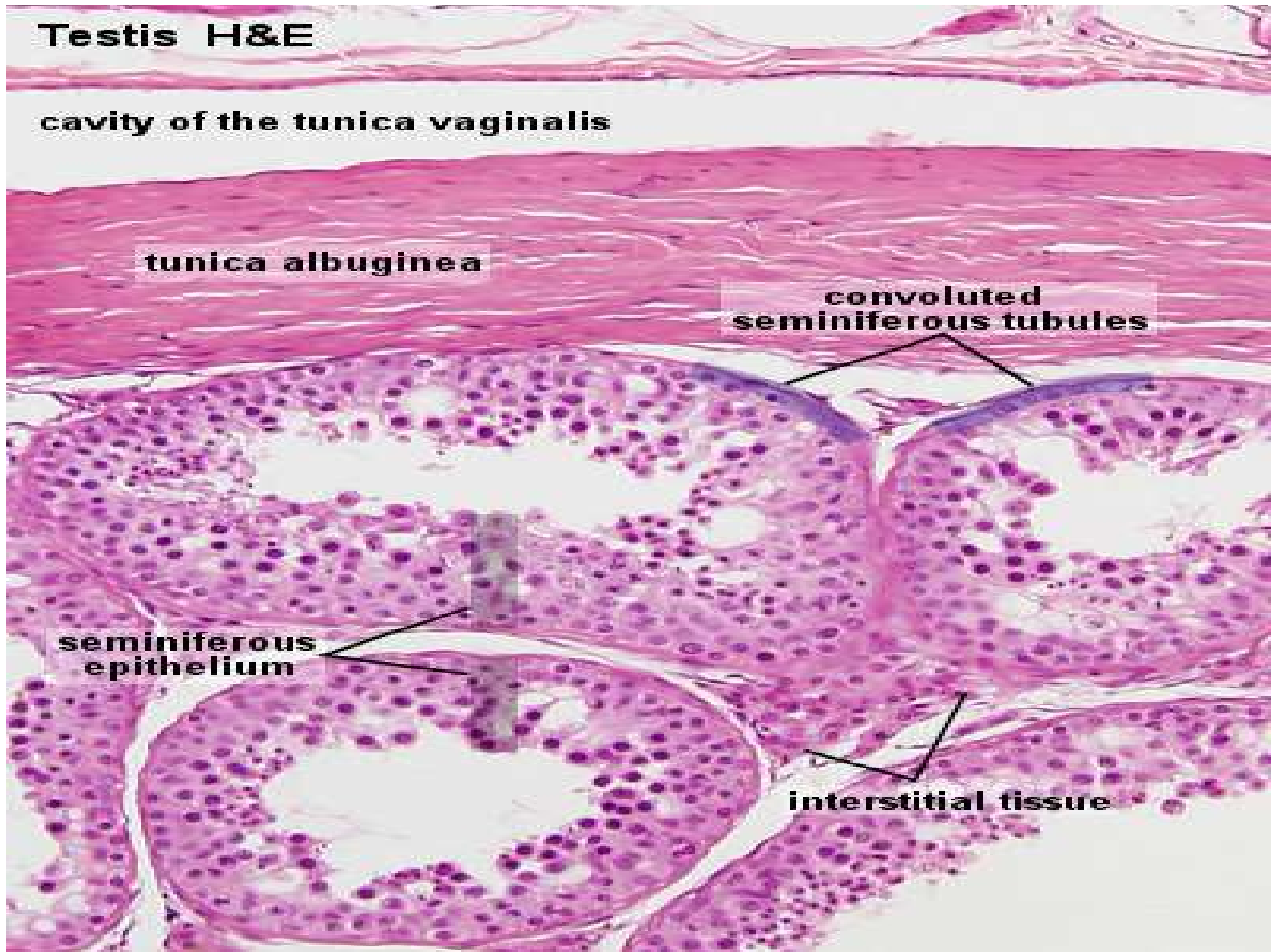
cavity of the tunica vaginalis

tunica albuginea

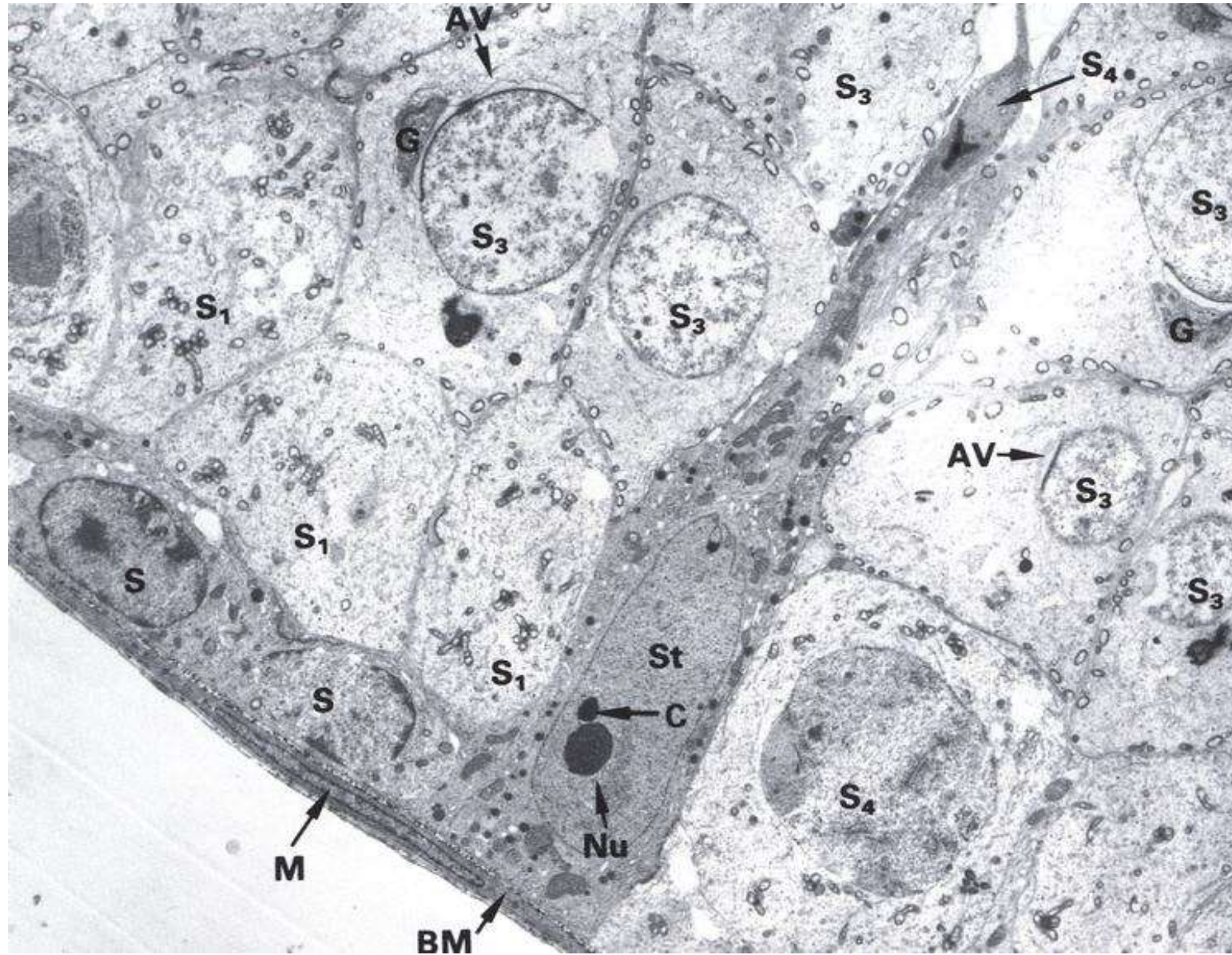
convoluted seminiferous tubules

seminiferous epithelium

interstitial tissue

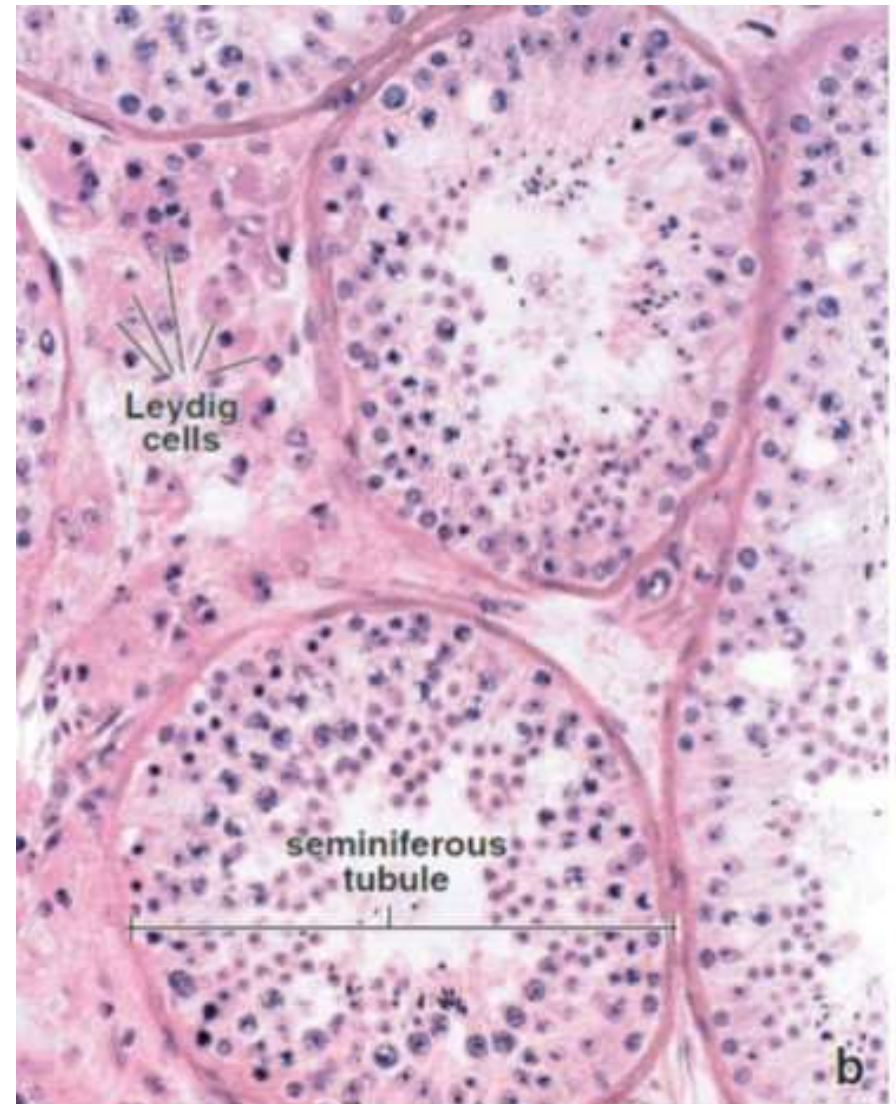


(BM) Baseme membrane
(M) myoid cells
(St) Sertoli cells
(S) Spermatogonia



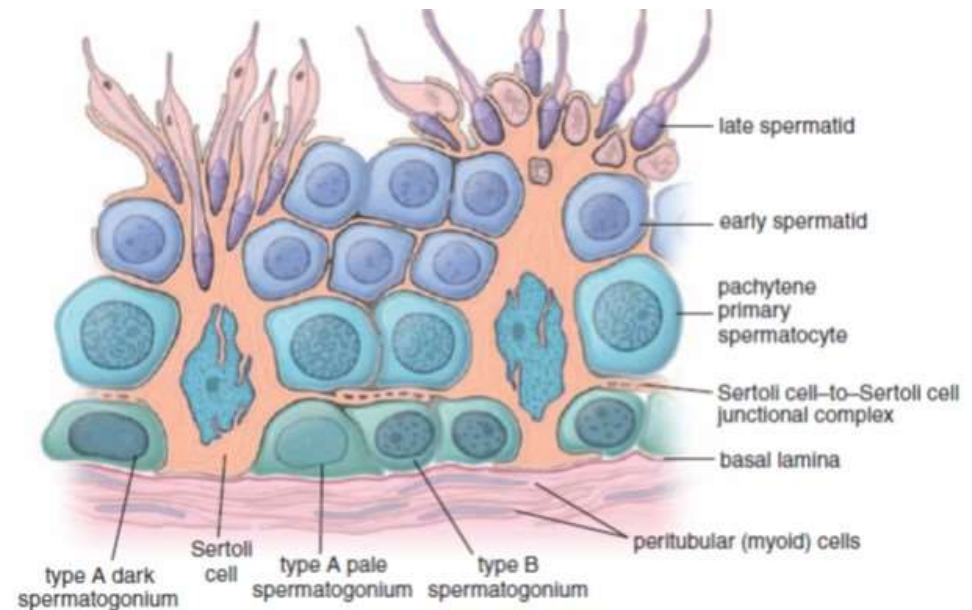
Seminiferous tubules

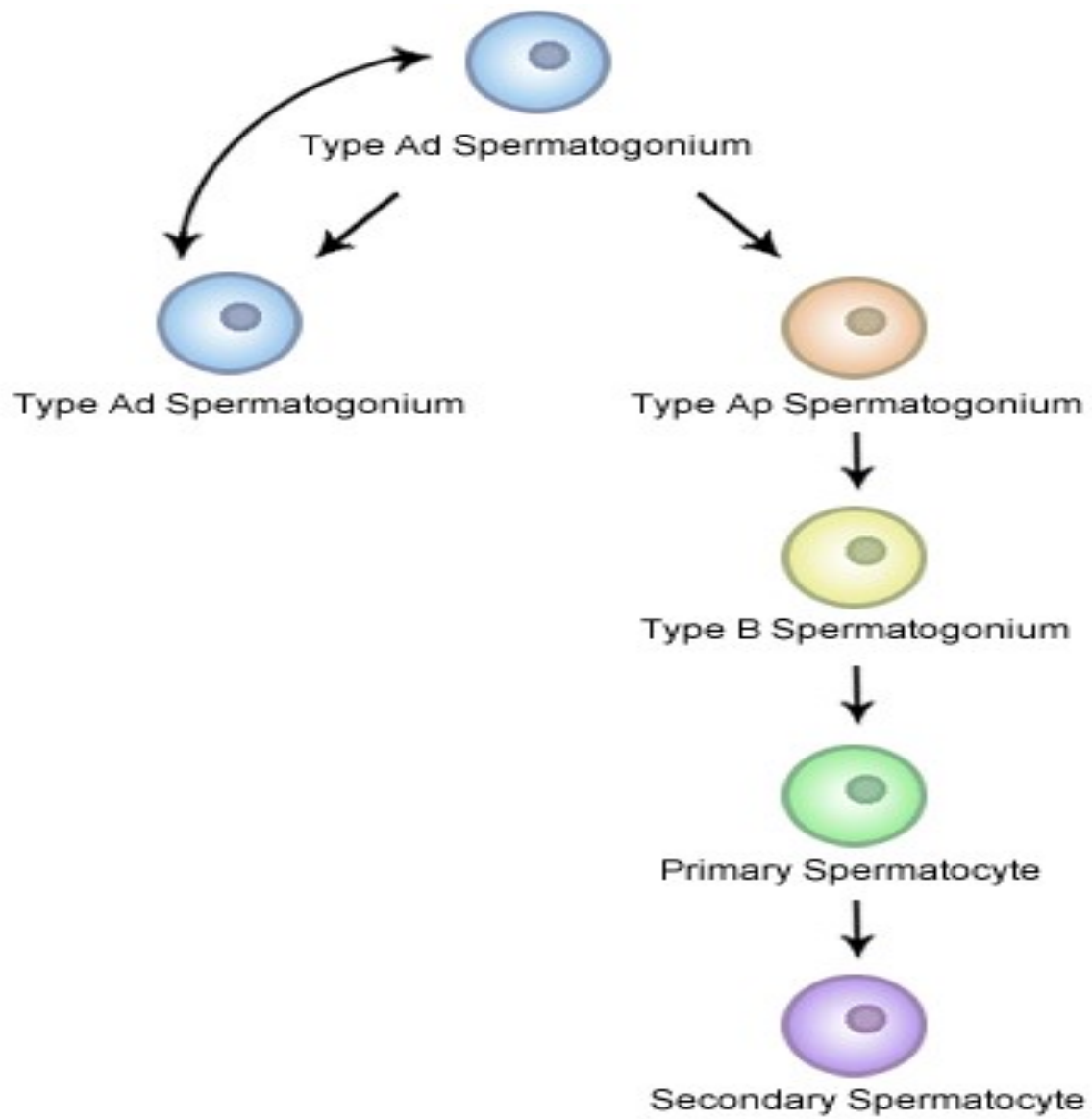
- Lined by stratified epithelium known as seminiferous epithelium rests on Basement membrane (Basal Lamina)
- The epithelium is composed of Two populations of cells:
 - Sertoli cells (Mesodermal)
 - Spermatogenic cells (Endodermal)
 - The connective tissue around tubules contains fibroblast and myoid cells
 - The Myoid cells produce peristalsis waves to help movement of spermatozoa and testicular fluid



Spermatogenic cells

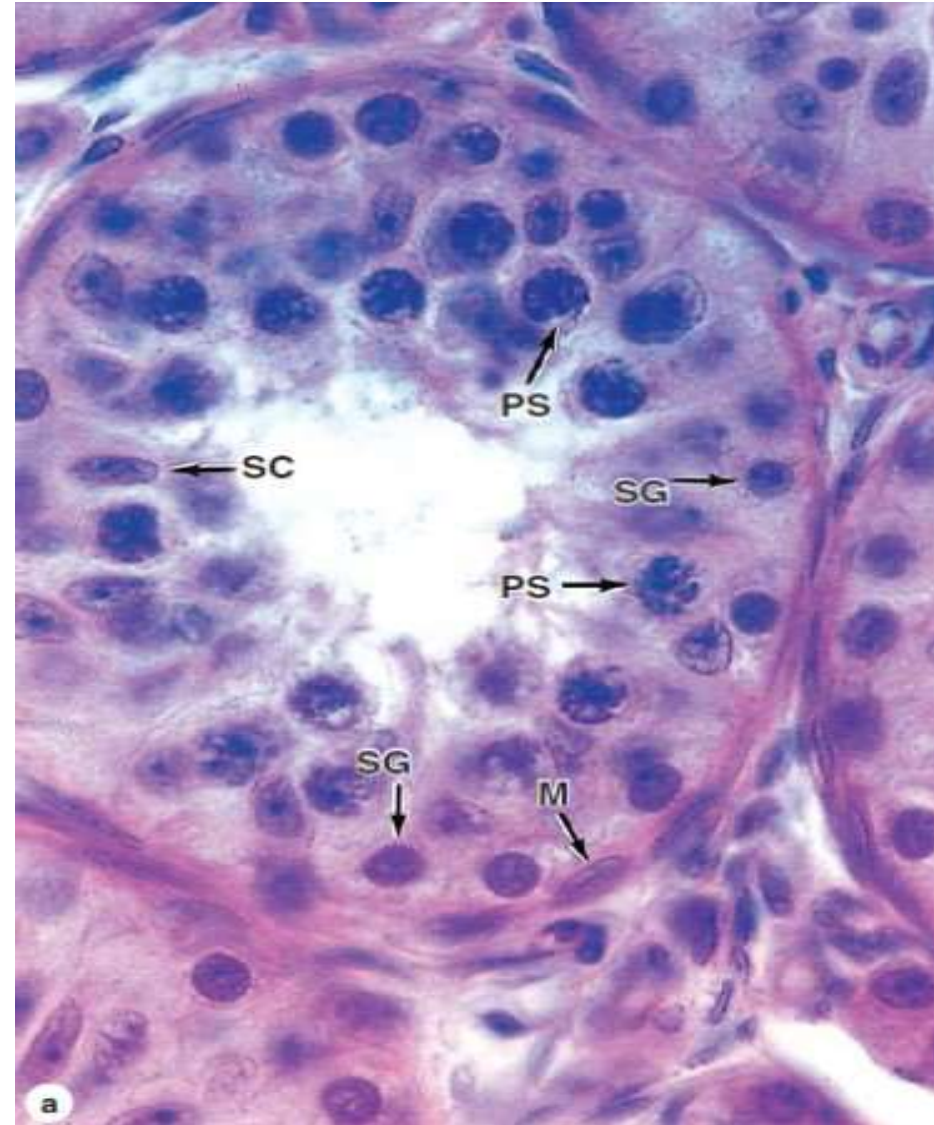
- Male germ cells that replicate and migrate from the basal lamina to the lumen
- Endodermal in origin
- Include:
 - Spermatogonia
 - Primary spermatocytes
 - Secondary spermatocytes
 - Spermatids





Spermatogonia

- Initial germ cells
 - Rest on the basal lamina and closely associated with Sertoli cell surfaces
 - Small rounded cells
 - Have diploid number of chromosomes and DNA
-
- **(SG)** Spermatogonia
 - **(PS)** primary spermatocytes
 - **(M)** myoid cells
 - **(SC)** Sertoli cells



By repeated mitosis they are differentiated into :

Type A dark and Pale spermatogonia.

They have a spherical nuclei

Dark type remain as a reserve and Pale type gives Type B spermatogonia

Type B spermatogonia

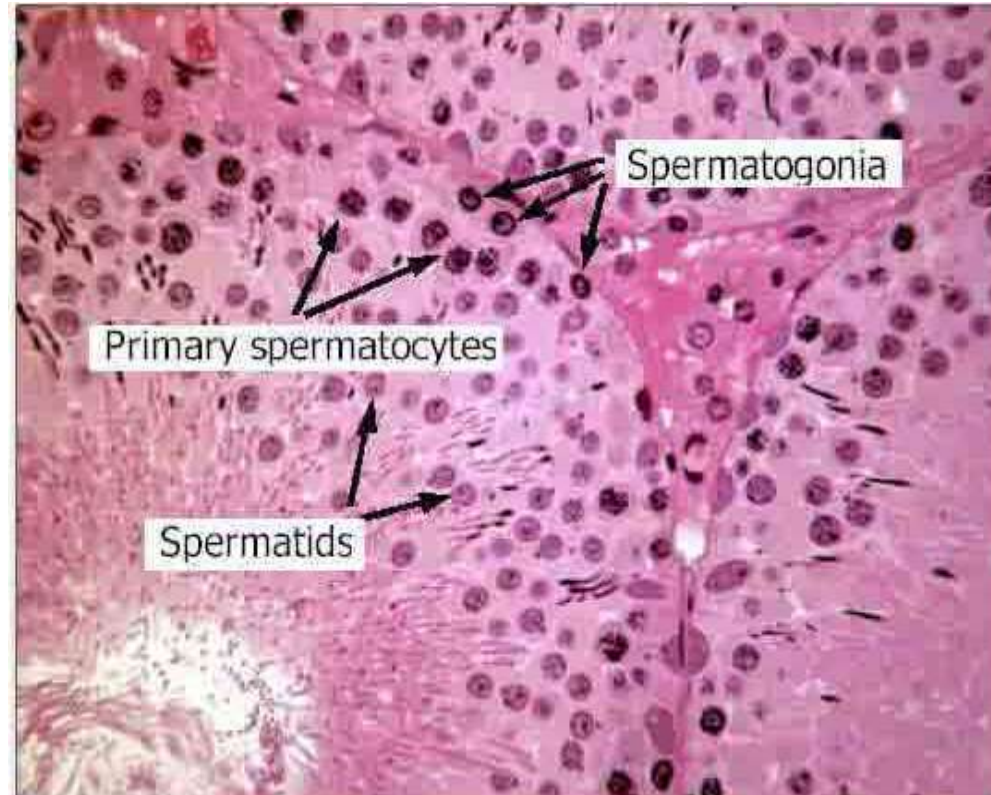
Larger and lightly stained nuclei

At puberty under effect of **FSH** they undergo mitotic activity and gives

Primary spermatocytes

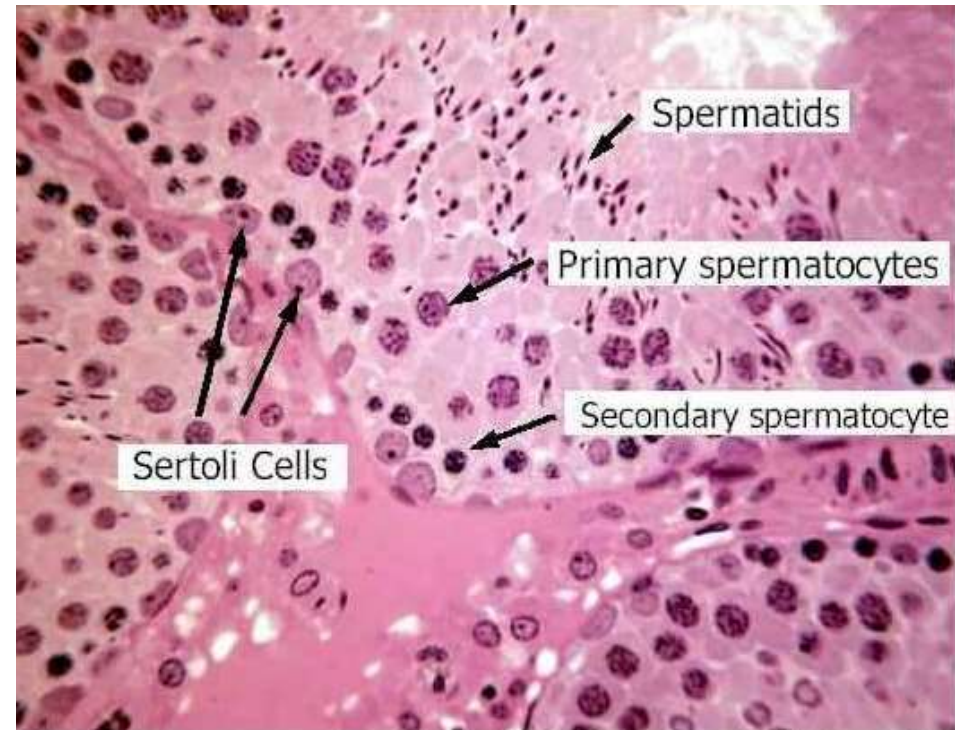
Primary spermatocytes

- The largest cells of the seminiferous epithelium
- spherical cells with euchromatic nuclei
- Has 46 chromosomes
- Enter the **first meiotic division to produce secondary spermatocytes**



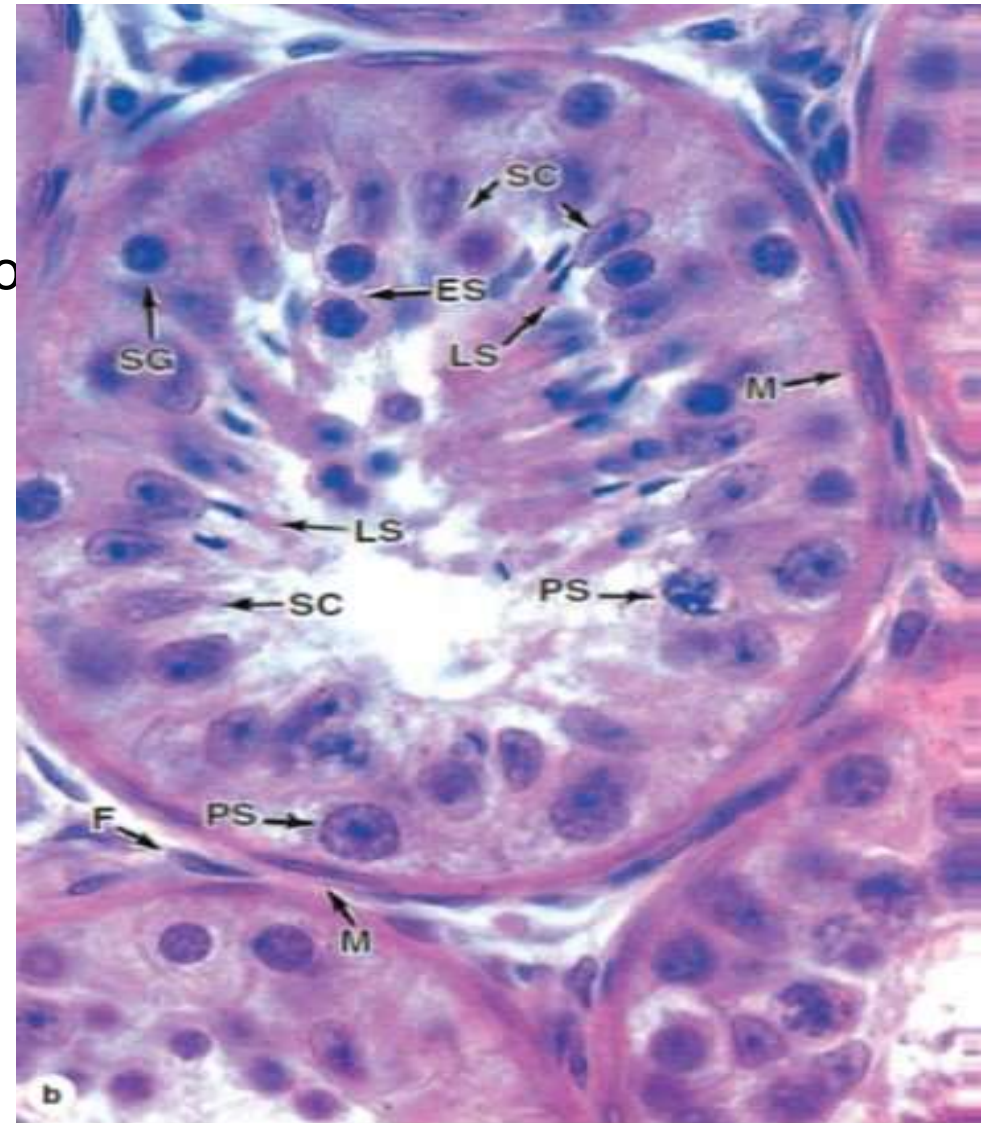
Secondary spermatocytes

- Derived from the first meiotic division of primary spermatocytes
- Have 23 chromosomes
- Small cells, and because they are very short-lived cells, they are rarely seen in the seminiferous epithelium.
- Immediately enter the second meiotic division, forming two spermatids.



Spermatids

- Small round cells with small spherical nuclei .
- Result from the second meiotic division of secondary spermatocytes
- Have 23 chromosomes and
- Undergo a differentiation process that produces mature sperm.
- **(M)** myoid cells
- **(F)** fibroblasts
- **(SC)** Sertoli cells
- **(SG)** Spermatogonia
- **(PS)** primary spermatocytes
- **(ES)** early spermatids
- **(LS)** late spermatids



Spermatozoa :

Mature spermatozoa lies free in lumina of seminiferous tubules

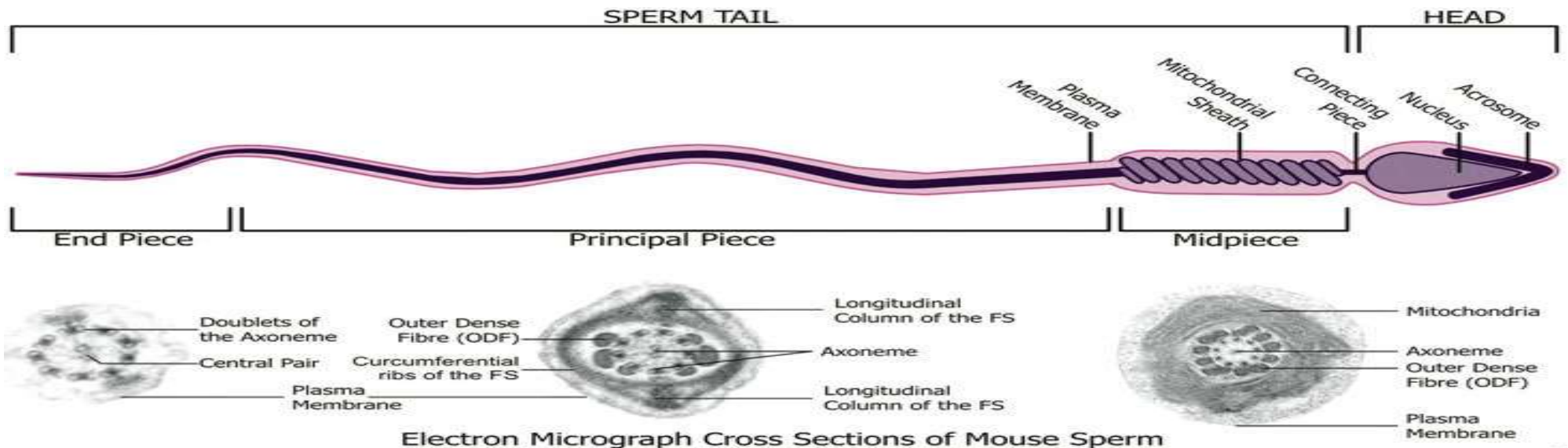
Each consists of

1-Head :

It contains condensed nucleus Covered with acrosomal cap which contains lysosomes and plays role for penetration of ovum.

2-Neck:

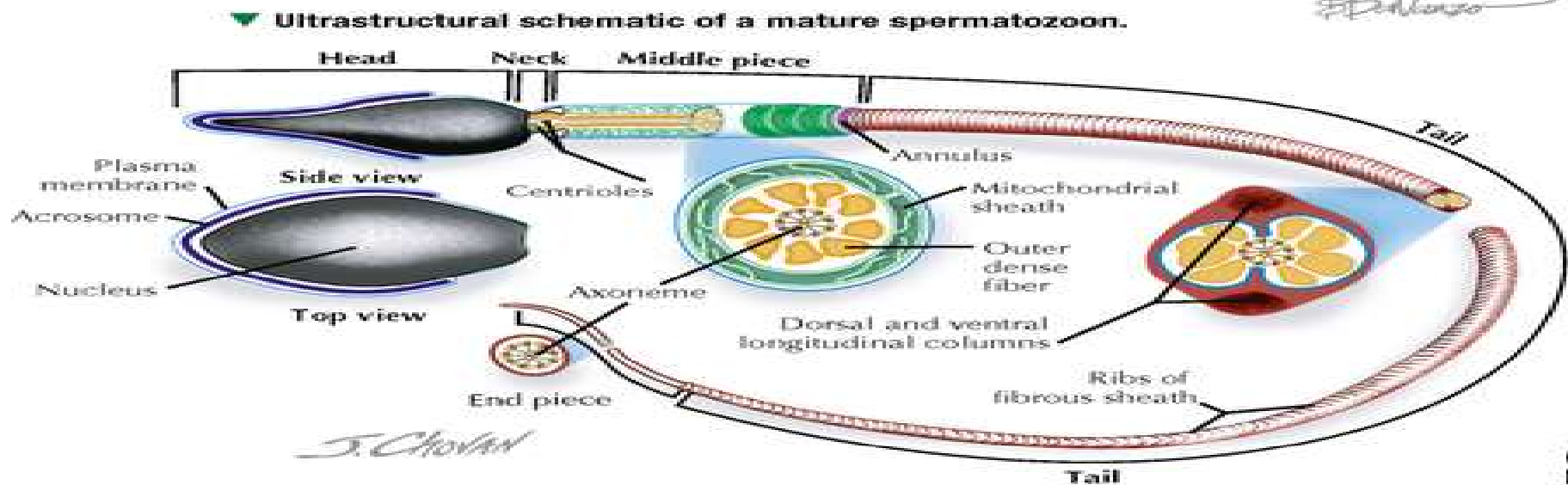
It is a containing the centrioles and the connecting piece, which for the nine fibrous rings surrounding the axoneme.



3-Middle piece:

It consists from outwards inwards:

- ❖ Plasma membrane.
- ❖ Elongated mitochondrial sheath.
- ❖ Fibrous sheath
- ❖ Axoneme : nine peripheral pairs of fused microtubules around a central pair of individual microtubules (9 +2)



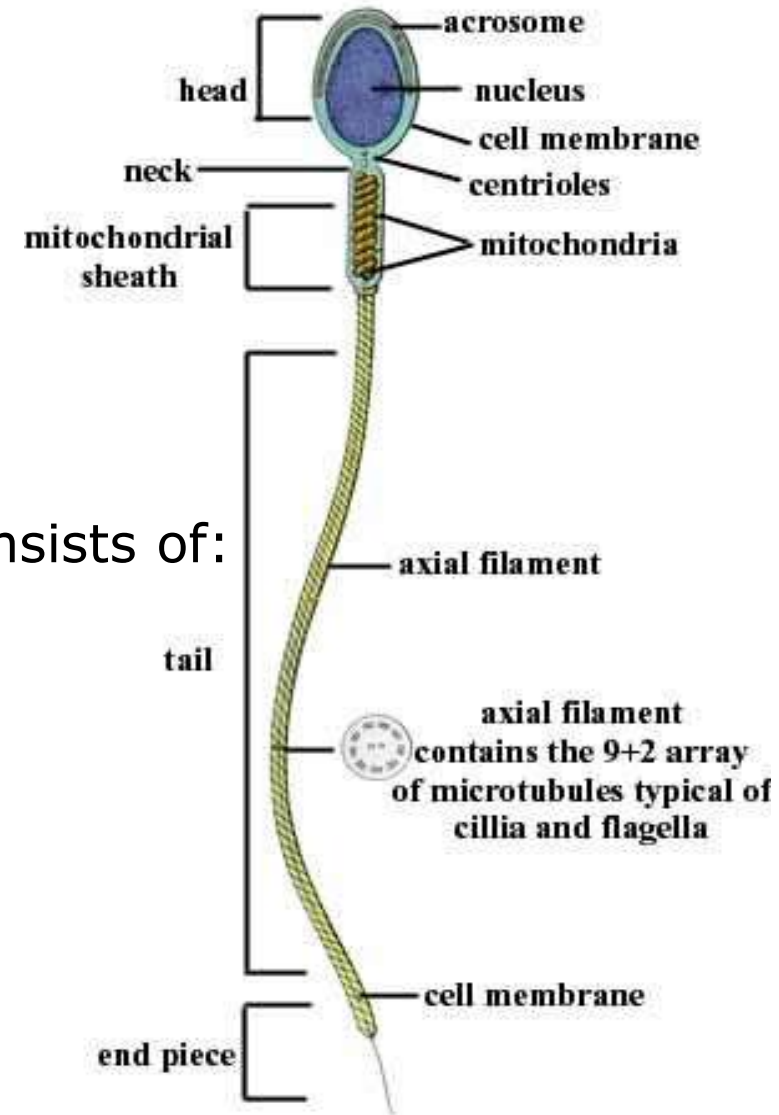
Tail: It consists of:

A- Principal piece: the longest part of the tail consists of:

- Plasma membrane.
- Fibrous sheath.
- Axoneme (9 +2).

B- End piece: the shortest part of the tail consists of:

- Plasma membrane.
- Axoneme (9 +2)



Sertoli cells

- Mesodermal in origin
- Resistant to heat, x-irradiation, infection and malnutrition
- The most numerous cells in the epithelium **before puberty** and reduced (make up to 10 % of the cell population) **after puberty** because of the increase in germ cells
- Have plasma membrane receptors for follicular stimulating hormone (FSH)

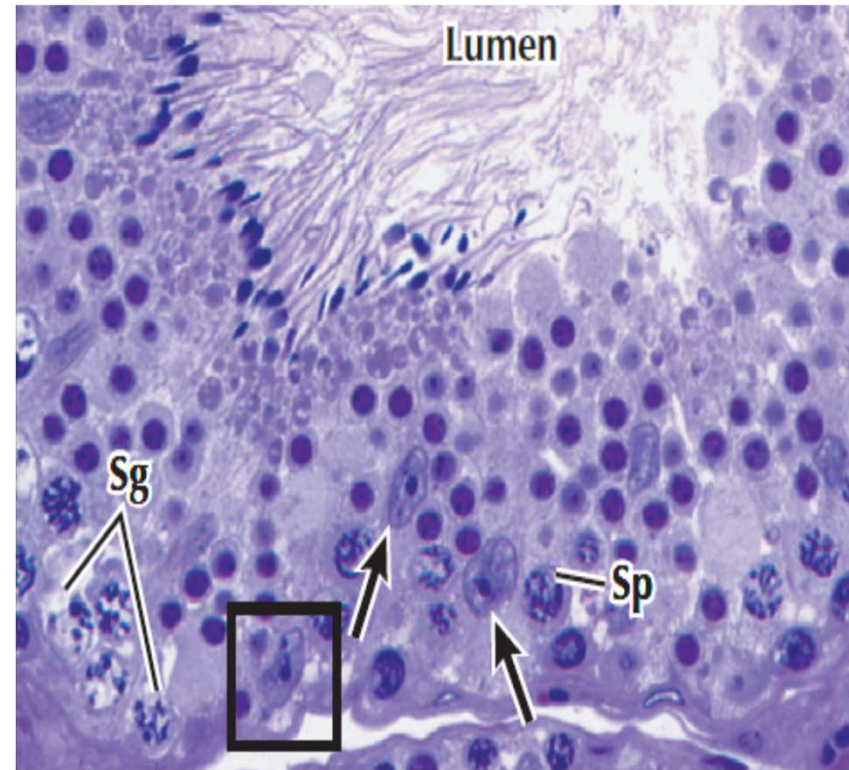
Sertoli cells

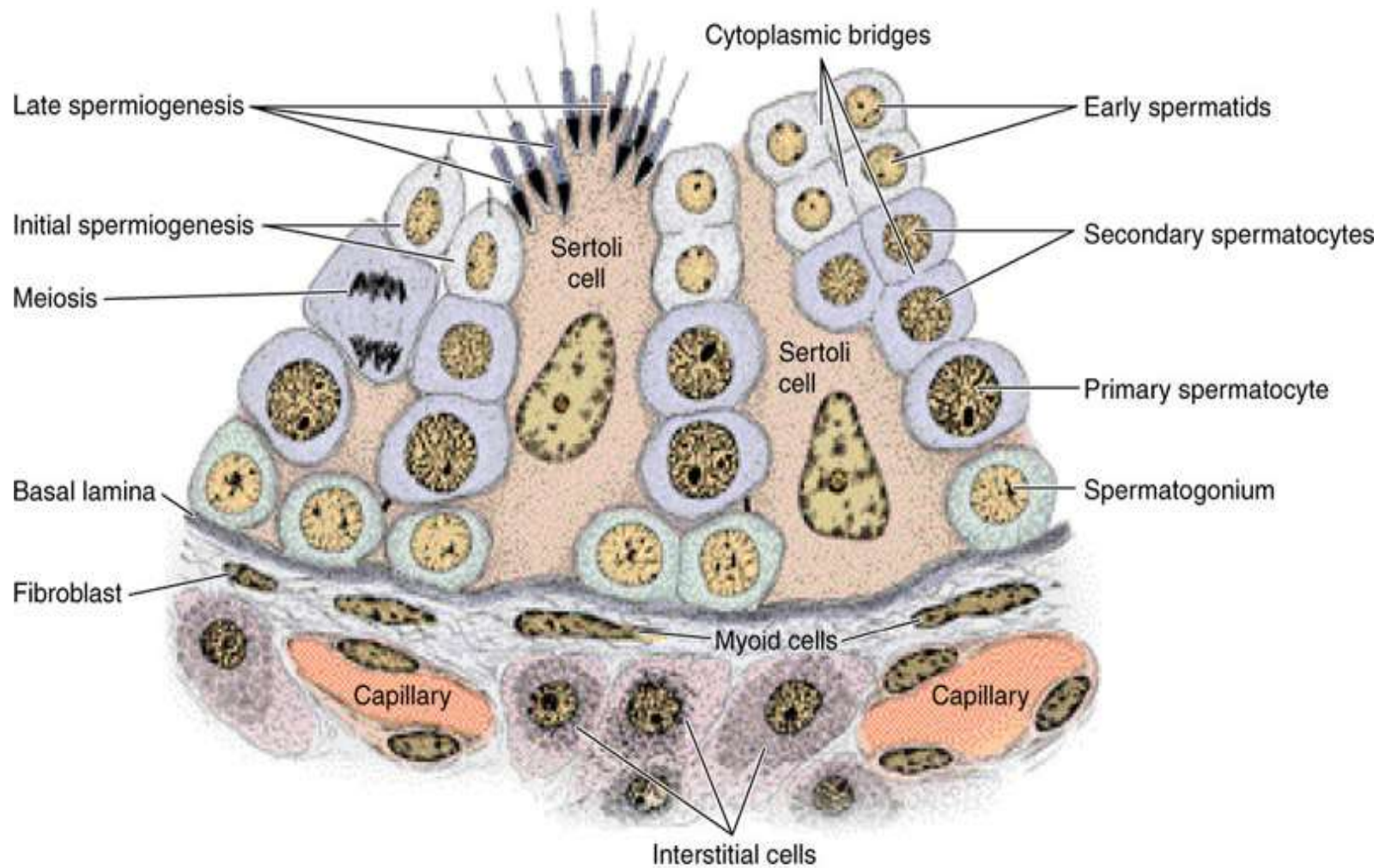
LM:

Tall columnar epithelial cells
Extend through the full thickness of the epithelium

Indistinguishable borders due to complex basal, lateral and apical cell margins as it surrounds the adjacent germ cells

Each has euchromatic nucleus usually ovoid with a prominent nucleolus



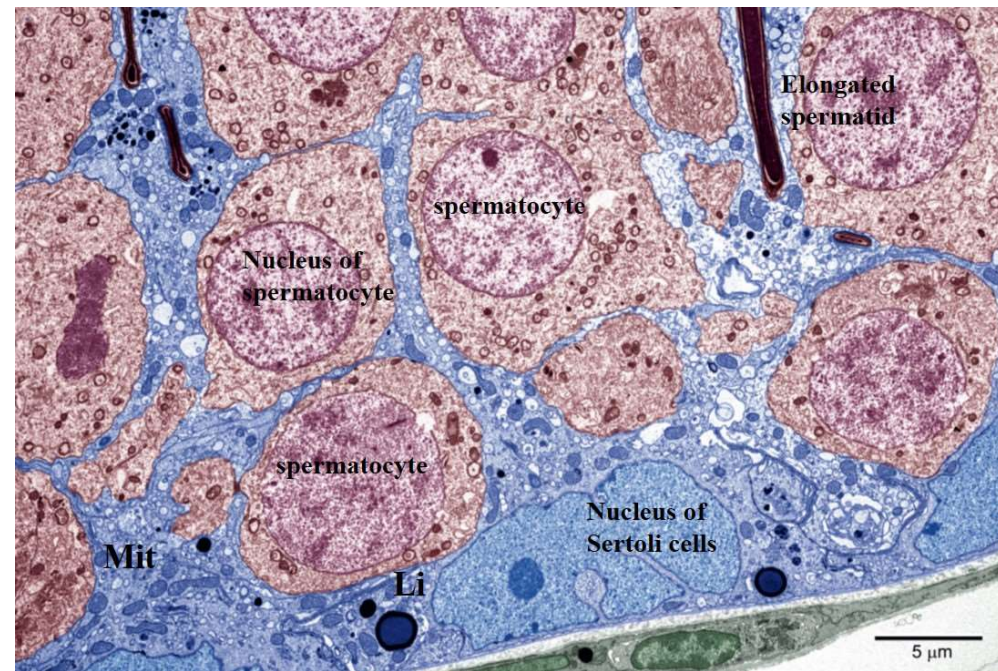


Part of a seminiferous tubule with its surrounding tissues. The seminiferous epithelium is formed by 2 cell populations: the cells of the spermatogenic lineage and the supporting or Sertoli cells

Sertoli cells

EM:

- Have complex apical and lateral processes that surround adjacent germ cells.
- Have an extensive SER and a well-developed RER, Lysosomes
- Abundant cytoskeleton (microfilaments and microtubules)
- Euchromatic nucleus, basally located and has with a large, centrally positioned nucleolus.



- Sertoli cells are bound to each other and to the germ cells by several types of cell-cell junctions

- **Sertoli-basal lamina junctions:**

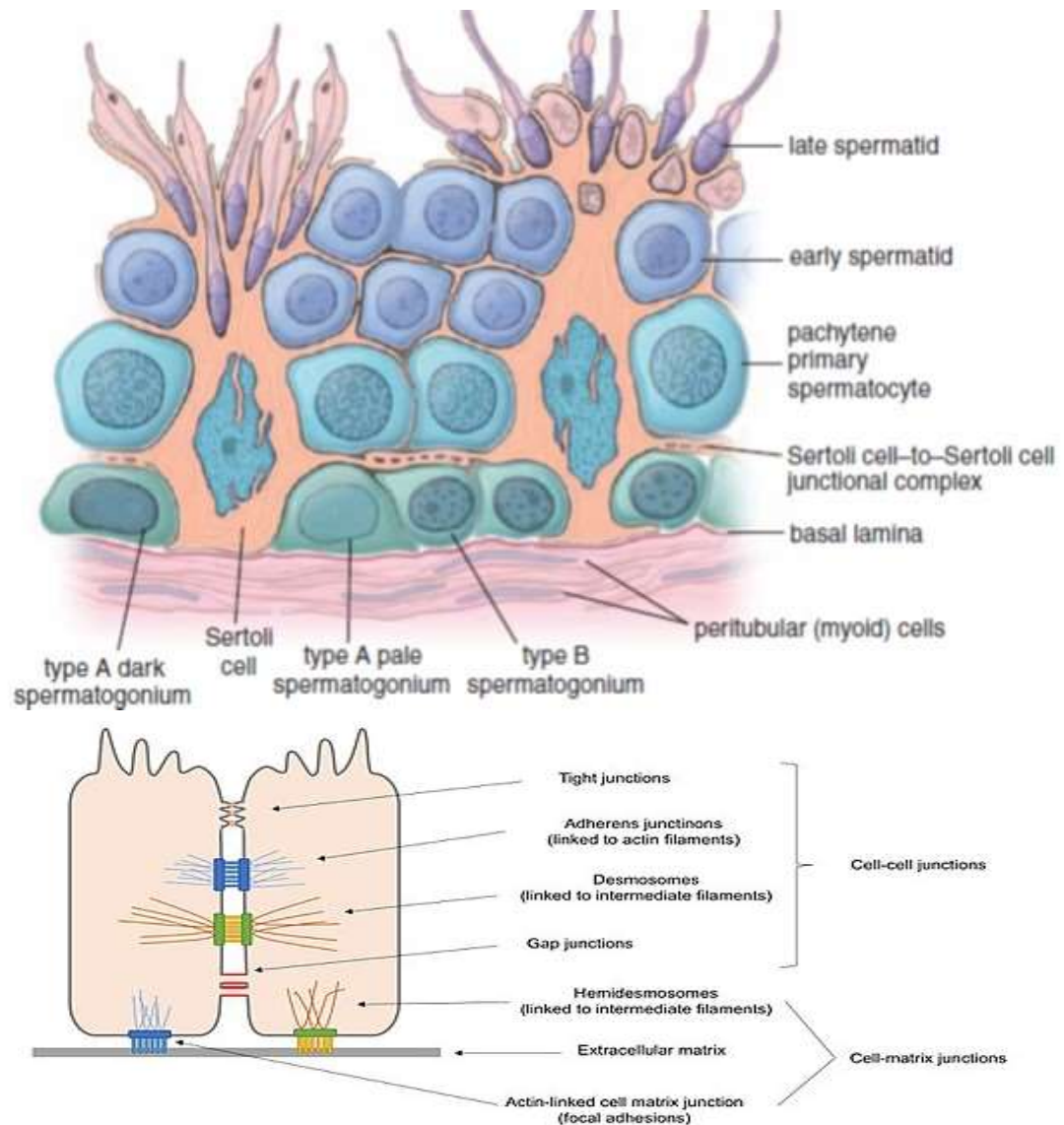
- Hemidesmosomes

- **Sertoli-germ cell junctions:**

- Desmosome

- **Sertoli-Sertoli junctions:**

- Gap junctions
- Tight junctions



Functions of Sertoli cells

1. Supporting cells.

Sertoli cells surround and physically support the developing germ cells.

2. Phagocytic cells.

- Sertoli cells phagocytize and digest the residual bodies released in the last stage of spermiogenesis,.

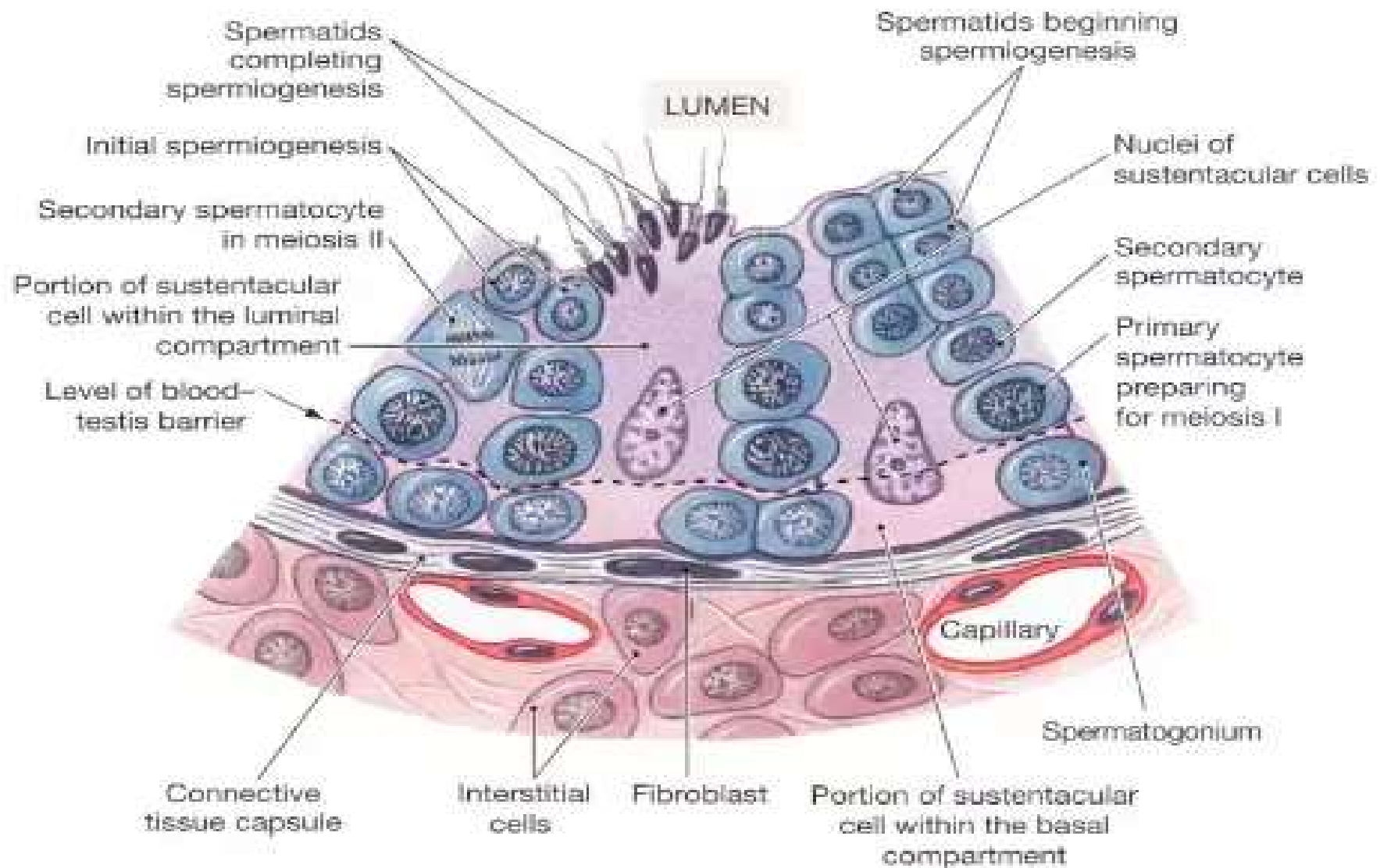
3. Secretory cells.

- **The testicular fluid** carry non motile sperm to epididymis
- **Androgen-binding protein (ANP)** which concentrates testosterone to a level required for spermiogenesis, is promoted by follicle-stimulating hormone (FSH)
- **Inhibin** which inhibits the secretion of **FSH** (recently, inhibin injections are used as male contraceptive as it inhibits spermatogenesis).
- **Anti-mullerian hormone** that causes regression of the embryonic müllerian ducts

4. Nutrition

They supply the spermatogenic cells with nutrition taken from near by capillaries, as the spermatogenic cells are isolated from blood supply by the testis barrier.

5. Formation of blood-testis barrier



The blood-testis barrier:

General Features:

It is the barrier that controls the passage of tissue fluids, from outside to the inside of the seminiferous tubule.

It is formed by the tight junctions between the basal parts of the Sertoli cells, thus subdividing the lumen of the seminiferous tubule into a basal and an adluminal compartment. Each compartment has a separate distinct population of spermatogenic cells.

The basal compartment : extends from the basal lamina of germinal epithelium to the tight junction (containing spermatogonia).

The adluminal compartment : extends between the tight junctions and the lumen of the tubule. It contains primary, secondary spermatocytes and spermatids.

Functions of the blood-testis barrier

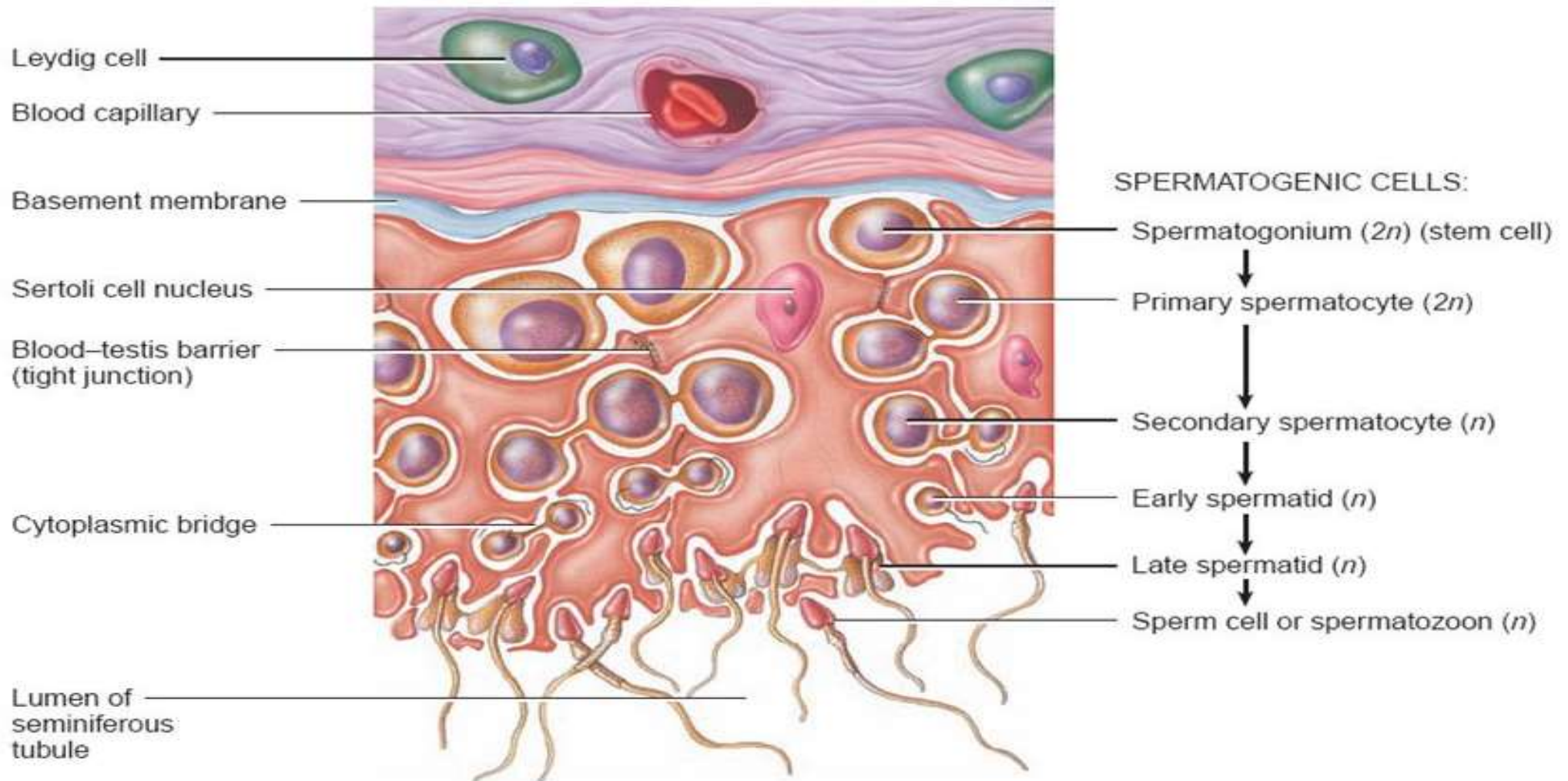
1- It allows the passage of useful materials needed for spermatogenesis as hormones (Testosterone) , vitamins, electrolytes,...

2-It prevents the entrance of damaging substances as antigens, antibodies and toxins.

3-It prevents the passage of sperms from the seminiferous tubule to the blood stream and the formation of antibodies against them (autoimmune disease).

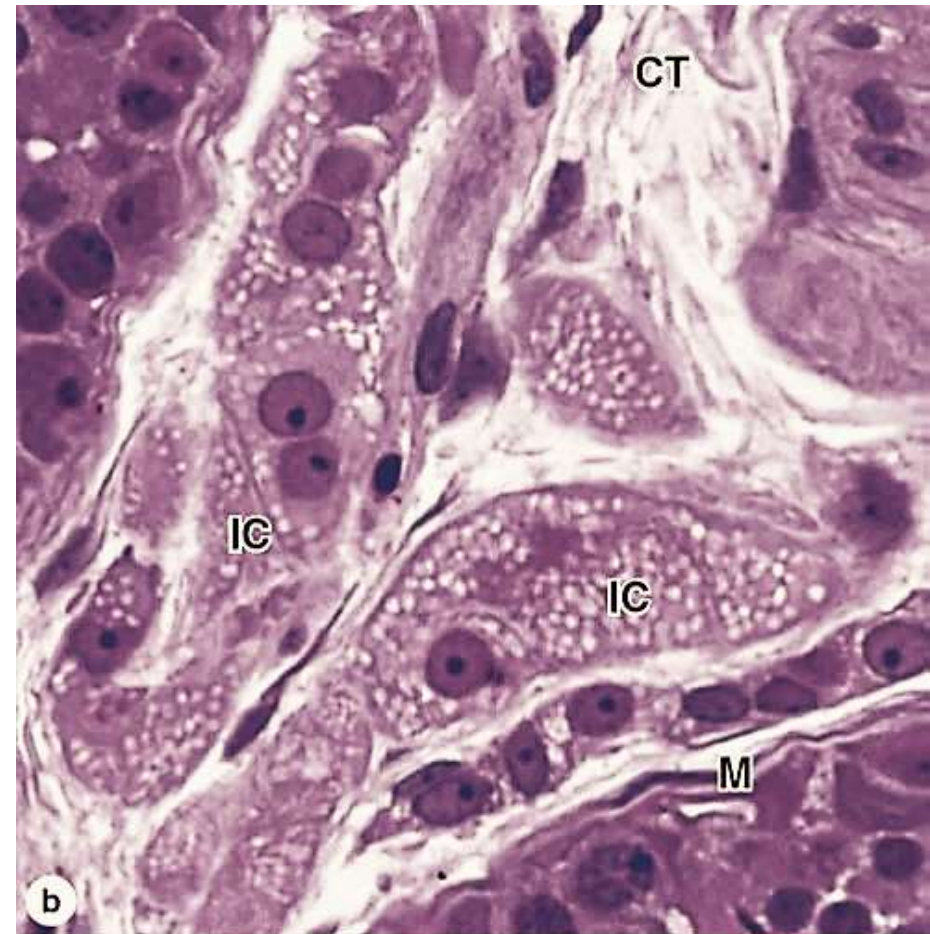
Because spermatogenesis begins after puberty, the newly differentiating germ cells, would be considered "foreign cells" by the immune system.

Blood-testis Barrier



Interstitial cells of Leydig

- ✓ They found in groups between seminiferous tubules in the interstitial connective tissue.
- ✓ Constitute 3% of cells in the interstitium after puberty
- ✓ Tend to decrease with age
- ✓ Mesodermal in origin
- ✓ Large rounded or polygonal cells with central nucleus and acidophilic cytoplasm
- ✓ Rich in small lipid droplets and lipochrome pigment

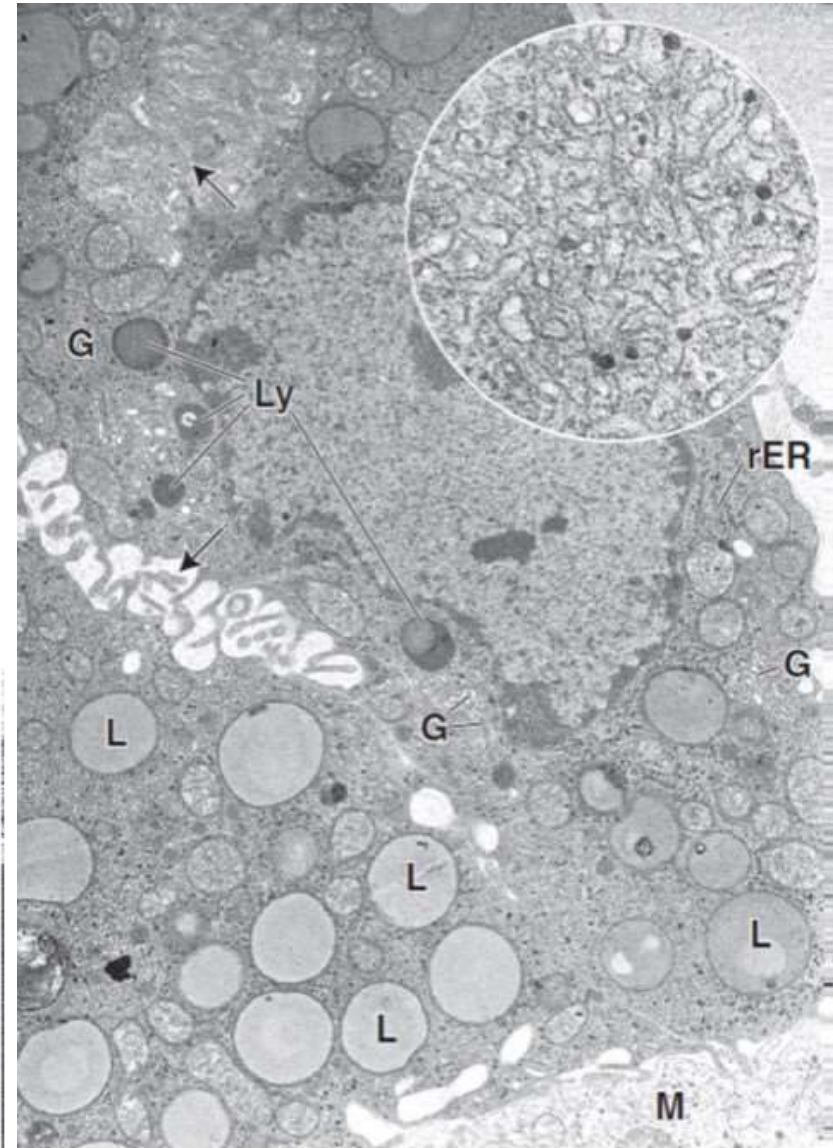
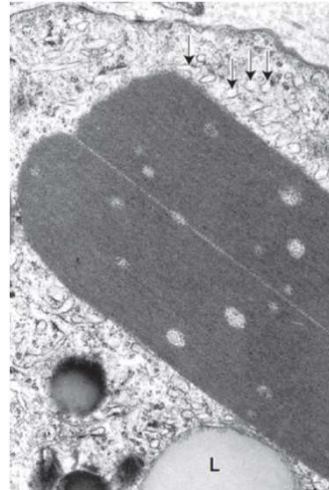


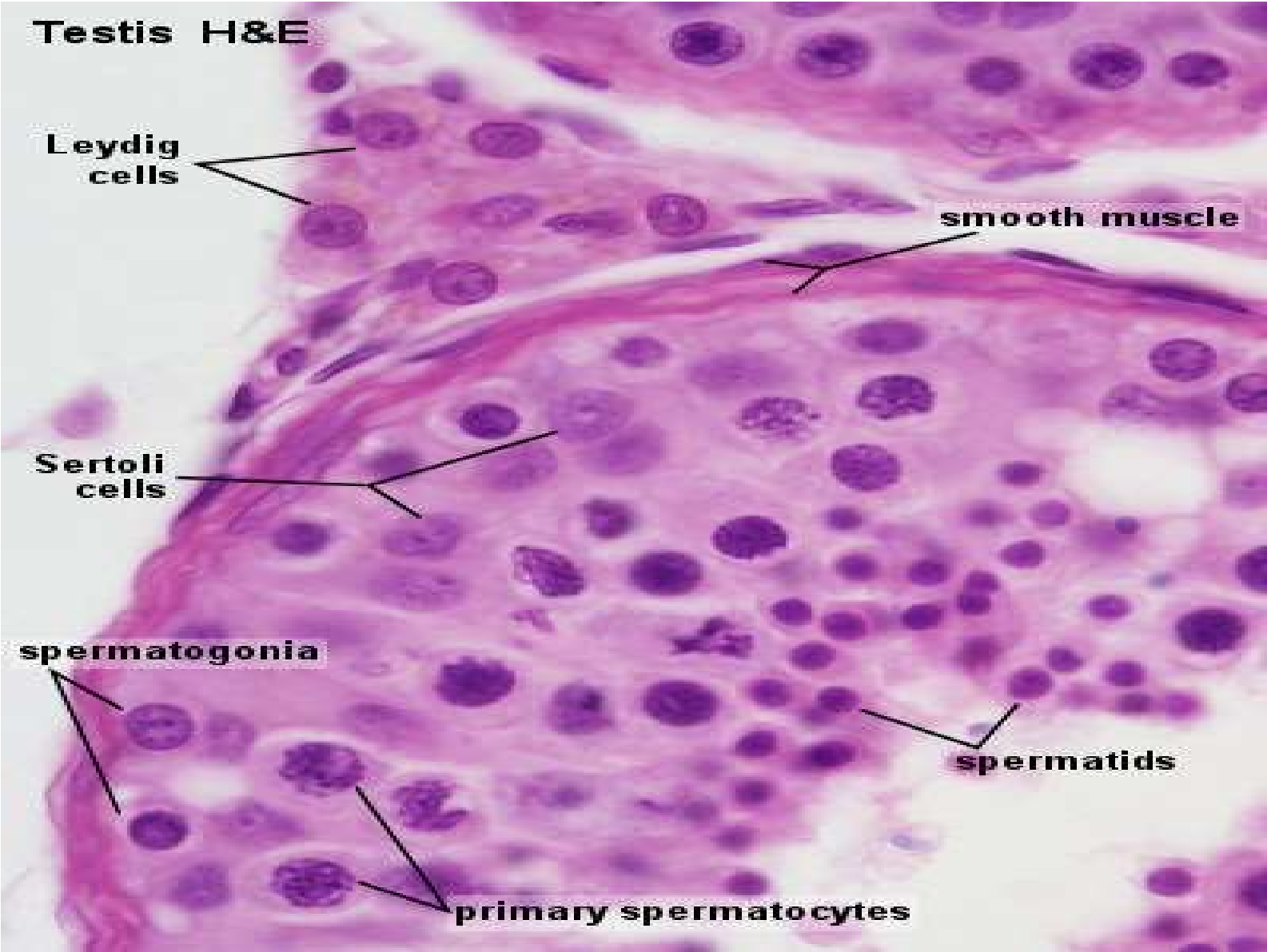
- **E.M.**

- It has abundant SER ,well developed Golgi apparatus , mitochondria.

- **Function :**

Secrete testosterone under the effect of L.H of pituitary gland





Testosterone secretion

Testosterone secretion by interstitial cells is triggered by the pituitary gonadotropin, **luteinizing hormone (LH) at puberty** when the hypothalamus begins producing gonadotropin-releasing hormone.

In embryonic phase placenta secretes gonadotropin which stimulates interstitial cells to synthesize the testosterone needed for development of the ducts and glands of the male reproductive system

The embryonic interstitial cells are very active during the third and fourth months of pregnancy then regress and become inactive cells until puberty

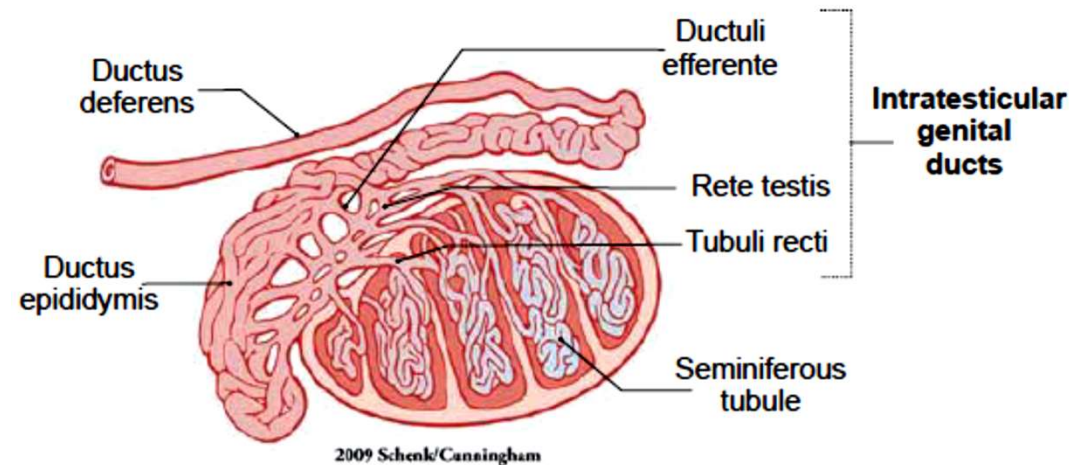
Genital ducts

Intratesticular ducts:

- Straight tubules (tubuli recti).
- Rete testis.
- Efferent ductules (ductuli efferenti).

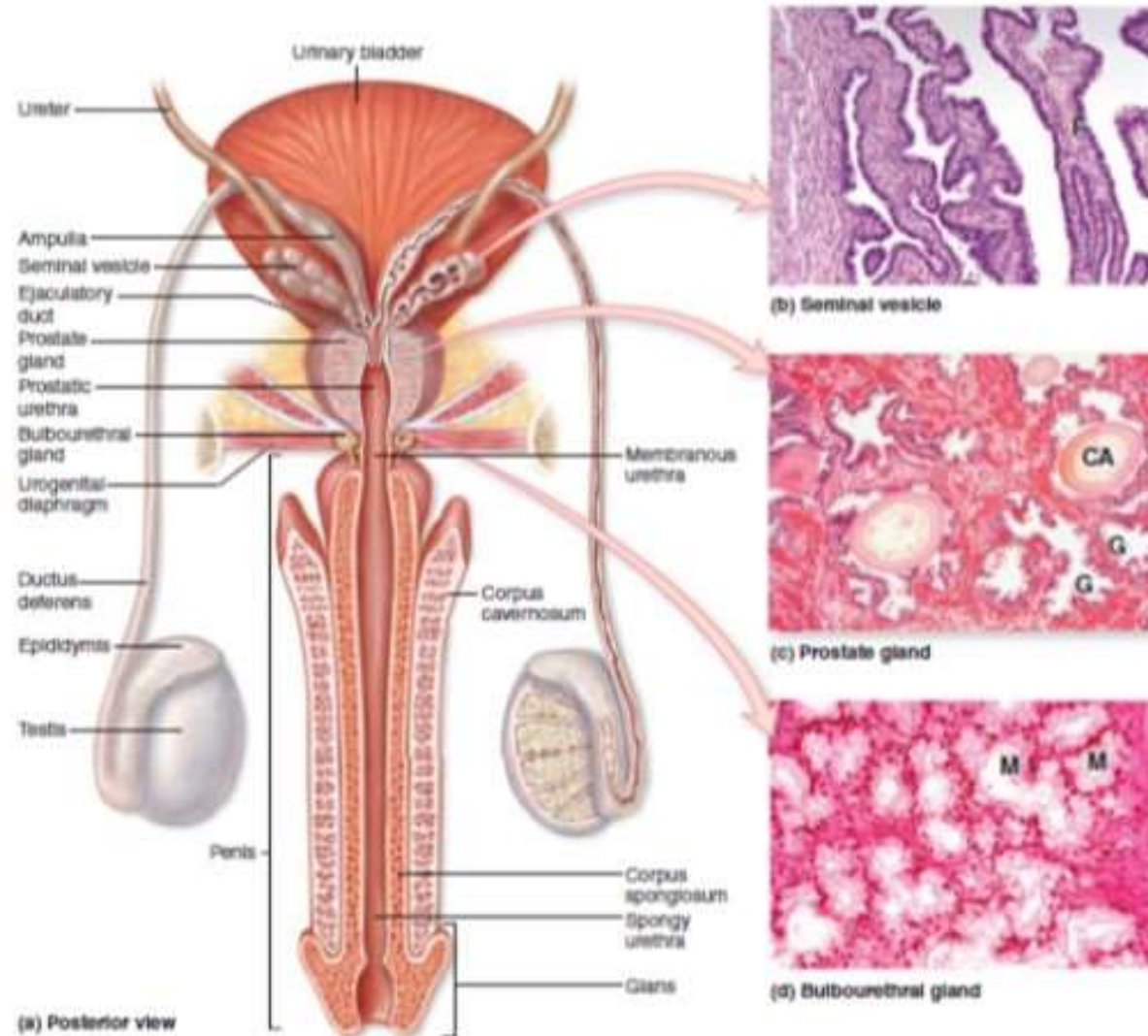
Excretory genital ducts:

- The epididymis.
- The ductus (or vas) deferens.
- The urethra.



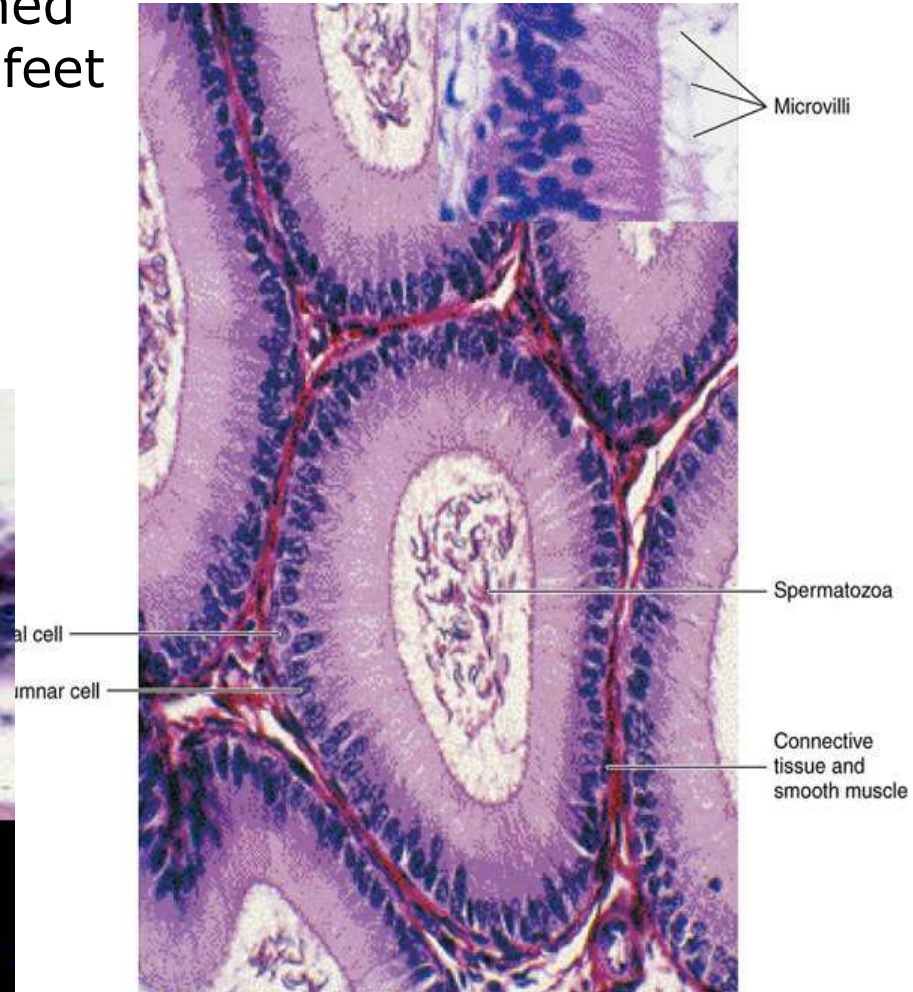
Accessory glands

- Paired seminal vesicles
- Single prostate gland
- Two bulbourethral glands



THE EPIDIDYMIS

- The body & the tail of epididymis are formed of a single narrow duct which is about 20 feet (6 meters) & is highly coiled to form the gland.



Mucosa : This duct is lined by pseudostratified columnar epithelium composed of rounded basal cells & columnar cells.

- The cells have long branched microvilli called “stereocilia”

- Musculosa** : A circular smooth muscle layer

- Adventitia** : A connective tissue layer

- Function** :

- It is site for storage and maturation of the sperms.

- Reabsorption of testicular fluid

- Phagocytosis and digestion of degenerative spermatozoa

Epididymis



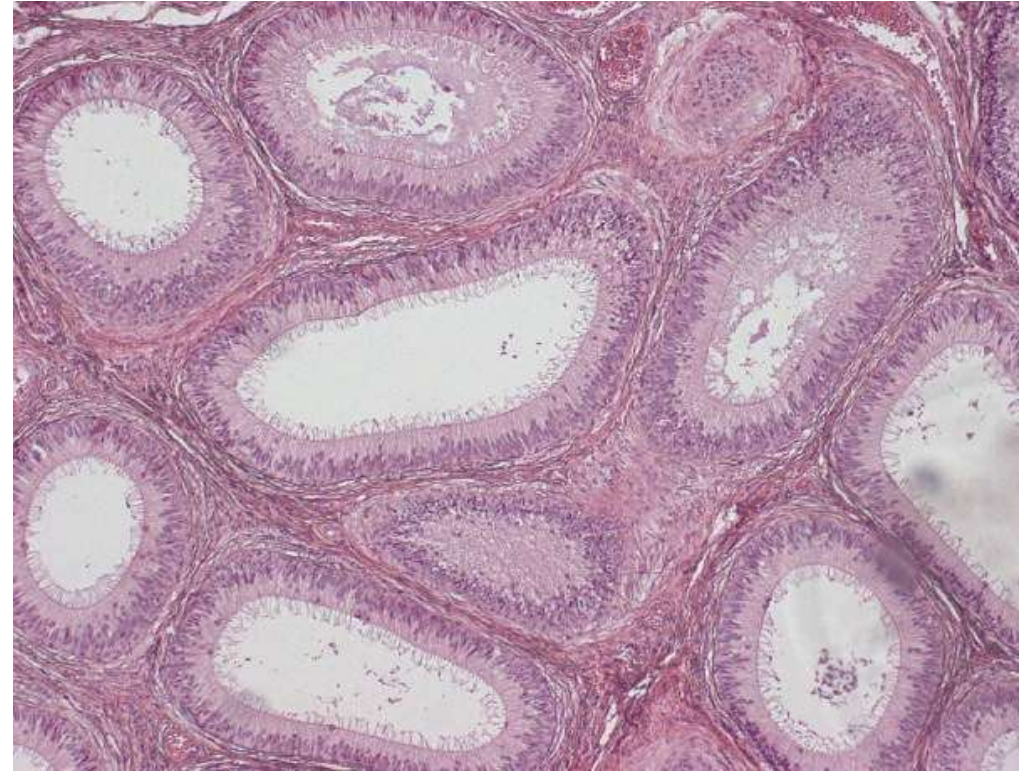
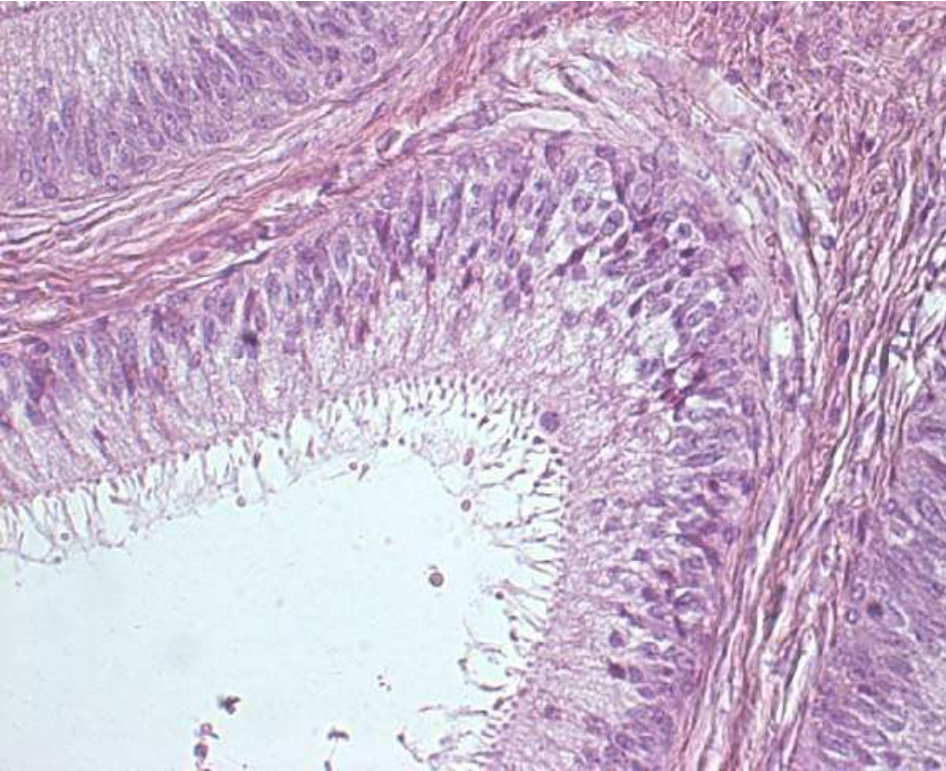
**Basal
Cell**

**Principal
Cell**

Sperm

**Pseudostratified Columnar
Epithelium**

**Stereocilia
(microvilli)**



Epididymis HE

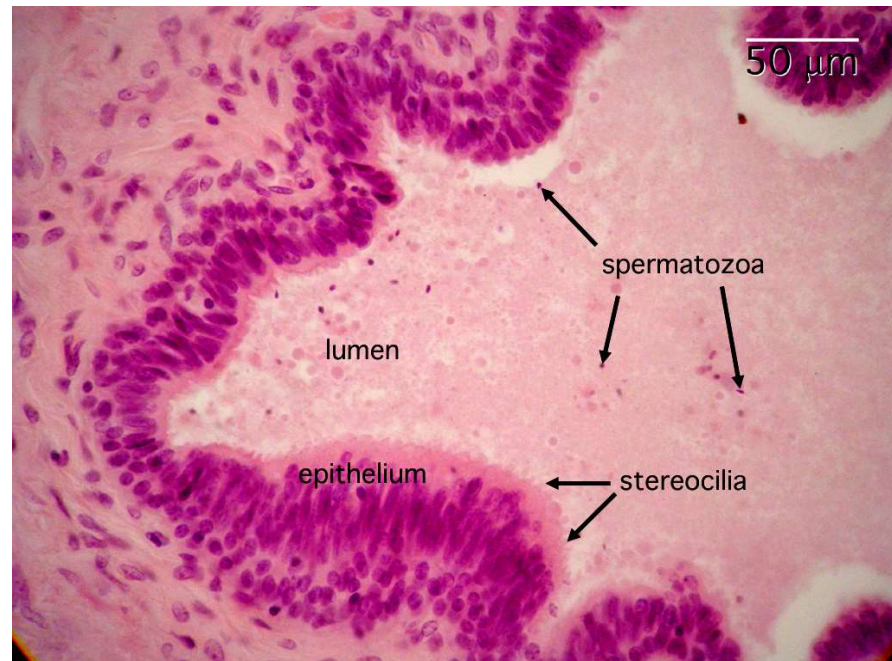
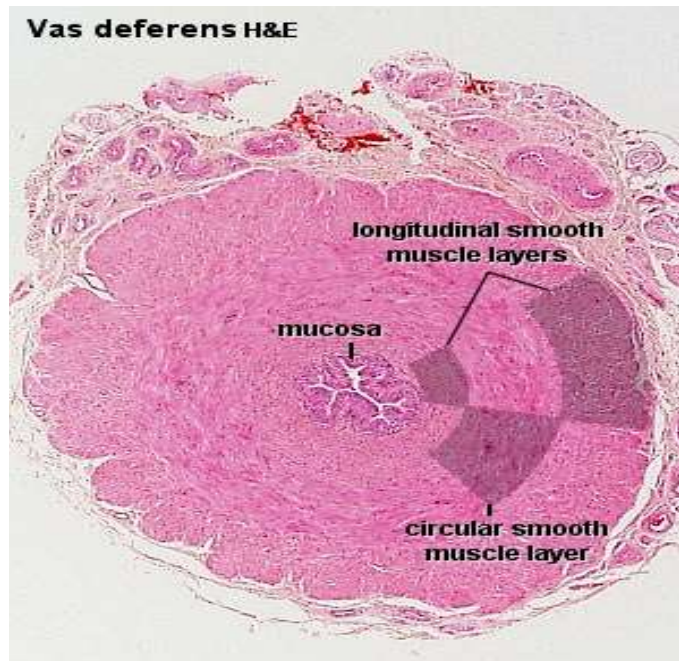
Vas Deferens

Mucosa is irregular. It is lined by a pseudostratified columnar epithelium cells with stereocilia. The lamina propria is unusually rich in elastic fibres.

Musculosa is well developed (up to 1.5 mm thick) and consists of a thick circular layer of smooth muscle between thinner inner and outer longitudinal layers.

It is innervated with sympathetic innervation

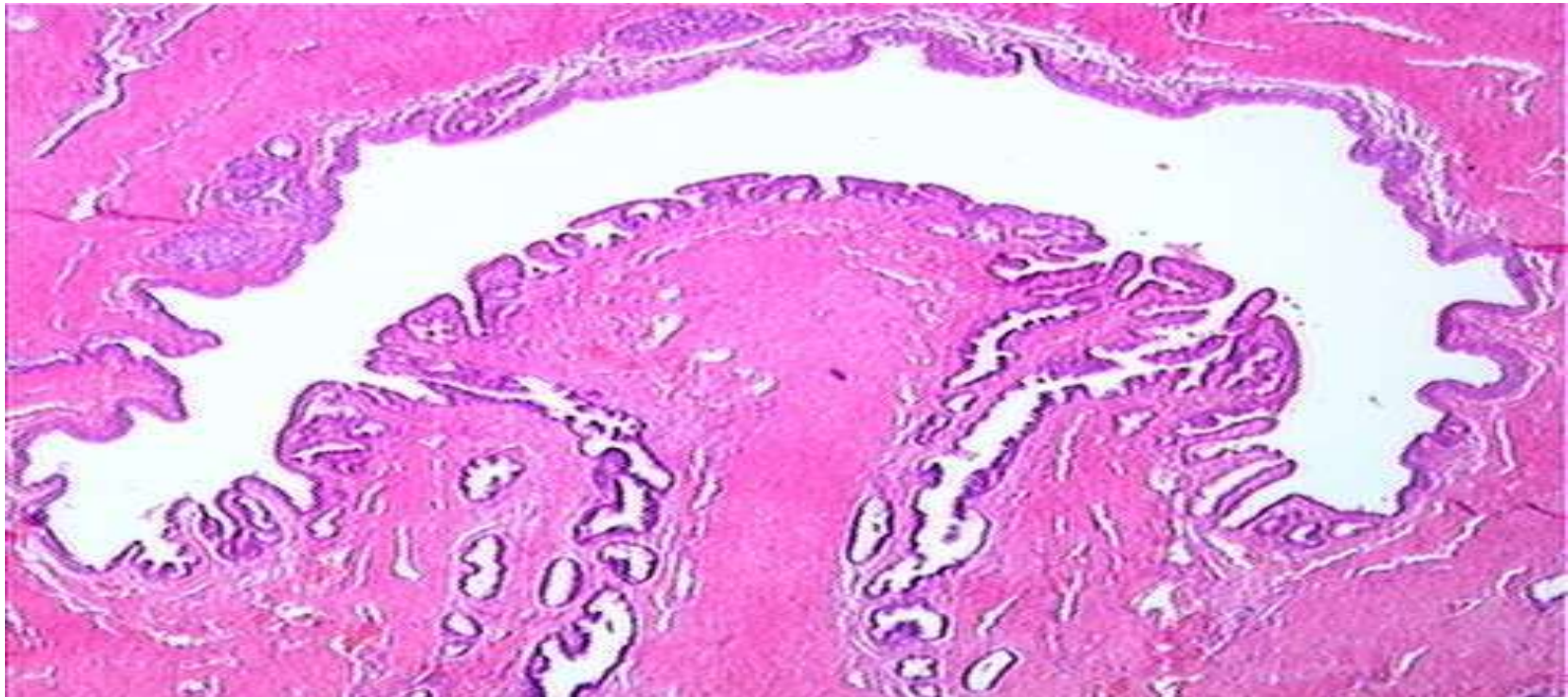
Adventitia : A connective tissue layer



The ejaculatory ducts

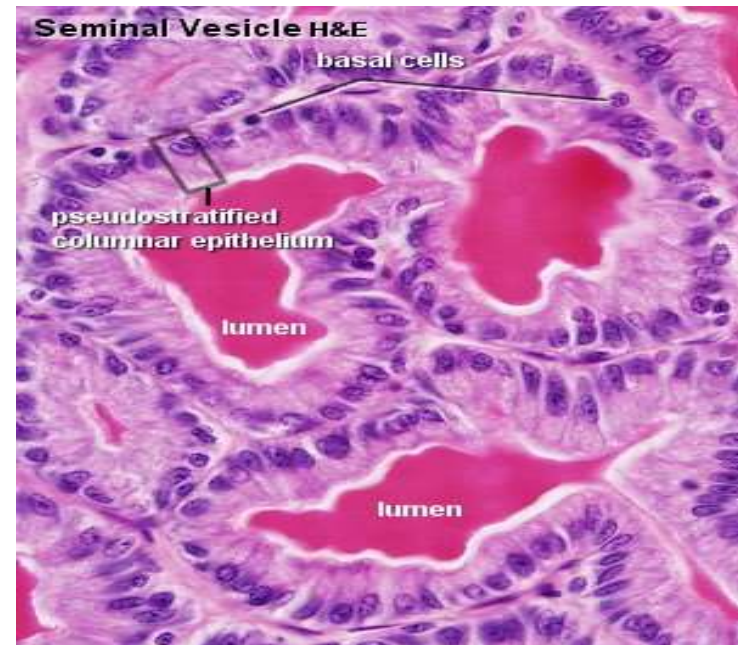
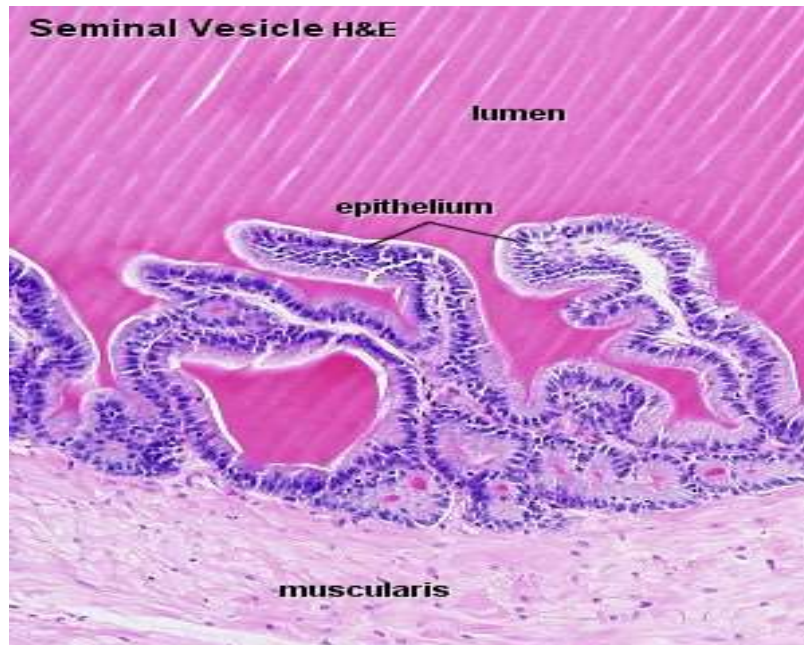
It is formed by the union of the ampulla of the vas deferens with the seminal vesicle & opens in the prostatic **urethra** through the prostate gland

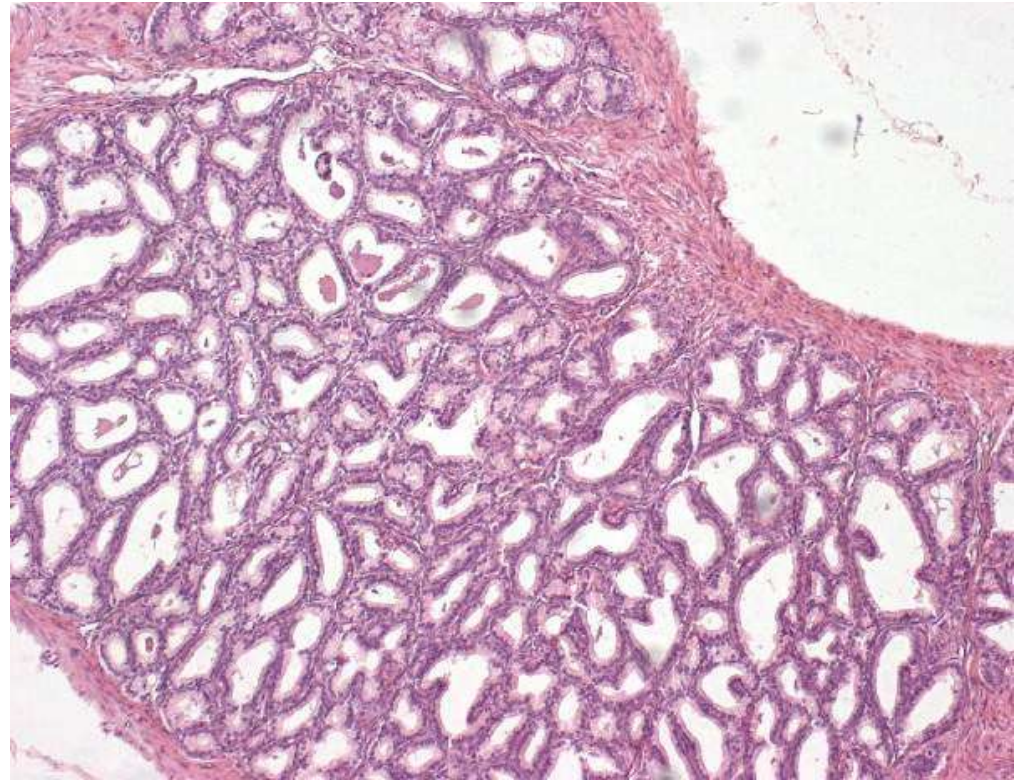
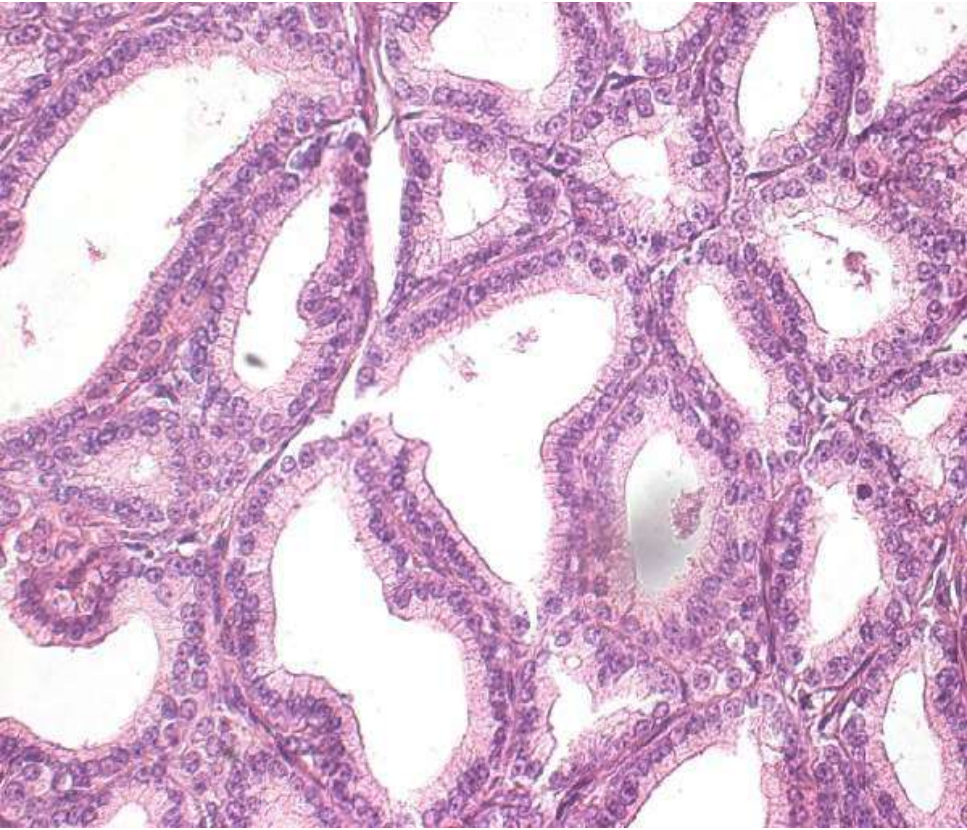
Histology: simple or pseudostratified columnar epithelium (secretory in function), no muscular coats



The Seminal Vesicle

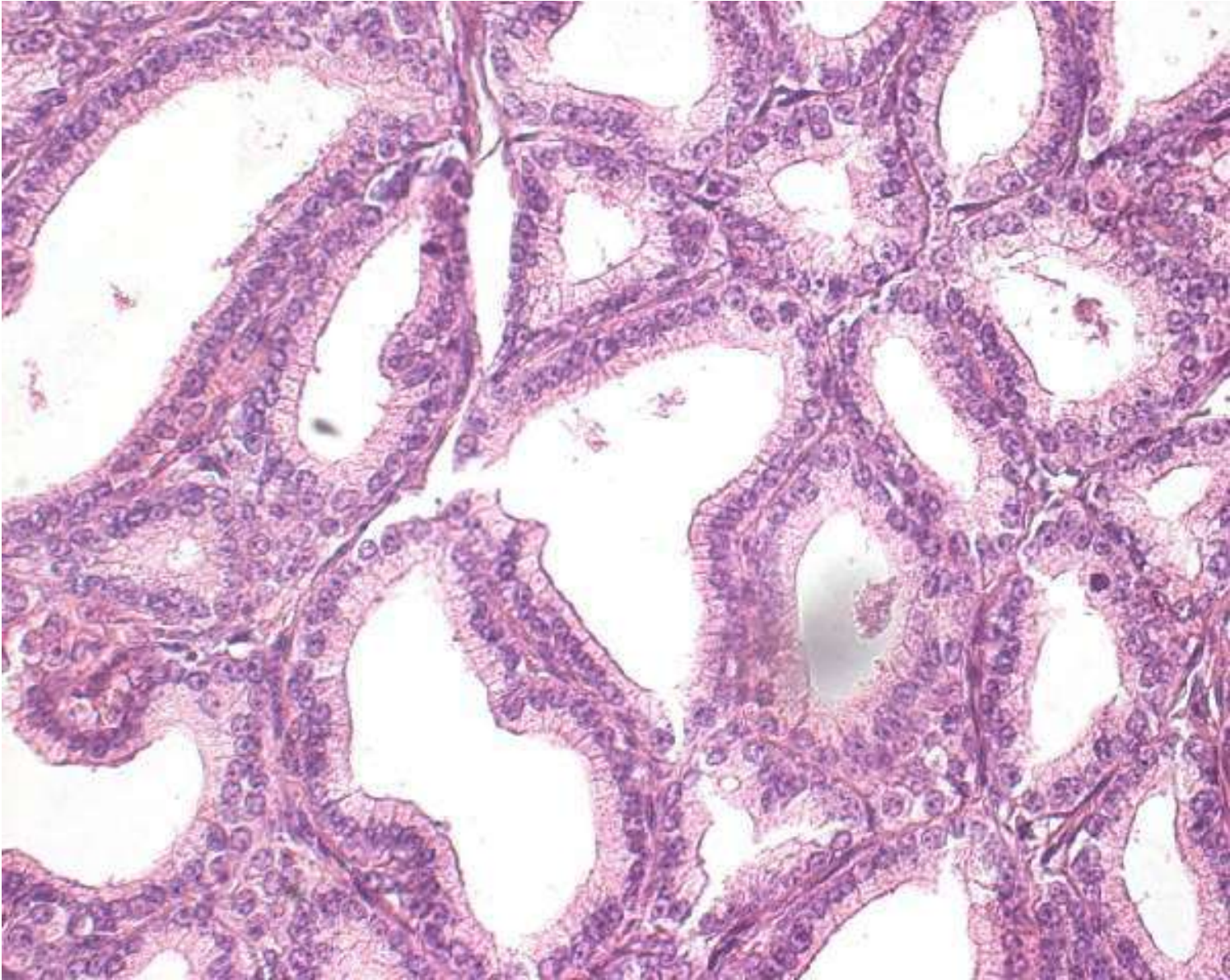
- Each seminal vesicle consists of one coiling tube (about 15cm long).
- **Mucosa** shows thin, branched, anastomosing folds. The epithelium is variable appearing columnar or pseudostratified columnar secretory epithelium .
- **Muscularis** consists of inner circular and outer longitudinal layers of smooth muscle.
- **Adventitia** : A thin fibroelastic connective tissue layer
- **Functions** The secretion of the seminal vesicles is thick, yellowish, alkaline fluid rich in protein, fructose and vitamin C, these are of importance for nutrition and production of energy for sperms.





Seminal vesicles HE

Seminal vesicles HE



The Prostate

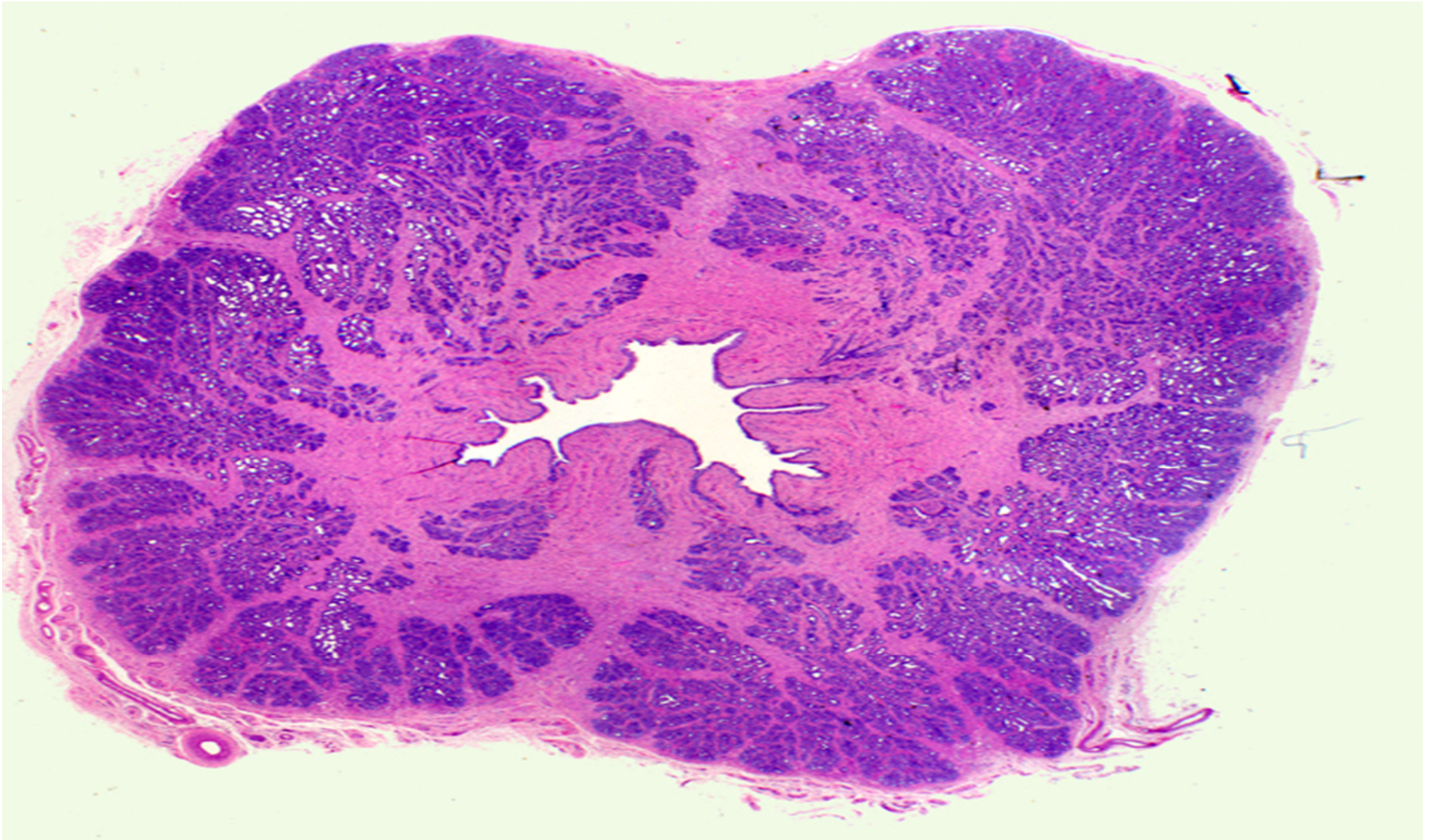
It is formed of 30-50 compound tubulo-alveolar glands surrounding prostatic urethra, from which numerous ducts drain independently into the prostatic urethra.

The gland is made of stroma and parenchyma.

1- Stroma:

It is made of capsule and trabeculae formed of fibromuscular C.T. rich in smooth muscle collagenous and elastic fibers

2-Parenchyma: It is made of 30-50 glands arranged concentrically around the prostatic urethra. The acini are arranged in 3 levels:

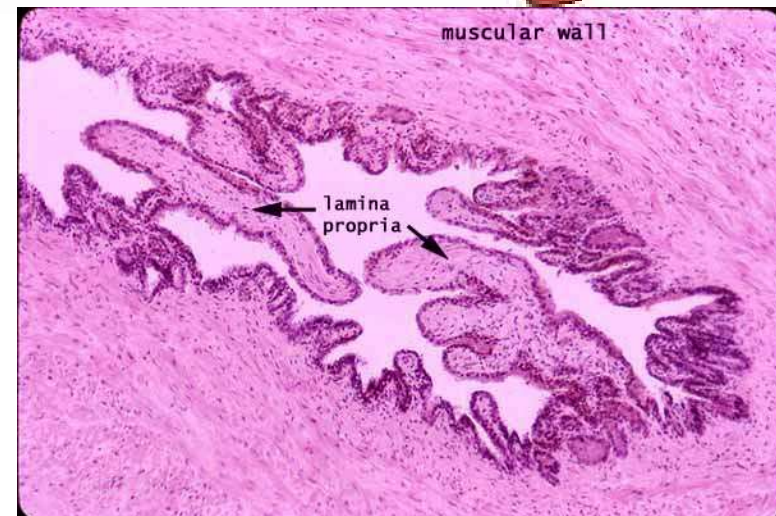
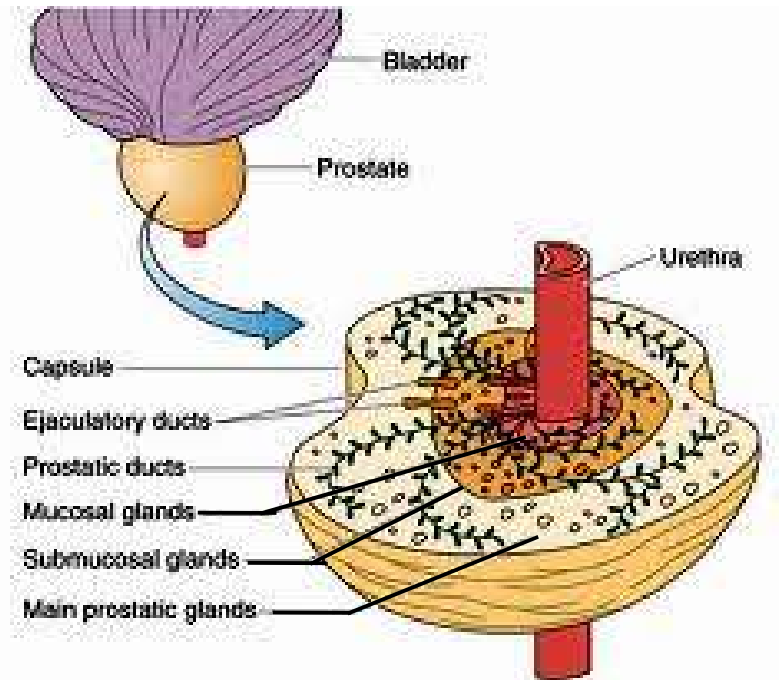


3 types of glands in prostate:

(1) Periurethral glands (mucosal)
– smallest, around urethra

(2) Submucosal glands
surround the periurethral tissue

(3) Main Prostatic Glands
(external, proper)–outer largest
portion of gland; provide most
prostatic secretions



Structure :

The glandular epithelium differs greatly within the gland may be simple or pseudostratified columnar or low cuboidal or squamous

The acini and ducts are lined with simple columnar epithelium

The secretory cells are slightly acidophilic and secretory granules may be visible in the cytoplasm.

Functions

It secretes a thin milky alkaline secretion, which gives the characteristic smell. The secretion is rich in acid phosphatase

Clinical notes on the prostate:

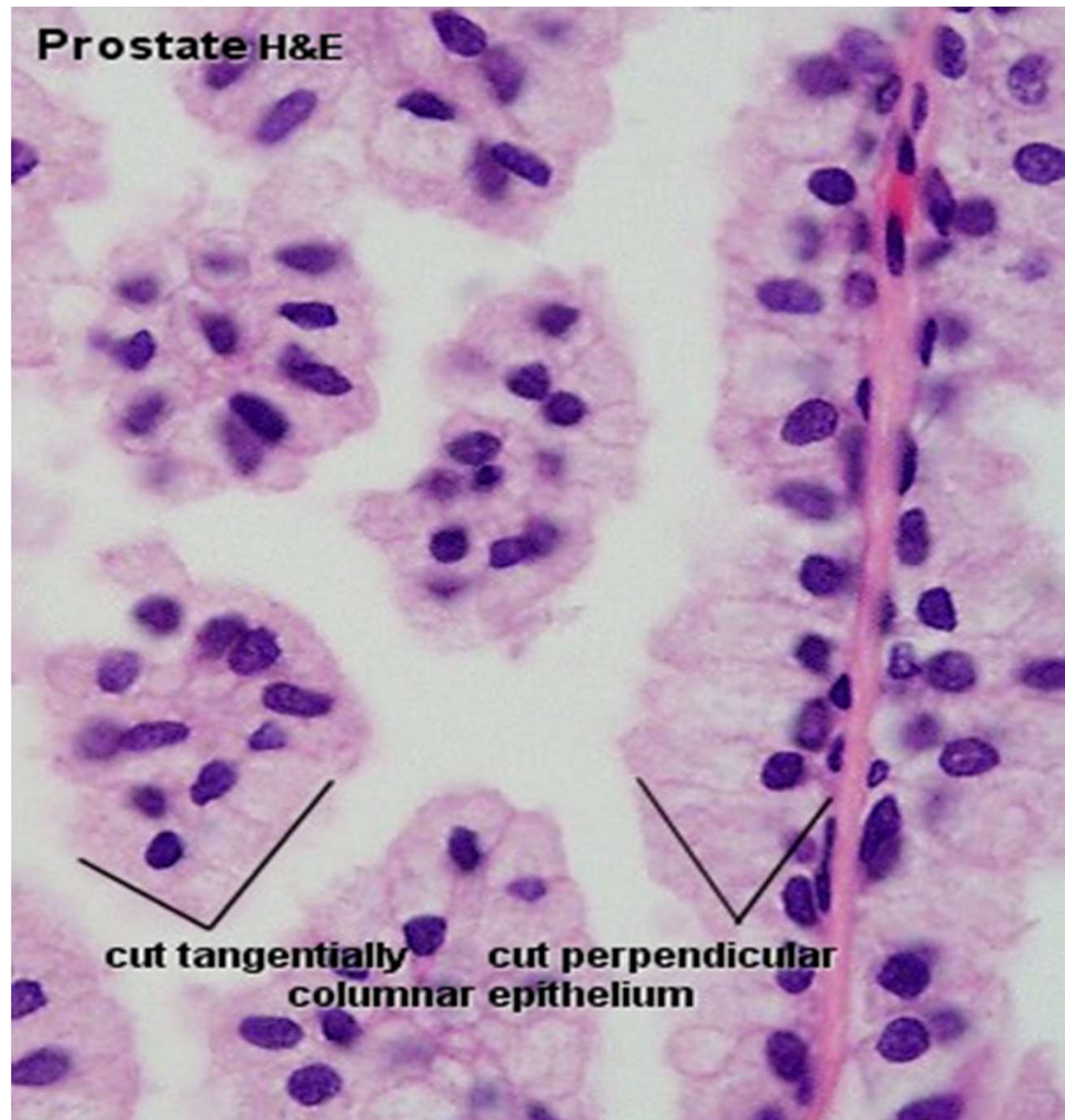
The mucosal and submucosal glands enlarge after the age of 40 causing pressure on the urethra and difficulty in micturition, condition known as **senile prostate**.

Carcinoma of the prostate affects the outer glands.

It is diagnosed by presence of high levels of acid phosphatase in plasma

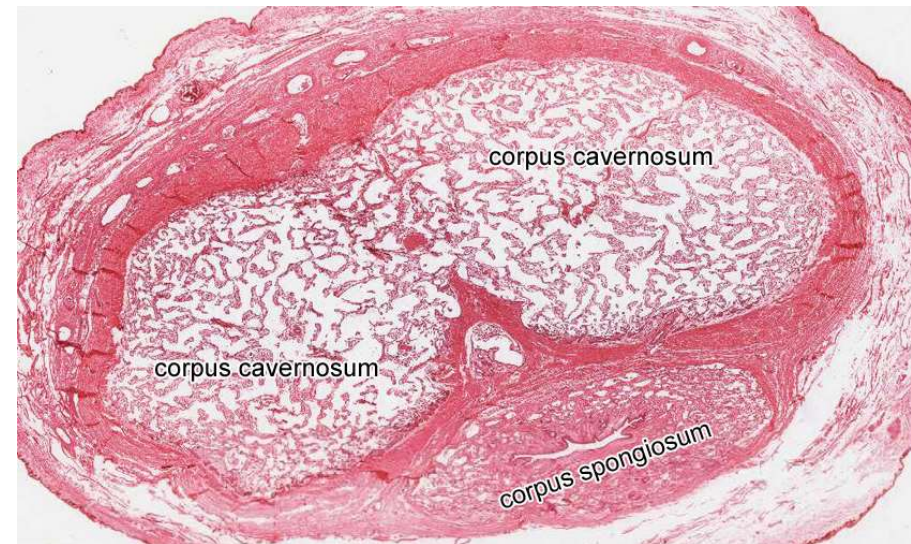
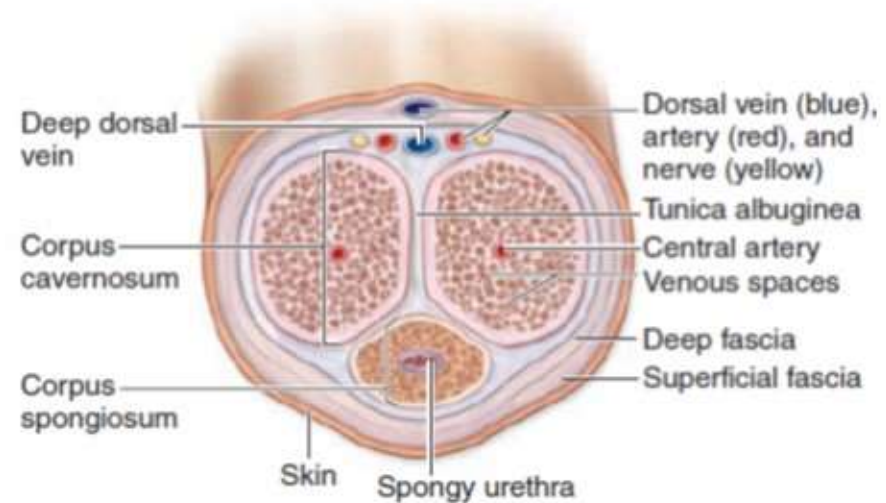
Prostatic concretions (corpora amyloacea) are thought to result from condensation of secretory material in acini.

They increase with advance of age and may become calcified.



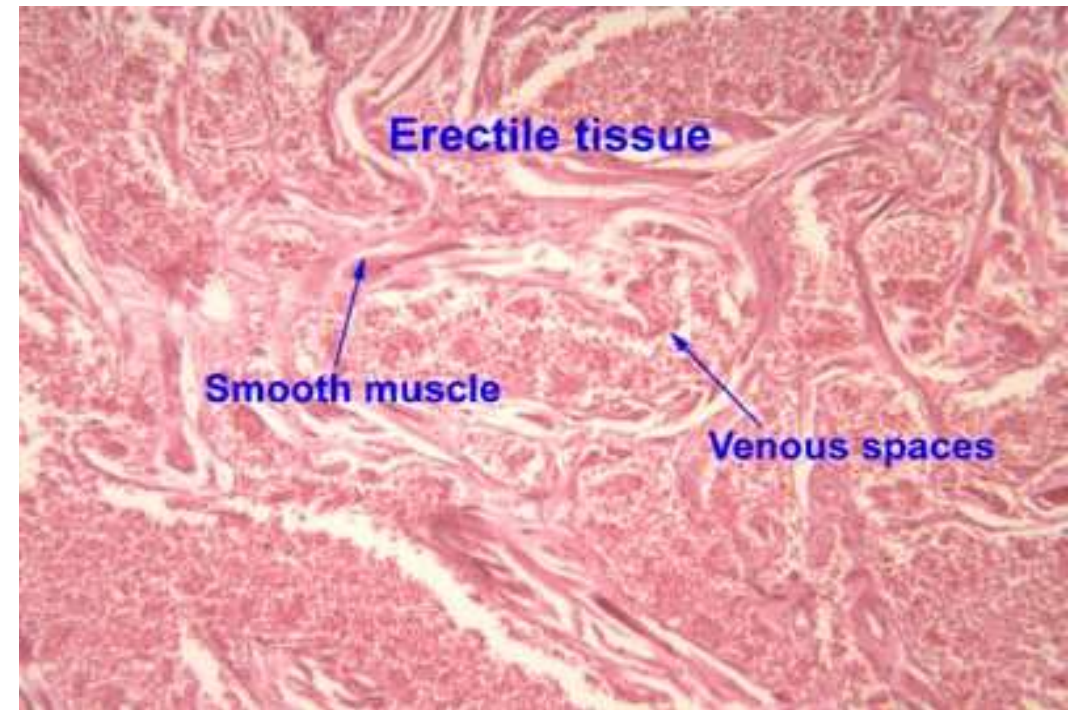
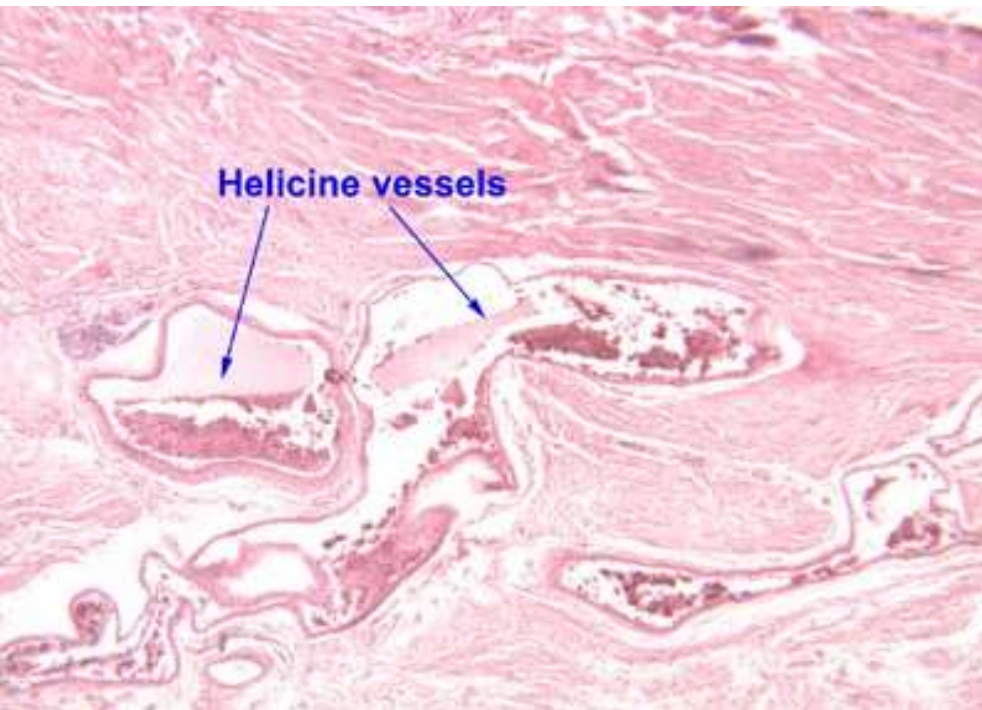
The penis

- Composed of 3 cylindrical masses of erectile tissue:
 - 2 dorsal corpora cavernosa
 - Ventral corpus spongiosum surrounds the urethra and expands at its end forming the glans penis
- Dense fibroelastic layer, tunica albuginea, binds the three masses together as well as forming a capsule around each one
- Covered by thin skin
- The tunica albuginea of Corpora spongiosum is thinner and more elastic



The penis – erectile tissue

- It is supplied by helicine arteries
- Contains numerous *endothelially lined* cavernous blood spaces separated from one another by trabeculae of connective tissue and smooth muscle.



*Thank
you*

