

# **Histology of Male Reproductive System**

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# Male Reproductive System

**A-Testis**

**B-Epididymis**

**C-Ductus Deferens**

**D-Urethra**

**1-Pelvic part**

**2-Penile part**

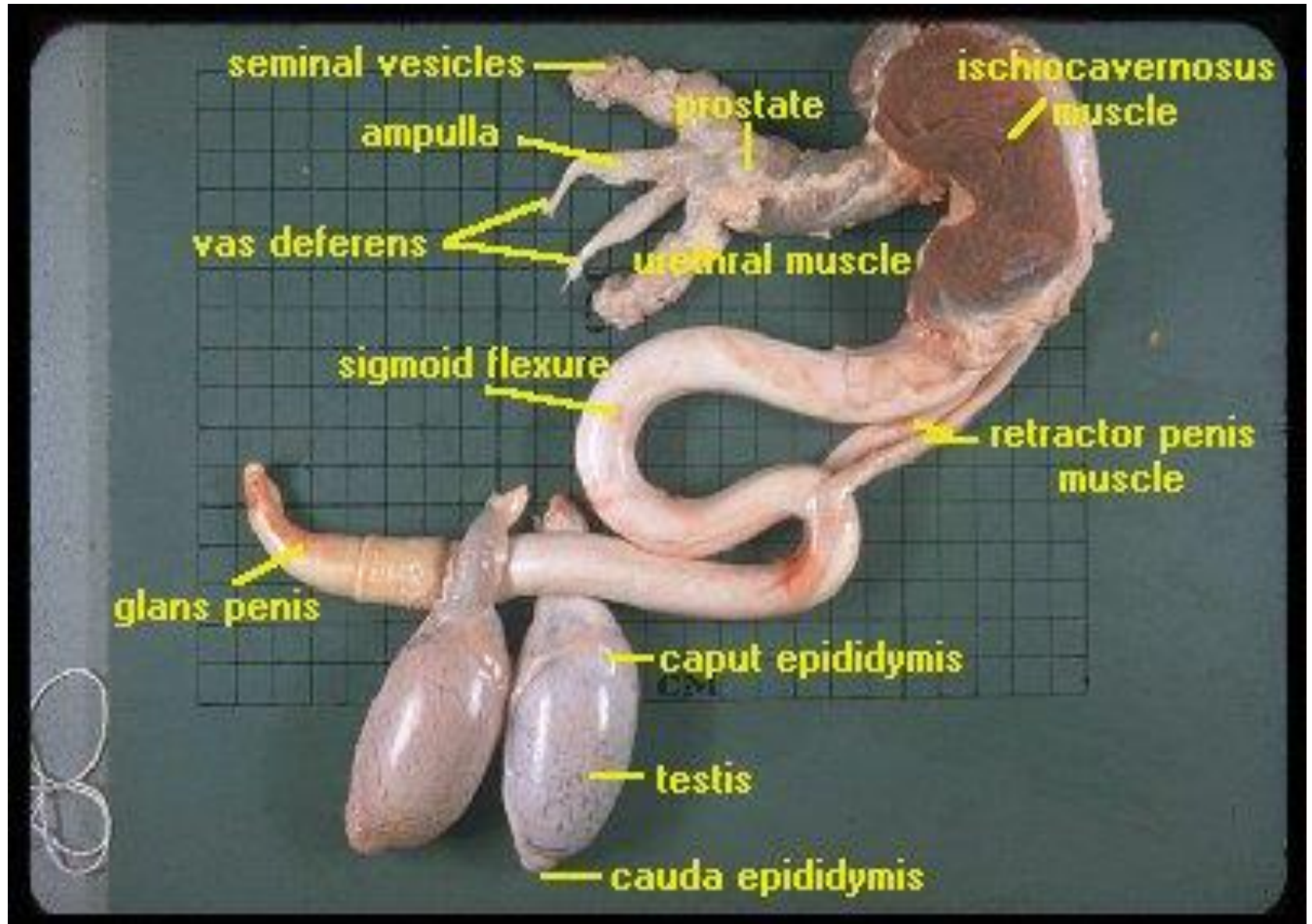
**E-Penis**

**G-Accessory Glands**

**1. Seminal vesicles**

**2-Prostate gland**

**3-Bulbourethral gland/ Cowper's gland**

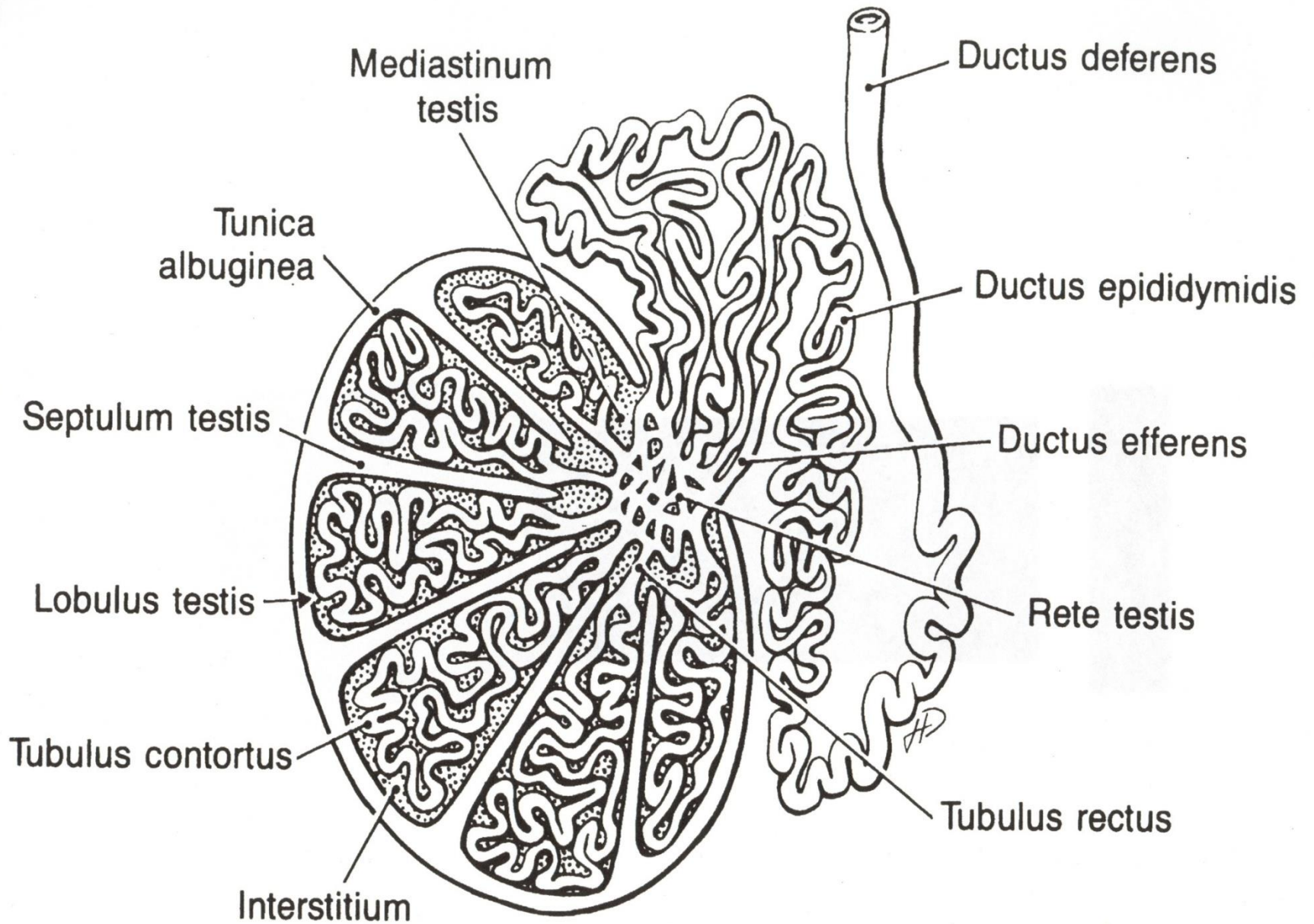


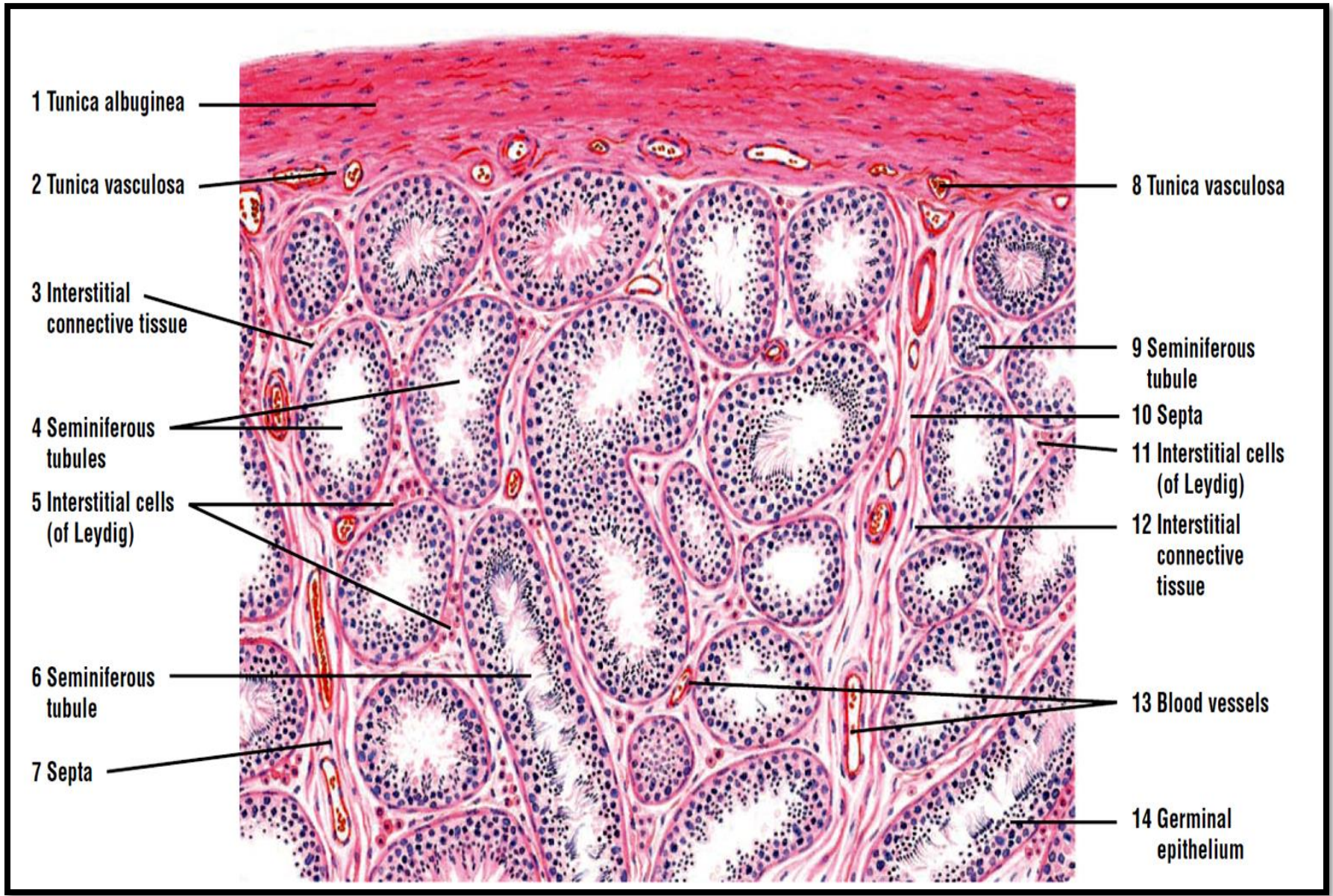
# Testis

- The testis remains covered by:
- Tunica vaginalis-
  - The outermost covering (peritoneal covering of the testis and epididymis).
  - It has a **parietal** and **visceral** layer. The parietal layer remains adhered to the scrotum while the visceral layer adheres to the capsule of the testis. The space between the these two layers is called the **vaginal cavity**.
  - The layers consists of mesothelium lining and connective tissue that blends with the underlying connective tissue of the scrotum.

- **Tunica albuginea:**

- Capsule of the testis
- Consists of dense irregular connective tissue, predominantly collagen fibers, few elastic fibers and myofibroblast.
- It has vascular layer (**Tunica vasculosa**) that contains anatomizing branches of testicular artery and veins.
- The tunica albuginea gives connective tissue trabeculae called **septula testis** which converge towards the **mediastinum testis**.
- The septula testis divides the testicular parenchyma into number of **testicular lobules**. Each lobule contains **1-4 seminiferous tubules**.
- **Mediastinum testis** is a connective tissue area containing the channels of rete testis, large blood and lymph vessels. In bull it occupies the central position along the longitudinal axis of the gonad.





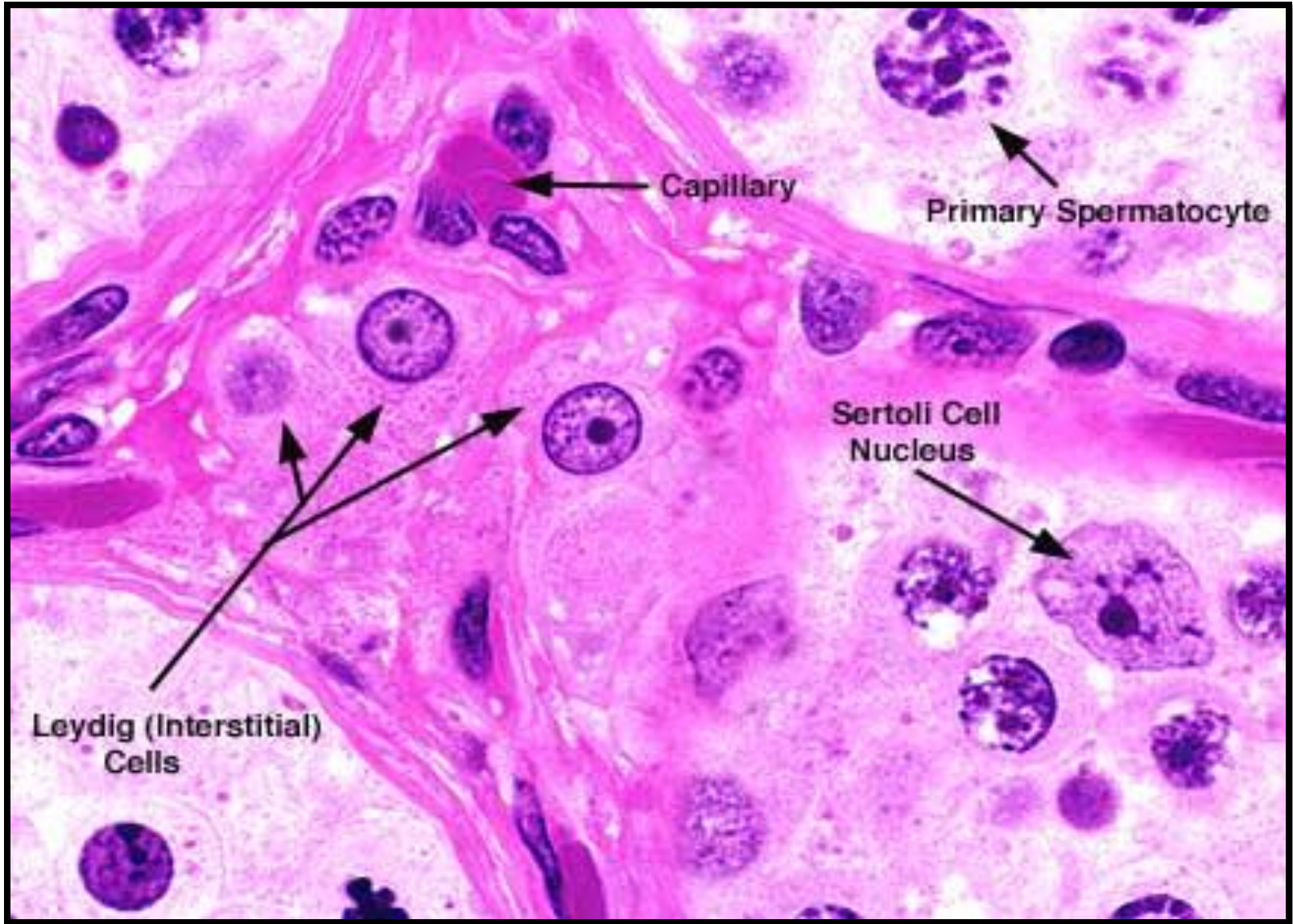
# Interstitial cells (Leydig cells)

The inter-tubular spaces of the testis contain loose C.T., blood and lymph vessels, fibrocytes, free mononuclear cells and interstitial cells called **Leydig cells**.

## **These Leydig cells are**

- Endocrine cells.
- Have acidophilic cytoplasm.
- Polyhedral in shape; has 1 or 2 spherical nuclei.
- Form cords or clusters.
- 1% ram, 5% bulls, 20-30% in boars.
- Produce testicular androgens (Testosterone)
- In Boars they produce large amount of estrogen.





## Leydig cells in the interstitial tissue, testis, LM



## Seminiferous tubules:

- Comprises of convoluted (**tubuli contorti**) and straight tubule (**tubuli recti**).
- Convoluted Seminiferous tubules are tortuous two-ended loops.
- Lined by stratified spermatogenic/ germinal epithelium.
- Underlined by basal lamina.
- Beneath the basal membrane lies the lamina propria.
- **The spermatogenic epithelium contains**
  - Spermatogenic cells
  - Sertoli cells/ Sustentacular cells.

1 Spermatogonia:

a Dark type A

b Pale type B

2 Primary spermatocytes

3 Connective tissue

4 Interstitial cells

5 Seminiferous tubule

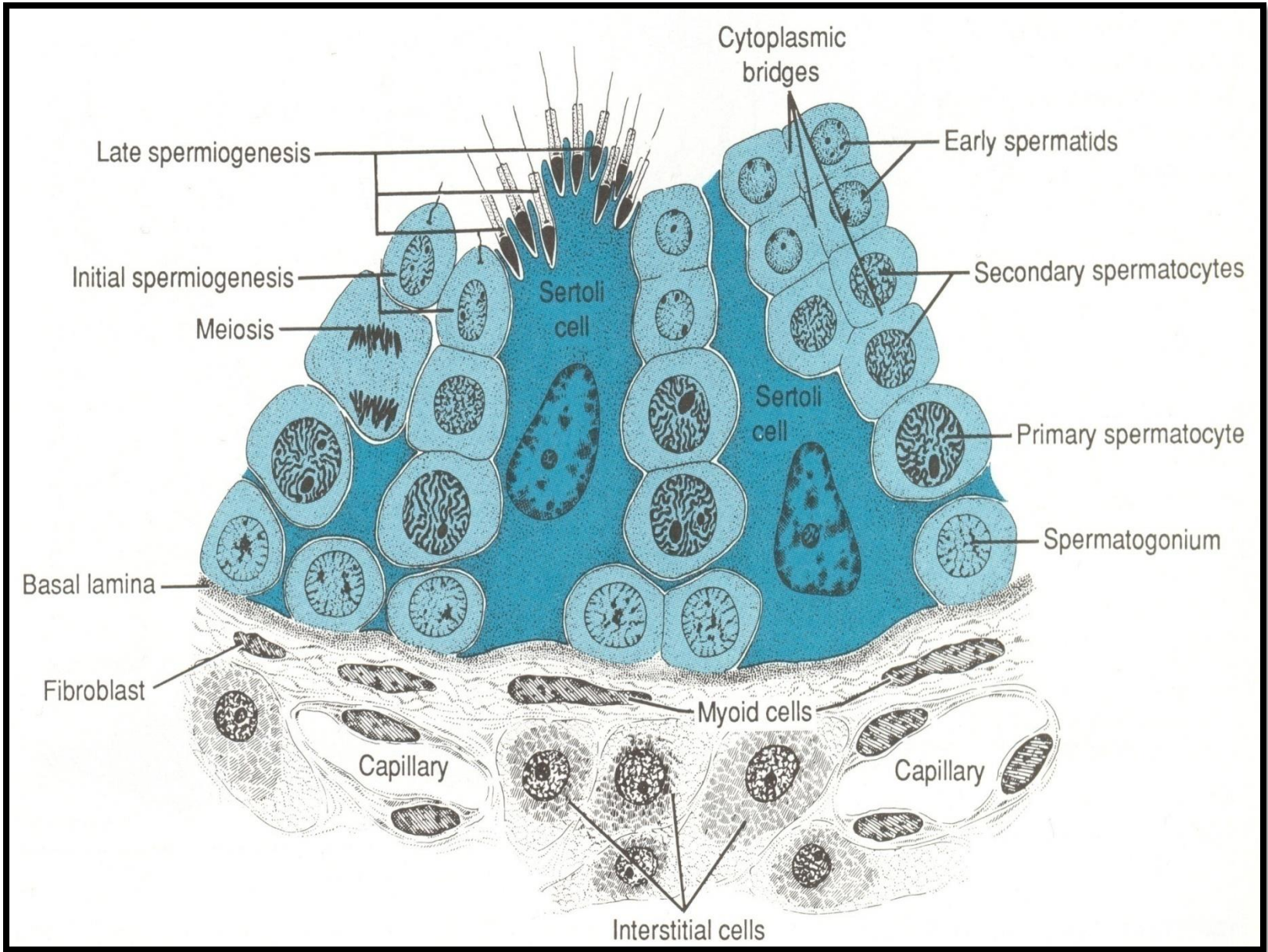
6 Sertoli cells

7 Spermatids

**Cross section showing one Seminiferous tubule**

# Spermatogenic cells:

- It is arranged as complex stratified epithelium which consists of stem cells (spermatogonia) at the base of the epithelium.
- The other cells are arranged in the order of development i.e., spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids and spermatozoa.
- The process of differentiation of spermatogonia to spermatozoa is called spermatogenesis.
- **Spermatogonia** are immature spermatogenic cells lying on the basement membrane of Seminiferous tubule.
  - They undergo mitosis to differentiate into Type-A and Type-B cells.
  - The type-A spermatogonia serves as stem cell of germinal epithelium.
  - The type-B spermatogonia undergo maturation to form the primary spermatocytes.



## **Primary spermatocyte:**

- These are the largest germ cells occupying the middle region of Seminiferous tubule.
- They have large rounded nucleus with coarse chromatin clumps.
- The primary spermatocytes undergo first meiotic division to form the secondary spermatocytes with haploid number of chromosomes.

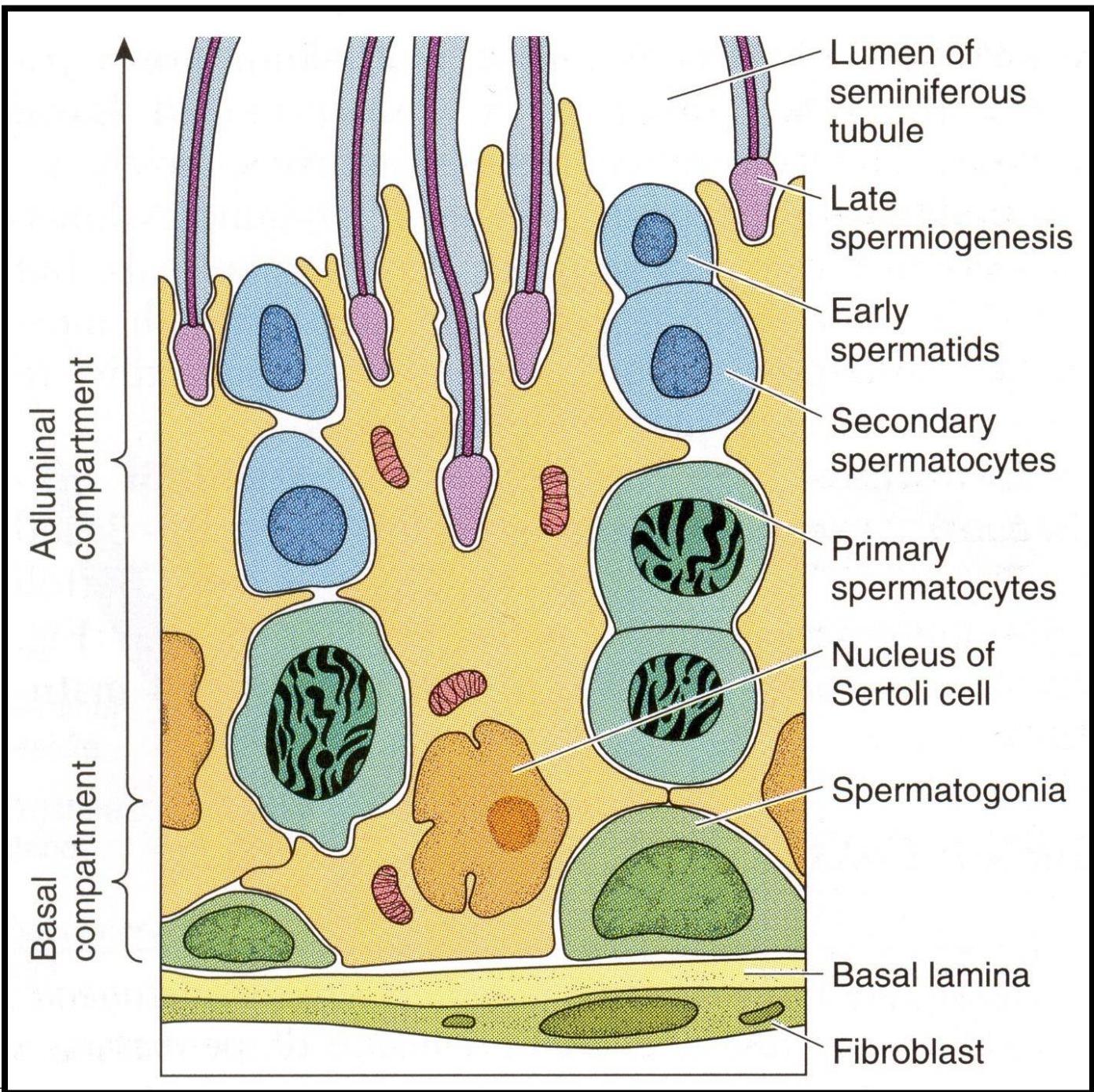
## **Secondary spermatocyte:**

- These are short lived cells and intermediate in size between the primary spermatocytes and spermatids.
- Their nuclei have less dense chromatin and undergo second meiotic division to form the spermatids.

## **Spermatids:**

- They are much smaller and lie in groups along the margins of sertoli cells.
- With the formation of spermatids the first phase of spermatogenesis i.e., spermatocytogenesis is completed.
- The second phase (Spermiogenesis) starts where the non-motile spermatids converts into motile spermatozoa.





Lumen of seminiferous tubule

Late spermiogenesis

Early spermatids

Secondary spermatocytes

Primary spermatocytes

Nucleus of Sertoli cell

Spermatogonia

Basal lamina

Fibroblast

Adluminal compartment

Basal compartment

**Testis H&E**

**Leydig cells**

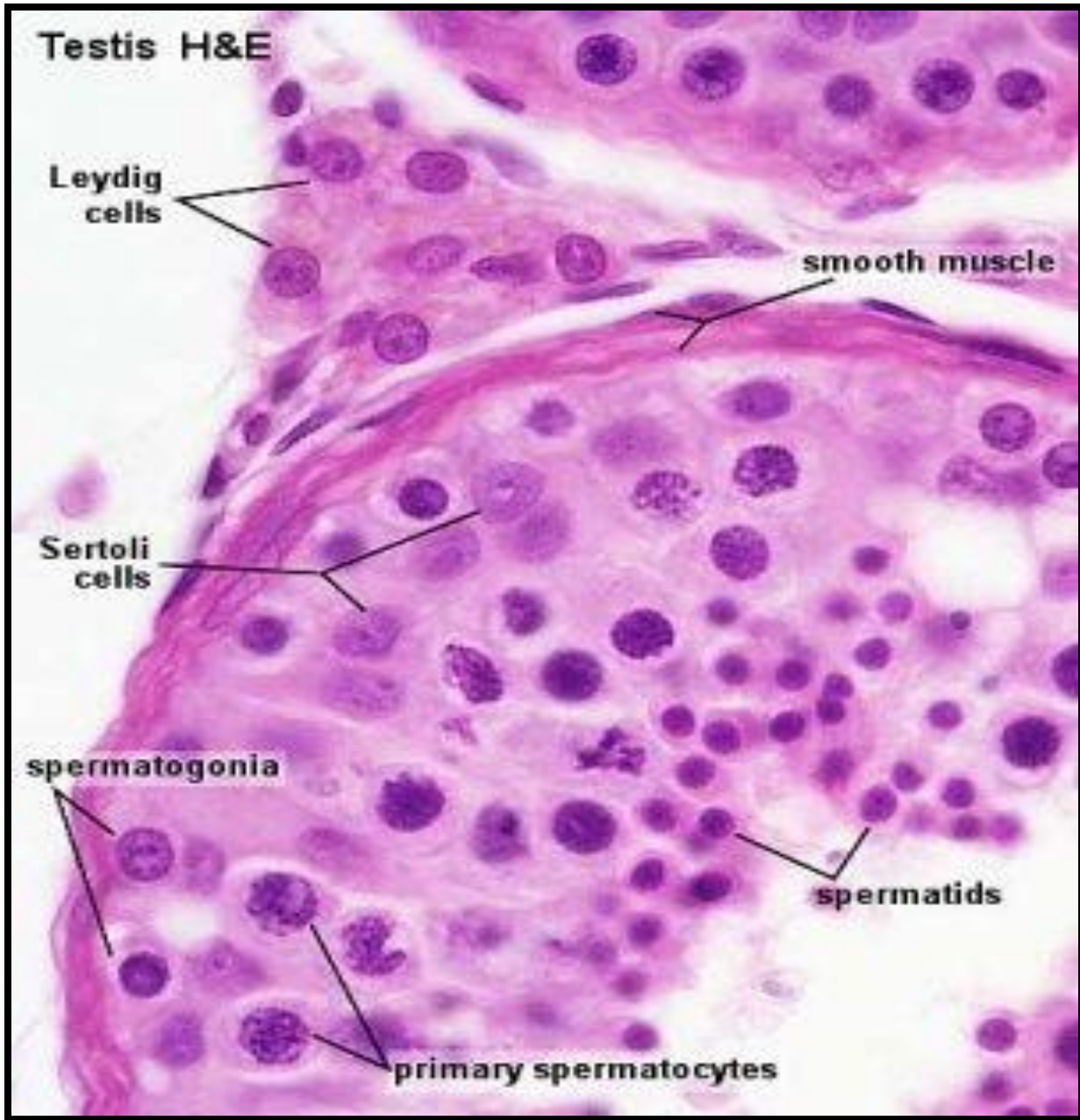
**smooth muscle**

**Sertoli cells**

**spermatogonia**

**spermatids**

**primary spermatocytes**



## **Sustantacular cell (Sertoli cell ):**

- Irregularly outlined tall columnar cells rest on basal lamina.
- Have oval or pear-shaped nuclei and located in the broad basal portion of the cell and contains large nucleoli.
- Form hemidesmosomes with the basal lamina.
- Looses its mitotic activity during puberty.
- A cross section of somniferous tubule has about 20 evenly spaced sustantacular cells.
- Adjacent sertoli cells have lateral tight junctions.
- This form a basal and an apical compartment forming blood-testis barrier.

# Structure of Sertoli Cells

Secondary spermatocyte

Primary spermatocyte

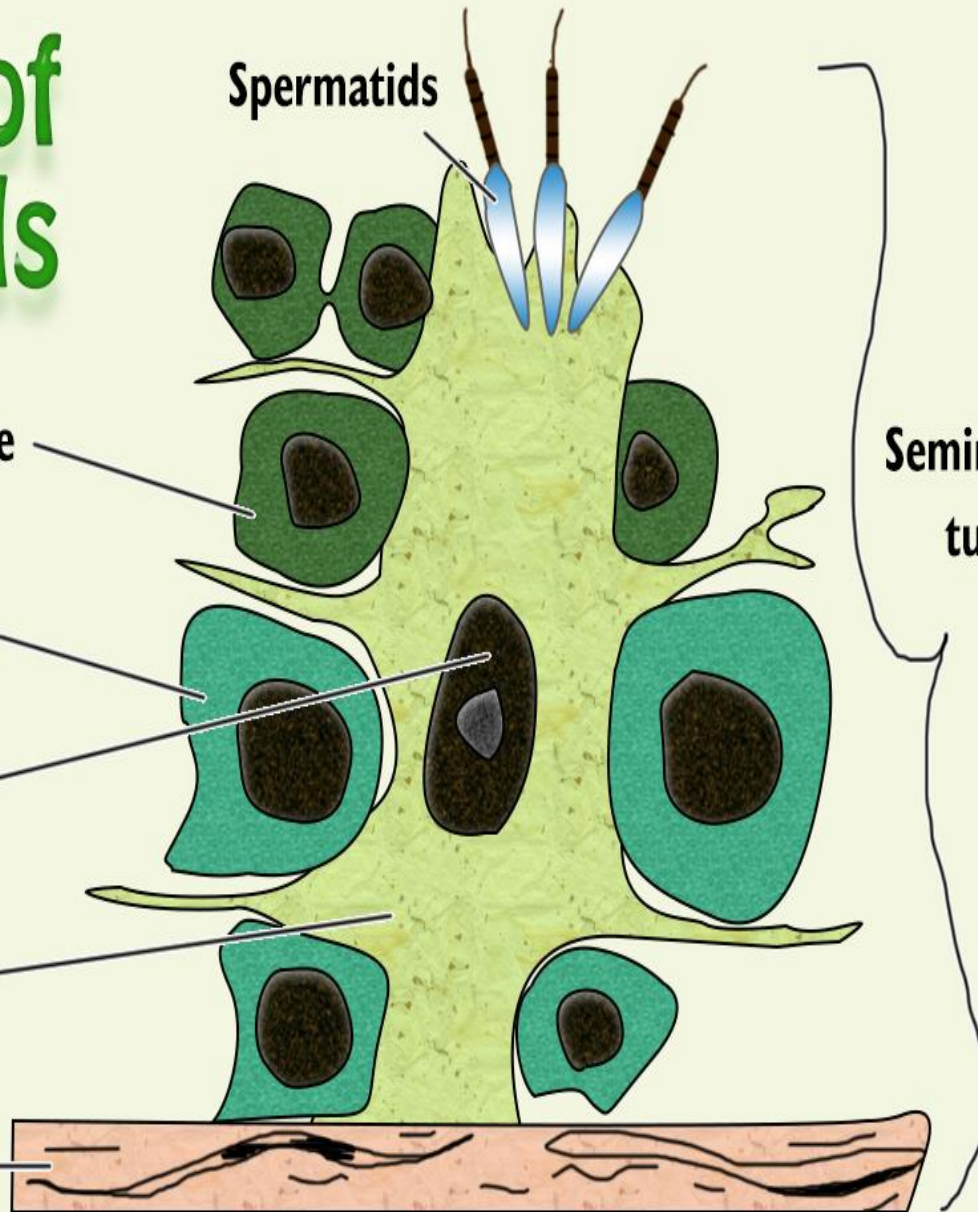
Nucleus of Sertoli cell

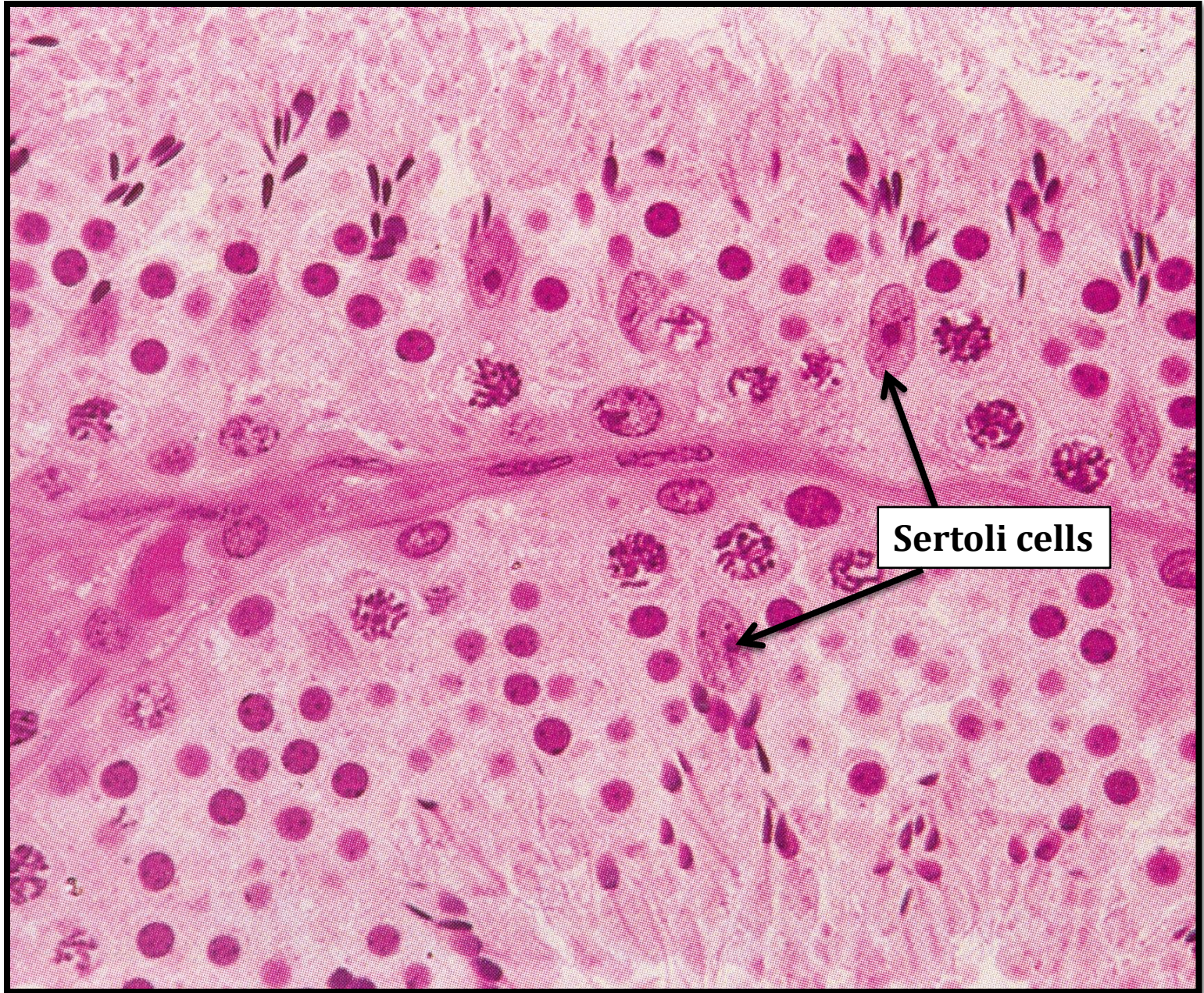
Sertoli cell

Basement membrane

Spermatids

Seminiferous tubule





**Sertoli cells**

## **Basement membrane:**

- Present beneath the epithelium and contains club shaped projections that extend into the basal infoldings of sustentacular cells and spermatogonia.

## **Lamina propria:**

- Made up of collagen and elastic fibers, fibroblasts, lymphocytes and monocytes. These lymphocytes and monocytes never invade the tubular epithelium.
- It also contains 1-5 layers of peritubular cells just beneath the basement membrane that contains actin filament bundles and are capable of contraction.

## **Tubuli recti:**

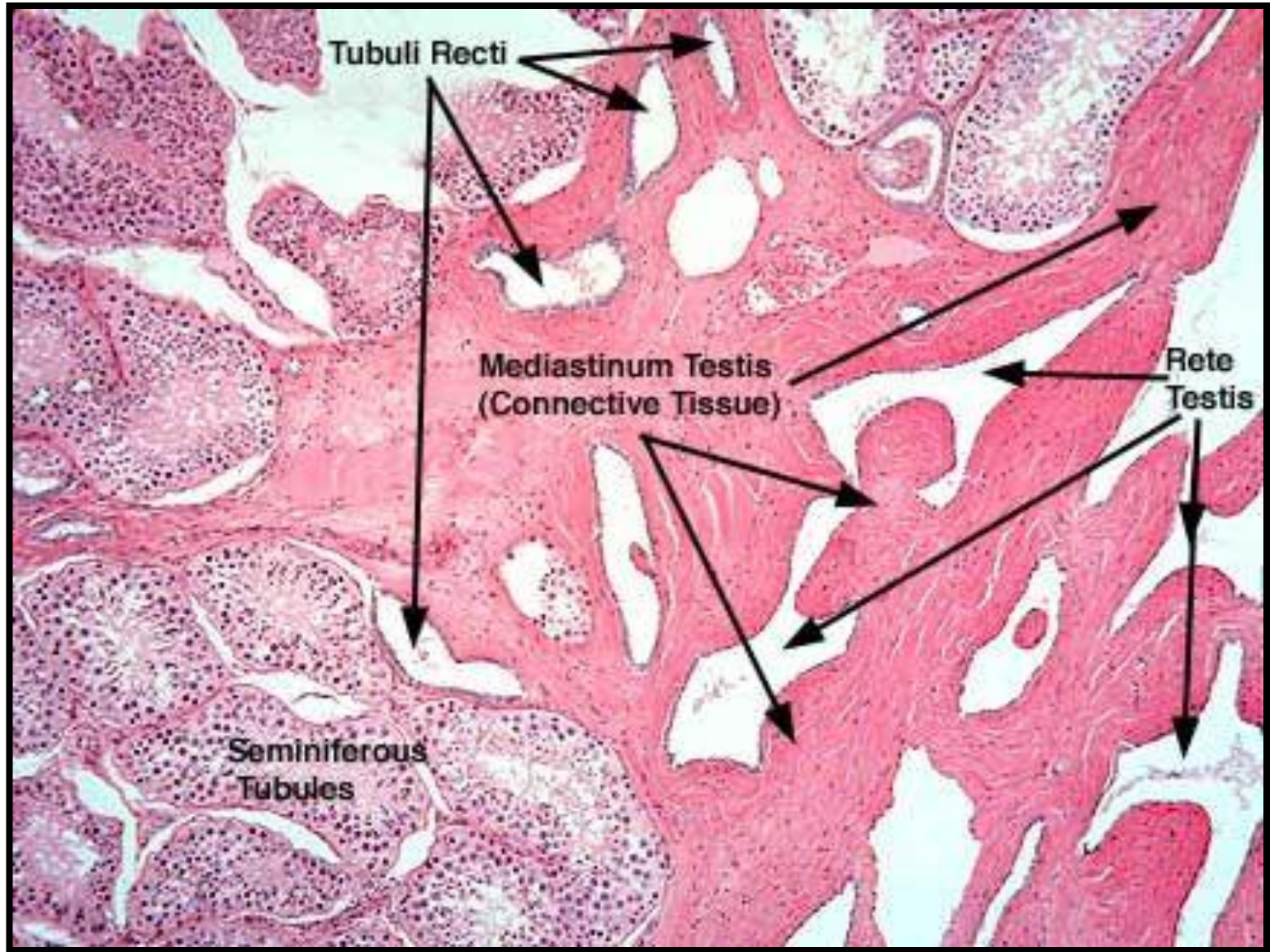
- Lining epithelium varies from simple cuboidal (proximal part) to simple columnar (distal part) in bull.

## **Rete Testis:**

- It is **irregular anastomosing channel** surrounded by vascular connective tissue of the mediastinum,
- Lined by simple cuboidal to columnar epithelium, some have microvilli.
- Elastic fibers and contractile cells are present beneath the epithelium.

## **Ductuli efferenti:**

- The rete testis is connected to the ductus epididymis by 8-25 ductuli efferenti.
- They are gathered in small lobules and lined by patches of nonciliated cuboidal cells alternate with ciliated columnar cells.
- Houses lymphocytes in their basal area.



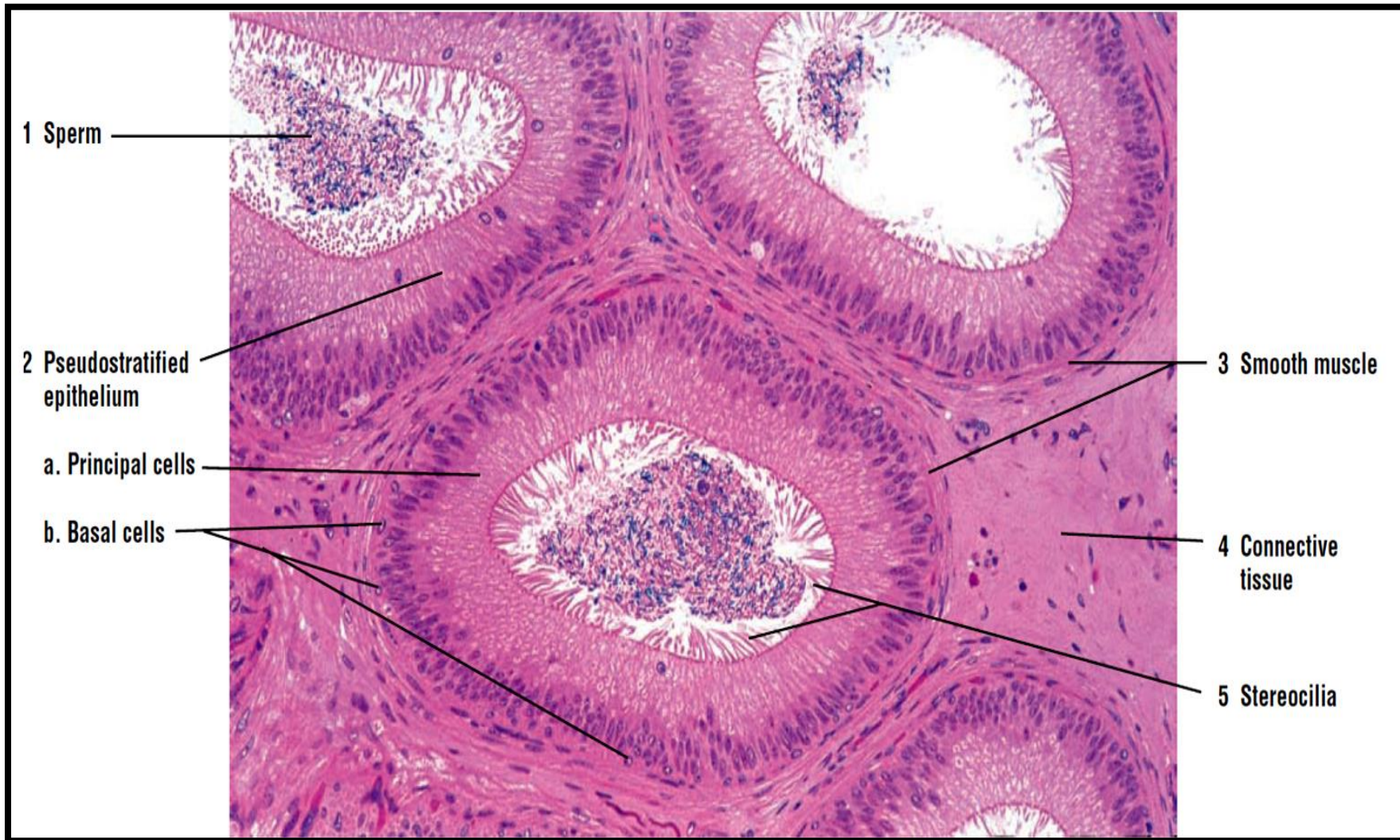




1. Ductuli efferenti

# Ductus Epididymis:

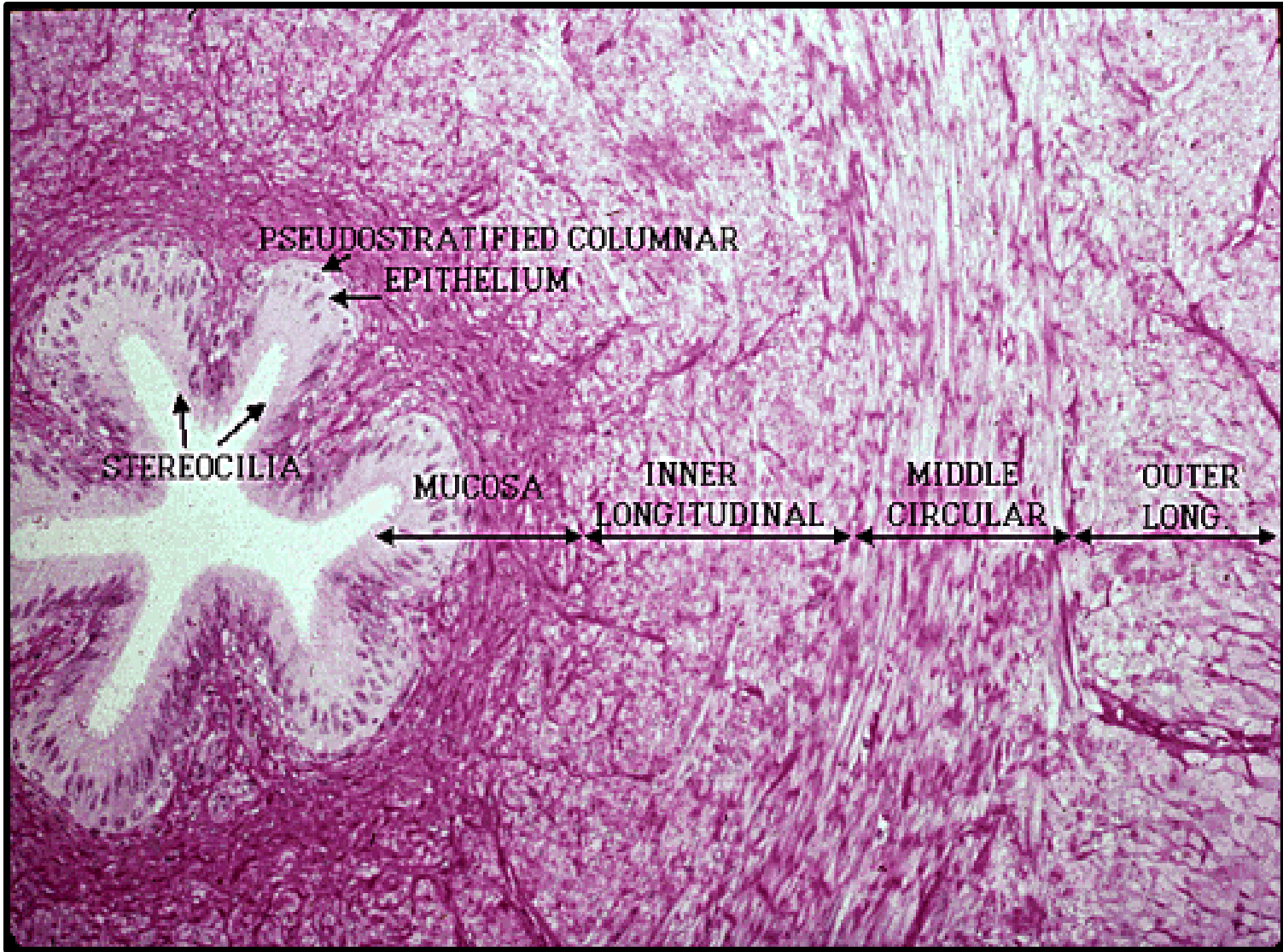
- Divided into a head, body & tail.
- Surrounded by loose connective tissue covered by the visceral layer of tunica vaginalis.
- Long & tortuous.
- Lined by **pseudo stratified columnar** epithelium with **stereocilia**.
- The epithelial height as well as the length of stereocilia decreases from head to tail region.
- The smooth muscle thickness increases from head to tail region.
- The epithelium contains some specific cell types like polygonal basal cells and principal cells.





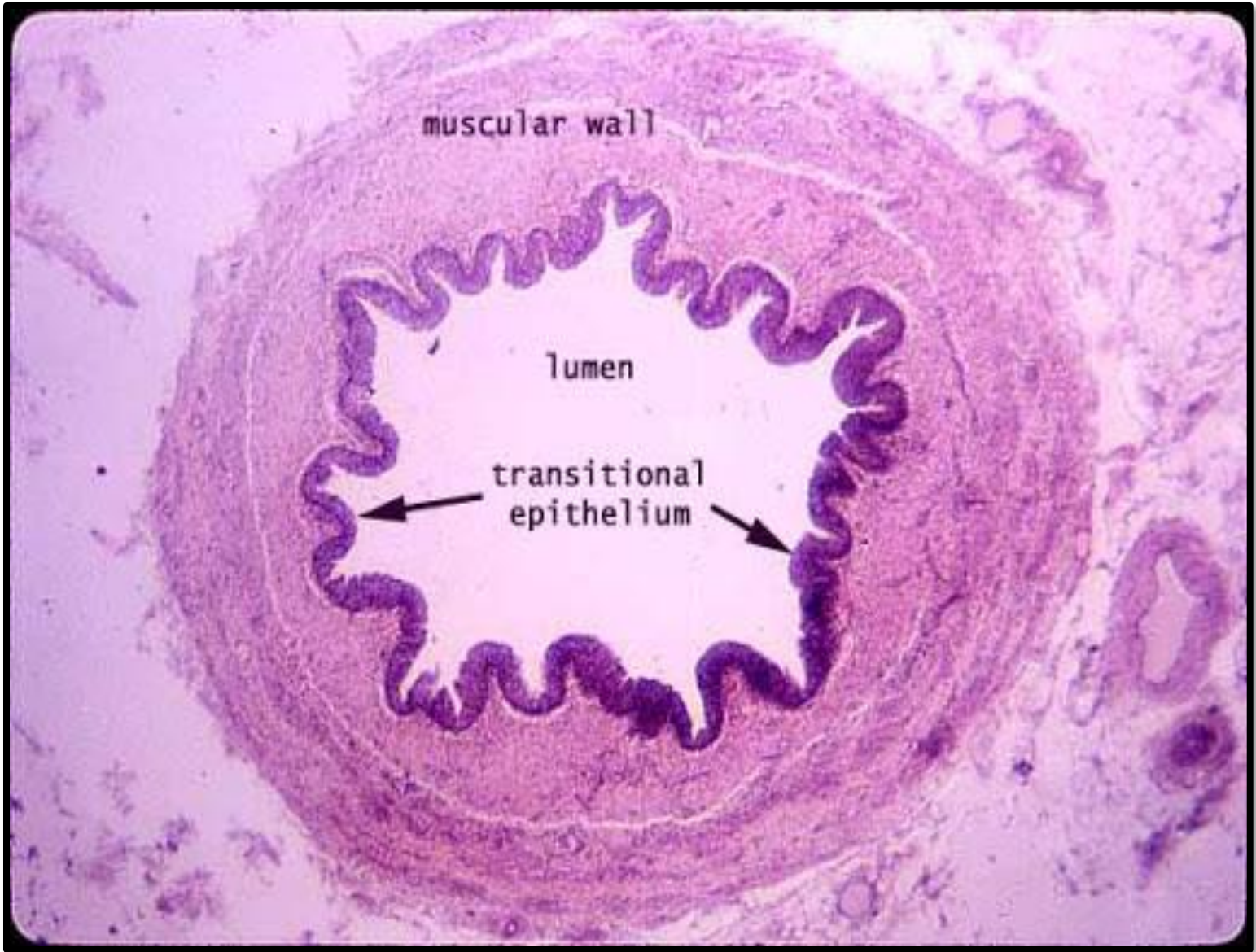
# Ductus Deferens:

- From the epididymis the ductus deferens, a straight tube with a thick muscular wall, continues towards the prostatic urethra and empties into it.
- It is characterized by a narrow lumen and a mucosa with longitudinal folds, covered along most of its extent by **pseudo stratified columnar epithelium with stereocilia**.
- The **lamina propria** is rich in elastic fibers and the thick **tunica muscularis** consists of longitudinal inner and outer layers separated by a circular layer. The abundant smooth muscle produces strong peristaltic contractions that participate in the expulsion of the spermatozoa during ejaculation.



# Urethra:

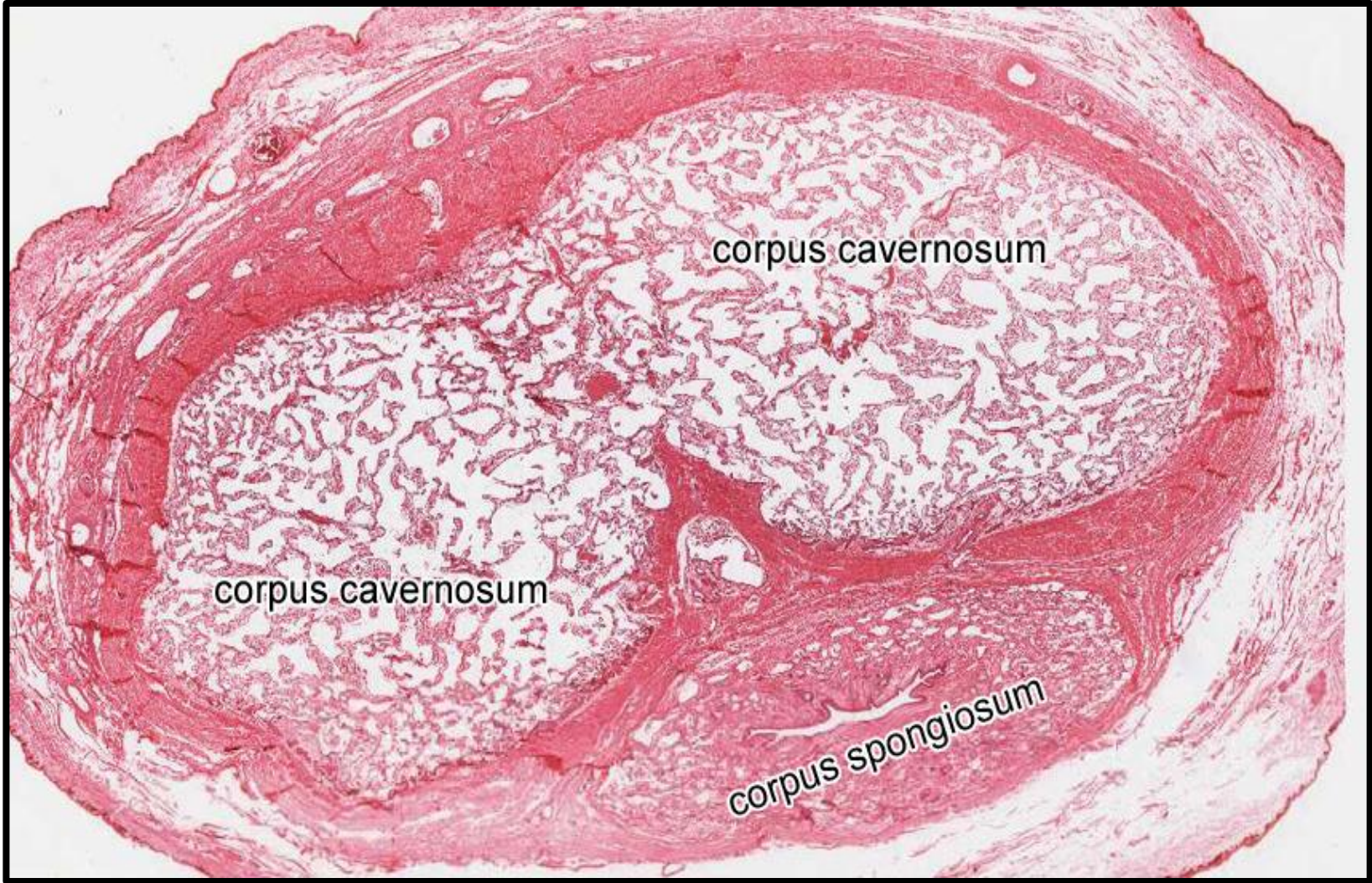
- The histological details include the basic four layers:
- **Tunica mucosa:** The epithelium is **transitional** but changes to stratified squamous at the external urethral orifice.
- **Tunica submucosa:** It is a connective tissue layer and has cavernous spaces that are typical of erectile tissue.
- **Tunica muscularis:** It has inner and outer longitudinal and a middle circular layer of smooth muscles as in bladder but towards the external urethral orifice, it acquires an external layer of skeletal muscle called **Urethralis muscle**.
- **Tunica serosa/ adventitia:** is a fibrous layer.





# Penis:

- The main component of the penis are the erectile tissues and the urethra, surrounded by tunica albuginea and skin.
- The erectile tissues are **corpus cavernosum penis** placed dorsally and **corpus cavernosum urethrae** (corpus spongiosum) located ventrally and surrounds the urethra.
- At its end it dilates, forming the glans penis.
- Trabeculae arise from the tunica albuginea and enters the erectile tissues.



corpus cavernosum

corpus cavernosum

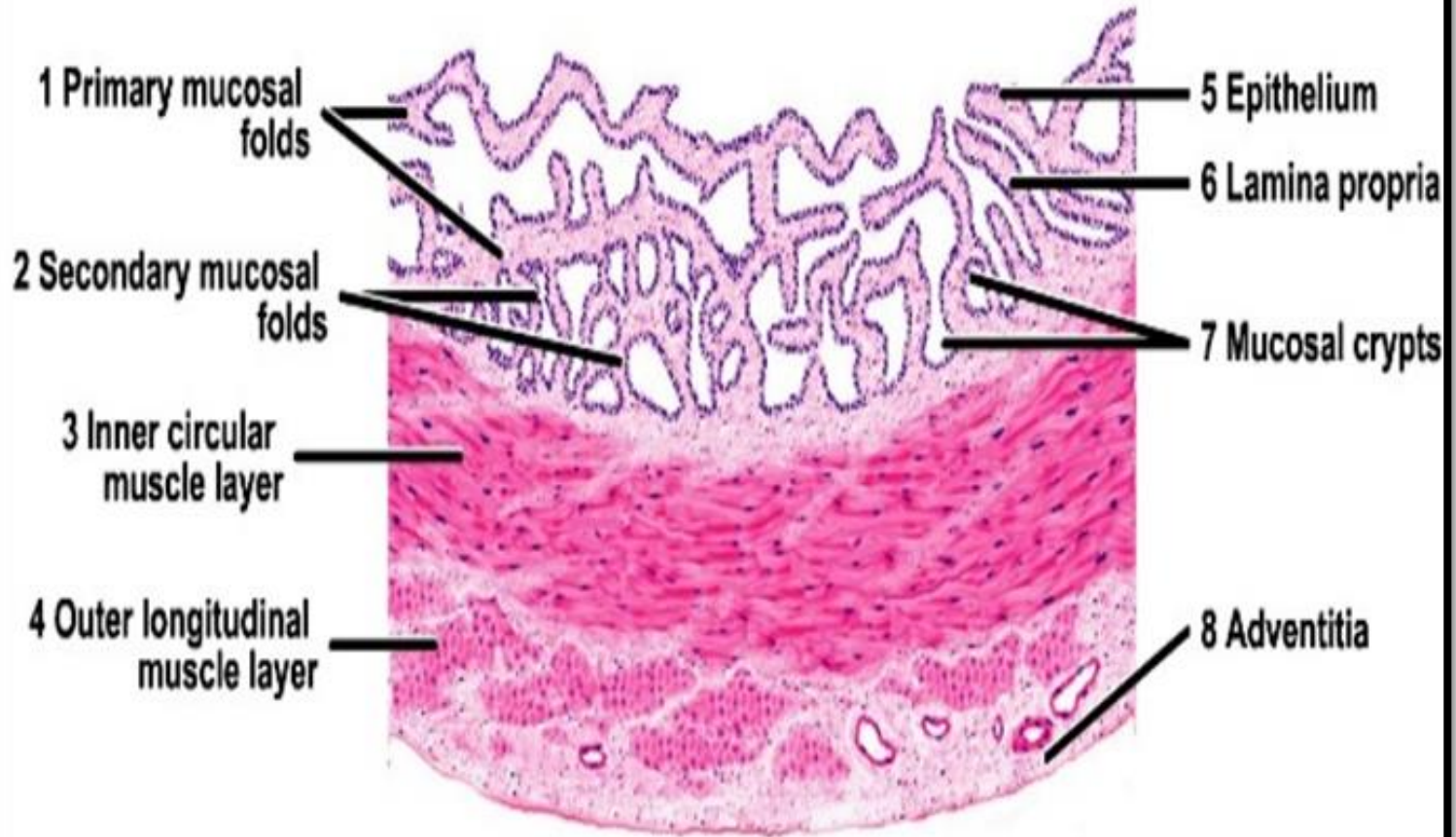
corpus spongiosum

# Accessory sex glands:

## Seminal vesicle:

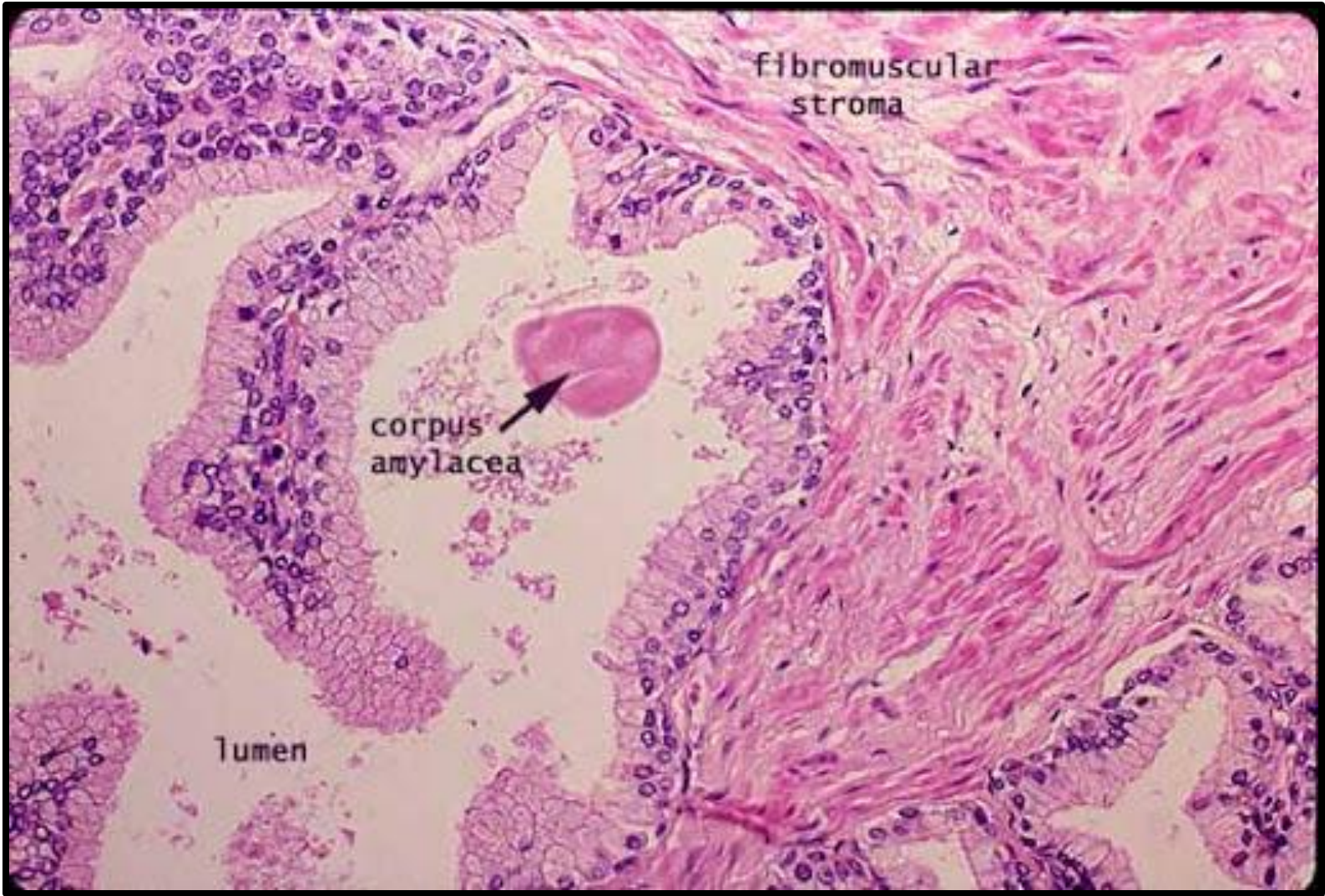
- Compound tubular/ tubulo-alveolar gland.
- Glandular epithelium is pseudo stratified columnar with few spherical basal cells.
- The intralobular and main excretory duct is lined by simple cuboidal epithelium in bull and stratified columnar in equines.
- Lamina propria is highly vascularised loose connective tissue which gives trabeculae that divides the glands into number of lobules.
- Tunica muscularis and adventitia is also present.

# SEMINAL VESICLE



## **Prostate gland:**

- Histologically prostate consists of parenchyma (tubulo-alveolar glands) and a characteristic fibro muscular stroma.
- The glandular parenchyma is formed by irregular prostatic alveoli with wide lumen.
- Secretory lining of alveoli varies from cuboidal to columnar depending upon activity.
- The lumen contains spherical prostatic concretions or corpora amylacea which are formed by condensation of prostatic secretions.
- The fibro muscular stroma supports the parenchyma and is made of smooth muscle fibers mixed with connective tissue fibers running in different directions.
- The fibro elastic capsule surrounding the prostate is rich in smooth muscle. Septa from this capsule penetrate the gland and divide it into lobes.



# **Bulbourethral gland:**

- Compound tubulo-alveolar gland in bull, stallion and ram, compound tubular gland in boar, cat and bucks and absent in dogs.
- Glandular epithelium is simple columnar with occasional basal cells.
- The collecting duct has simple cuboidal to columnar epithelium.
- The intraglandular duct has pseudostratified columnar epithelium.
- The bulbourethral duct is lined by transitional epithelium.
- The gland is covered by fibro elastic capsule containing striated muscle.

1 Tubular secretory units

4 Excretory duct

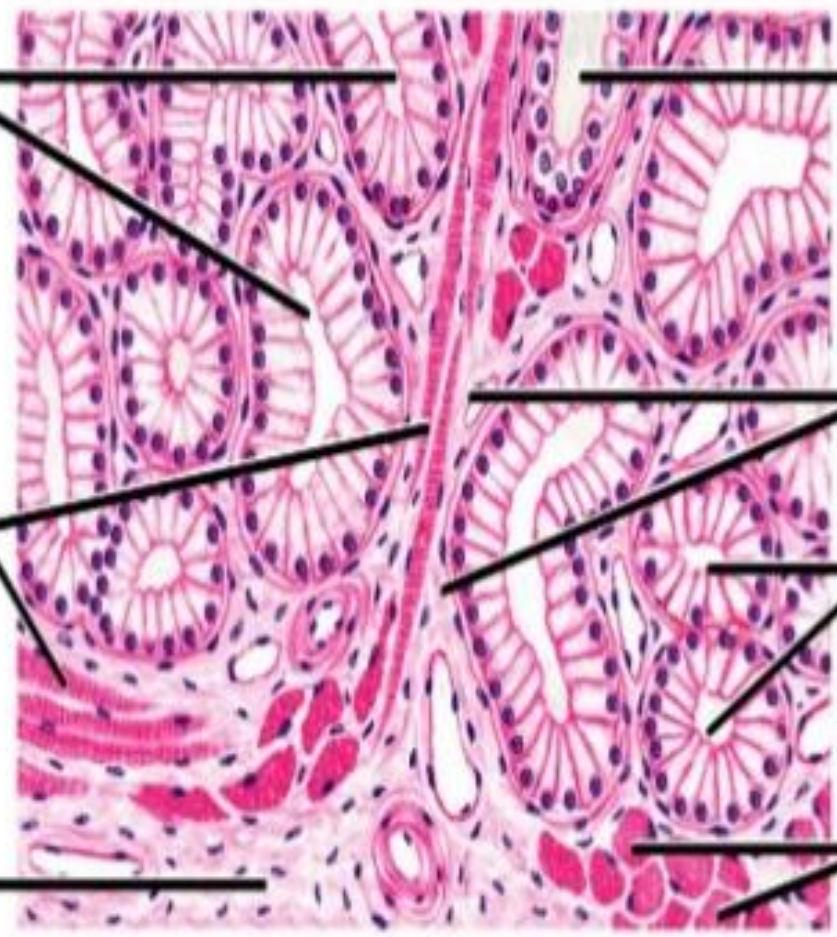
2 Skeletal muscle fibers (longitudinal section)

5 Connective tissue septum

6 Acinar secretory units

3 Connective tissue capsule

7 Skeletal muscle fibers (transverse section)





# **Assignment:**

- A well labelled histological representation of male reproductive system with key histological differences among species in practical note book.

Thanks!