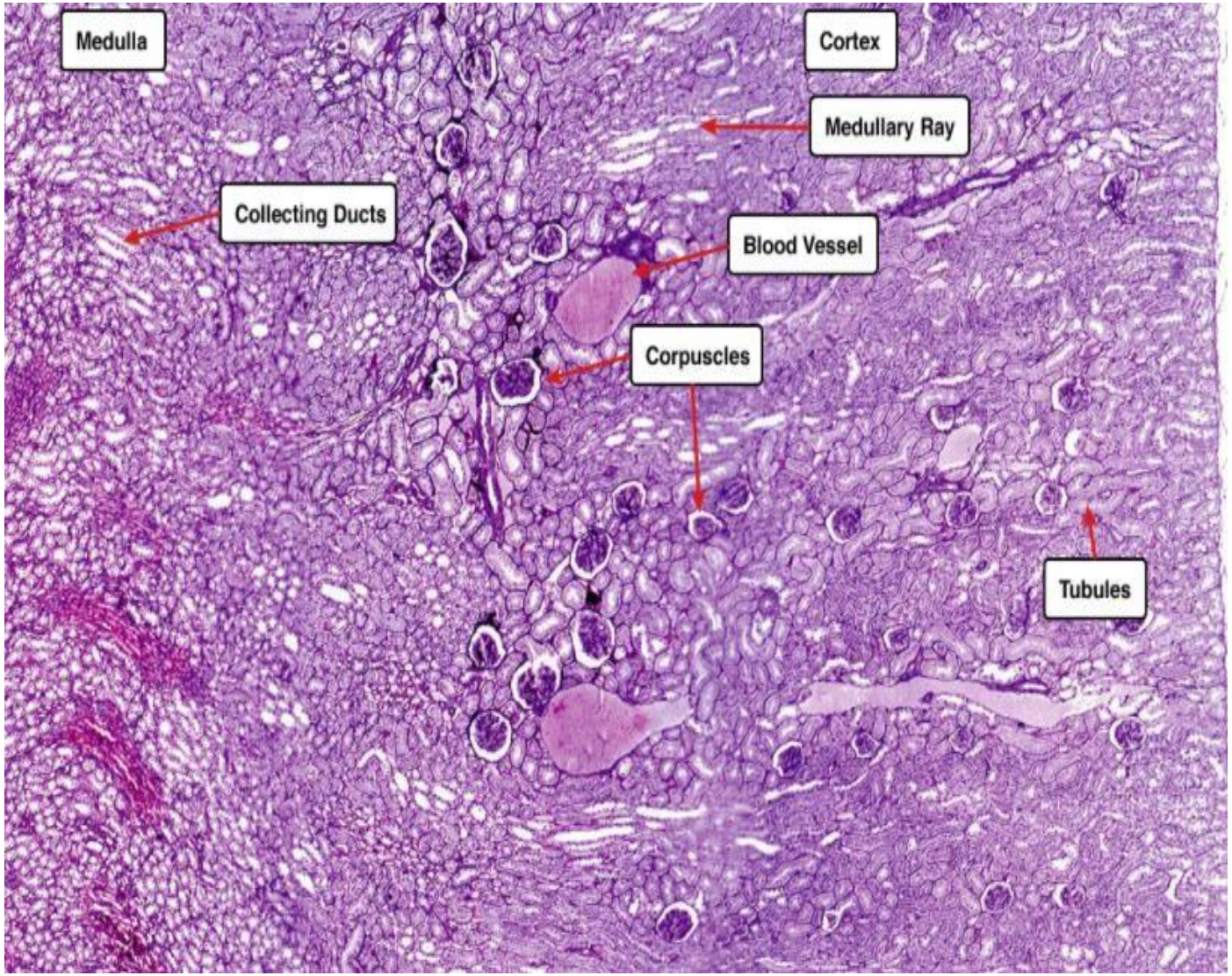
HISTOLOGY LAB 

Done By: Mays Qashou

DR. AHMED SALMAN

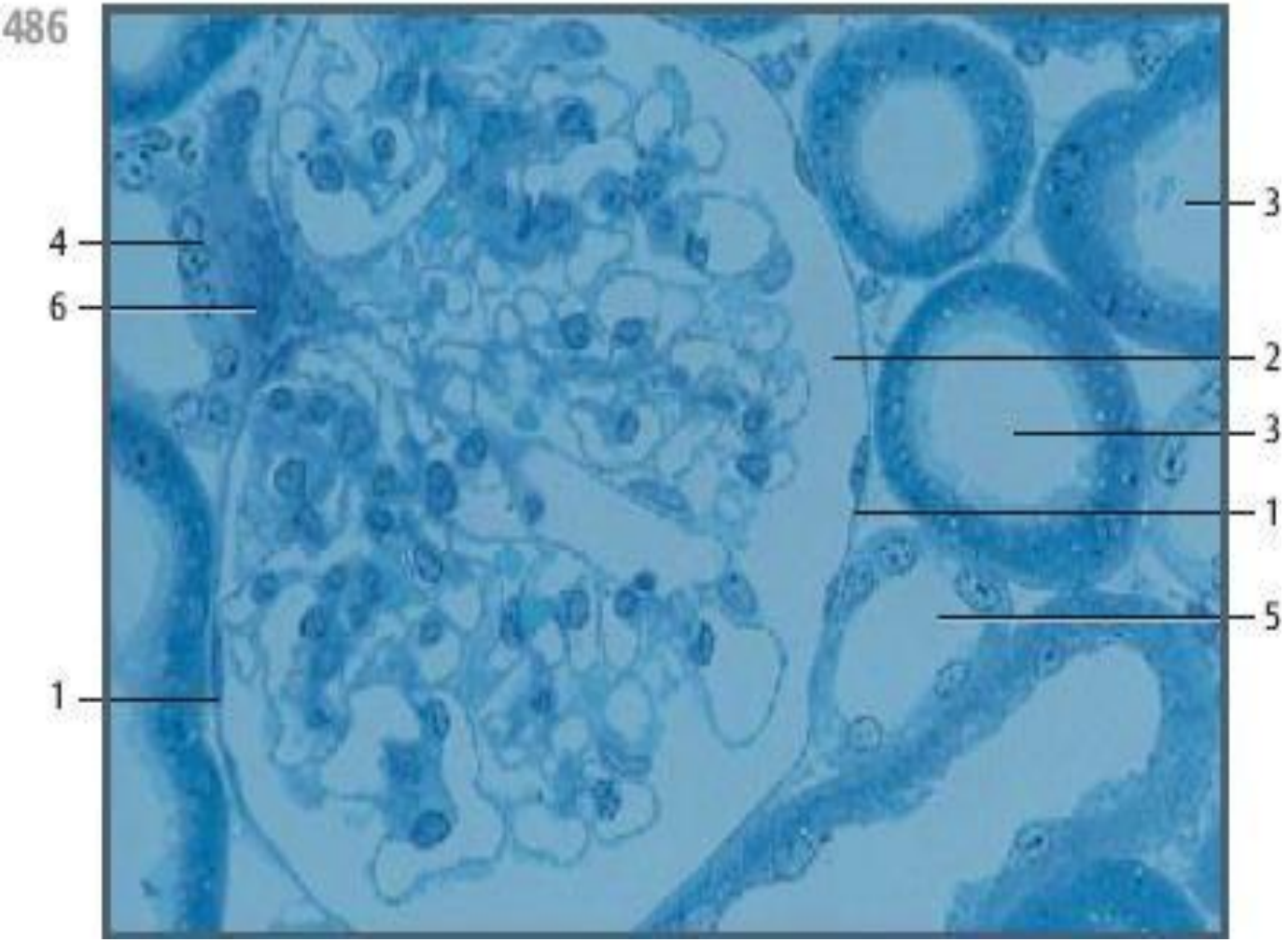
Urinary System



- The kidney is composed of two main regions: the **cortex** and the **medulla**. Extensions from the medulla into the cortex are known as **medullary rays.**

- The kidney consists of **nephrons** and a **collecting system**. The **collecting ducts** are located in the medulla, while parts of the nephron are found in the cortex. In the cortex, there are structures called **renal corpuscles**, which are made up of the **glomerulus** and **Bowman's capsule**. Surrounding the renal corpuscles are **afferent** and **efferent arterioles.**

- Additionally, the cortex contains **tubules** such as the **proximal convoluted tubule (PCT)** and the **distal convoluted tubule (DCT)**.



1. **Bowman's capsule, parietal layer** (lined by simple squams epithelium).

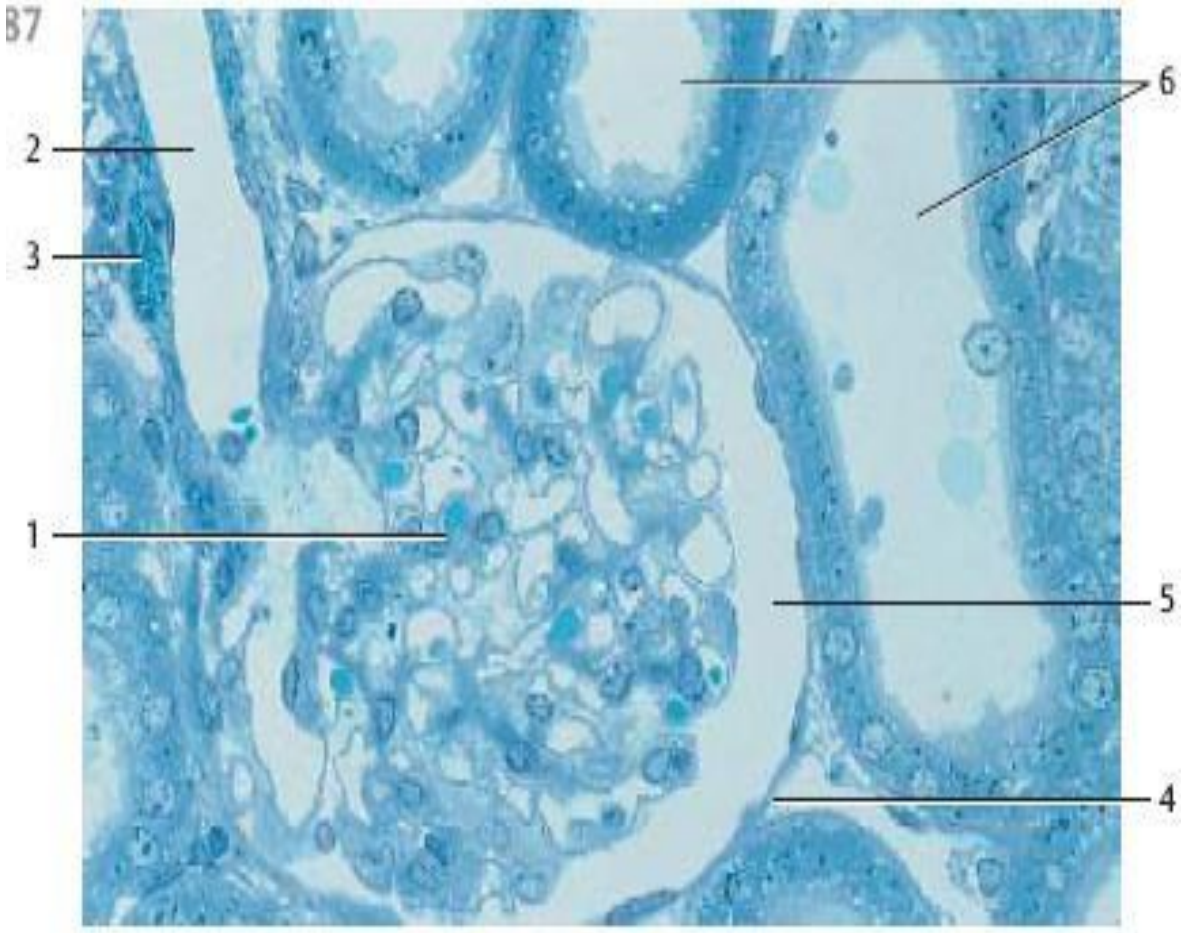
2. **Bowman's space** (capsular space) which contains the filtrate.

3. **Proximal tubule** (there is brush border).

4. **Macula densa** (in the wall of distal tubule).

5. **Distal tubule** (wider lumenand no brush border).

6. **Extraglomerular mesangium Cells** (are found between the distal tubule, glomerulus and afferent arteriole.
There function: supporting the system.



1. Glomerulus, coiled capillaries inside Bowman's capsule.

2.Afferent glomerular arteriole (at the vascular pole of Bowman's capsule

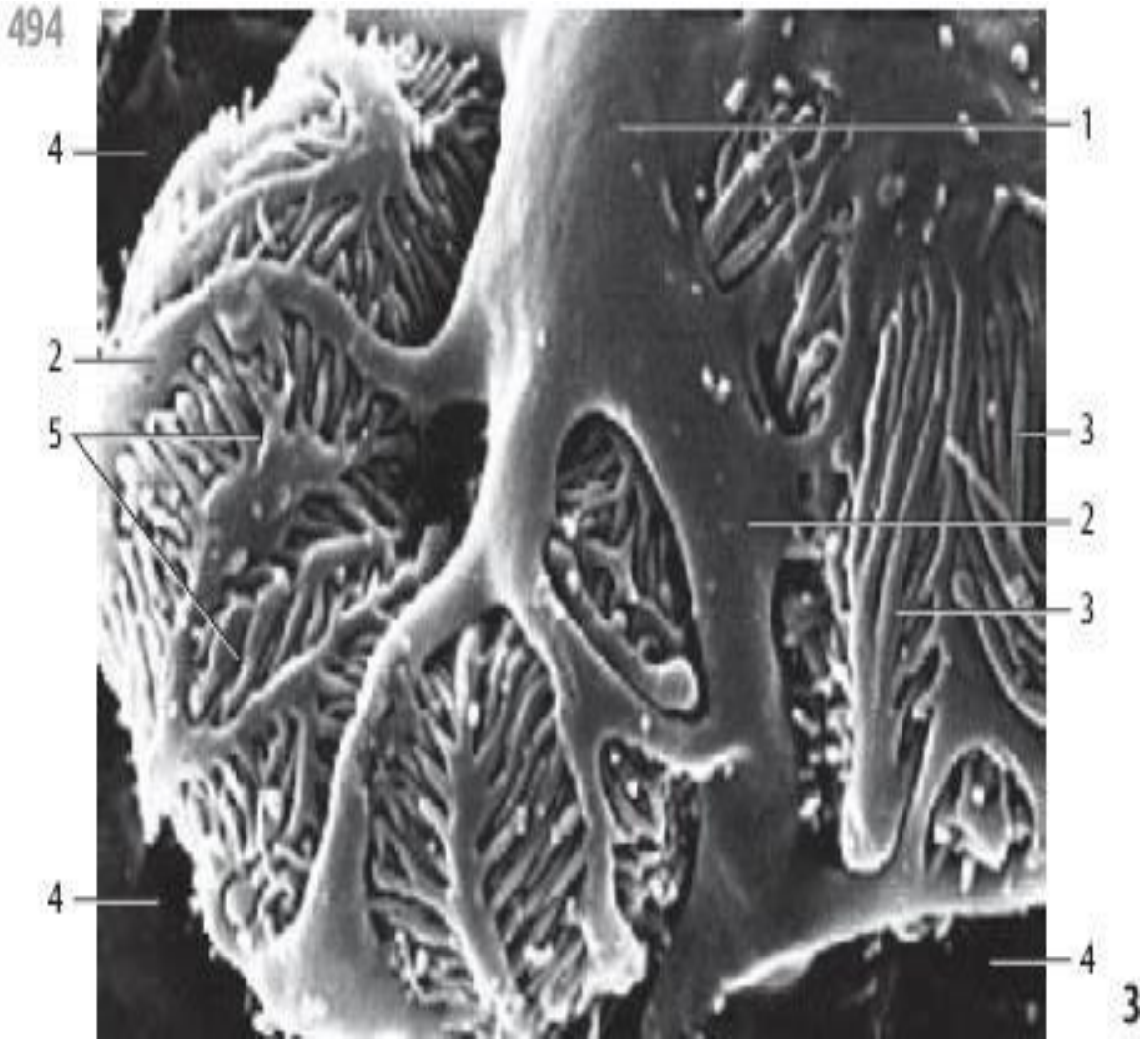
3. Juxta-glomerular (JG) cells or renin secreting cells (in the wall of afferent arteriole)
This is the third component of Juxta-glomerular apparatus (in the previous slide we explained the other 2 components of it: Macula densa and Extraglomerular mesangium Cells).

4. Bowman's capsule, parietal lamina (lining)

5. Bowman's space

6. Proximal tubule

Scanning electron microscopy; magnification: × 7850



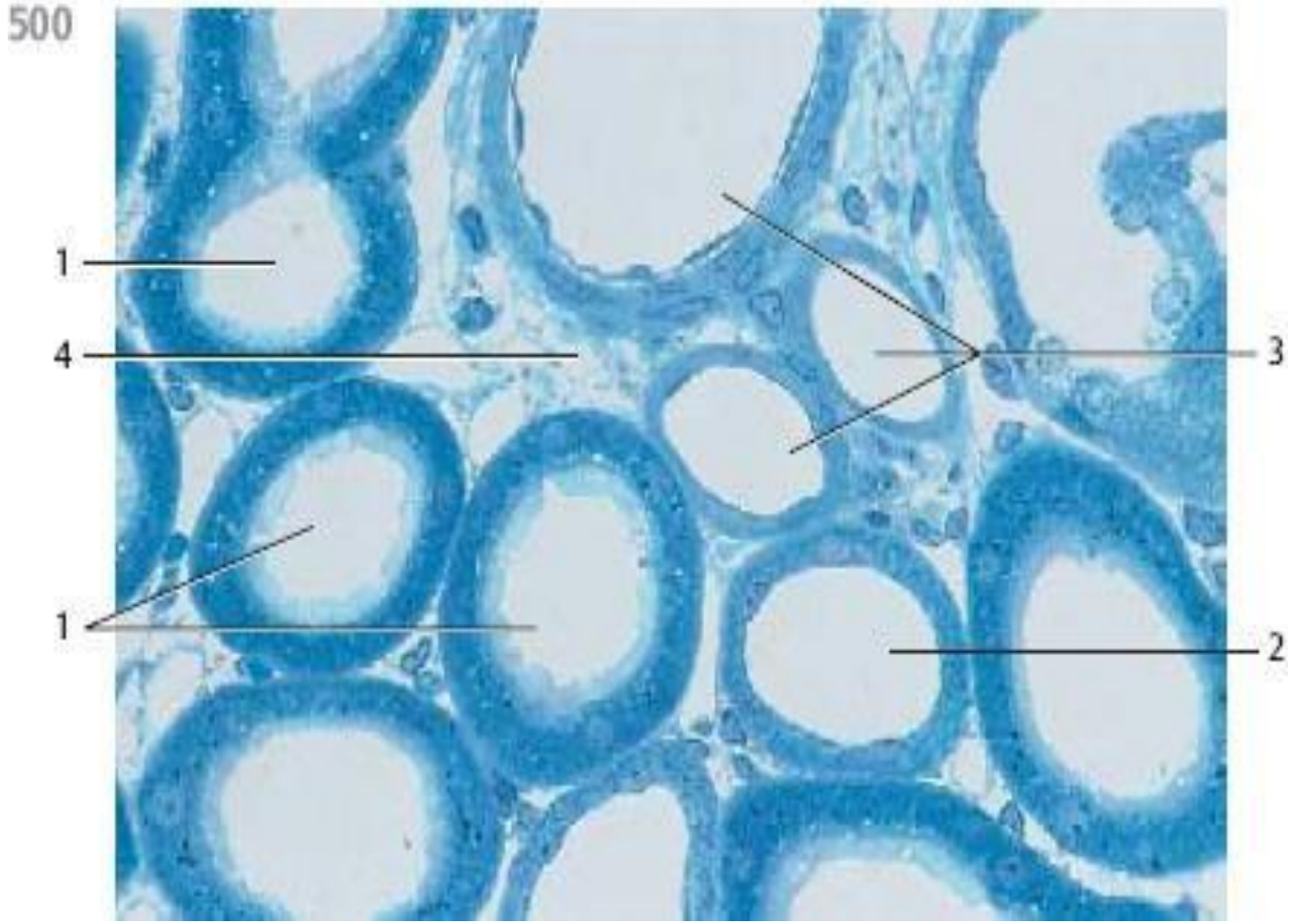
1. **Podocyte, cell body**

2. **Primary pedicles** (larger)

3. **Secondary pedicles (foot processes):** smaller

4. **Bowman's space**

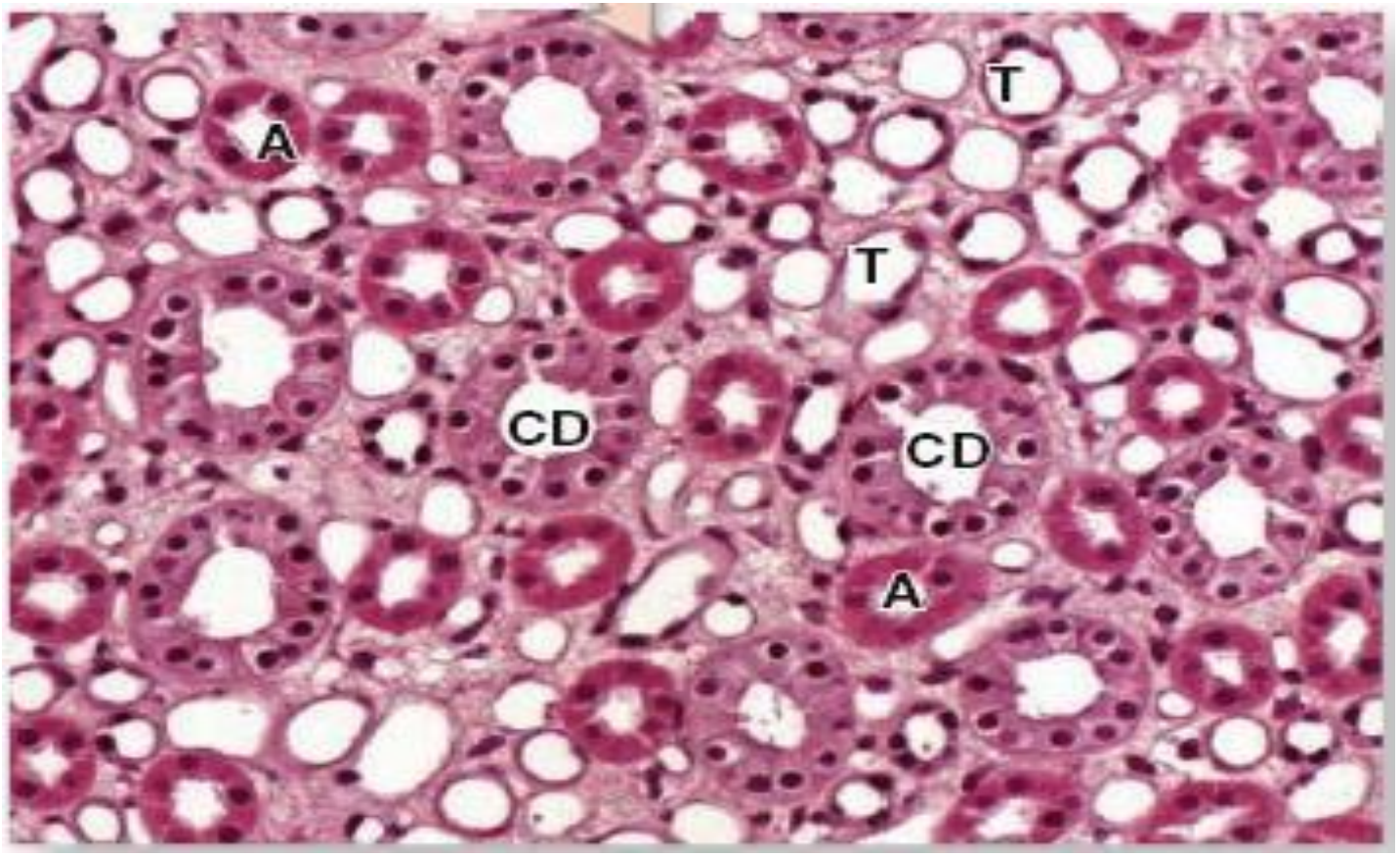
5. **Filtration slits** (between foot processes) which covered by diaphragm slits.



1. **Proximal tubules** (brush border and narrow lumen).

2. **Distal tubules** (no brush border and wide lumen).

4.Interstitial connective tissue



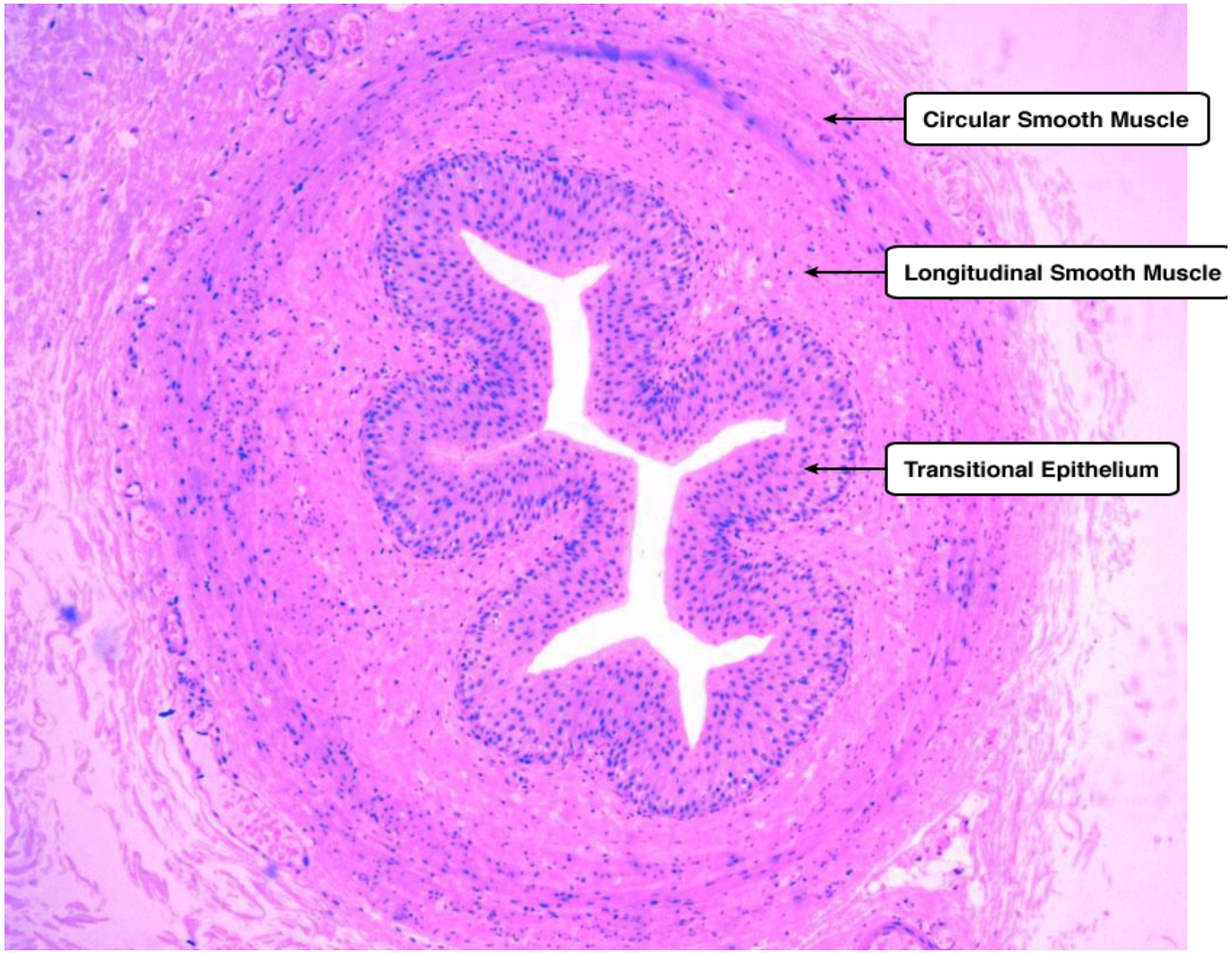
A cross section through a medullary renal pyramid shows

(T): The simple squamous epithelium of the thin descending and ascending limbs of loops of Henle. (resample the blood capillaries)

(A) Thick ascending limbs which lined by cuboidal epithelium.

(CD): the pale columnar cells of collecting ducts which lined by cuboidal to columnar epithelium.

Ureter

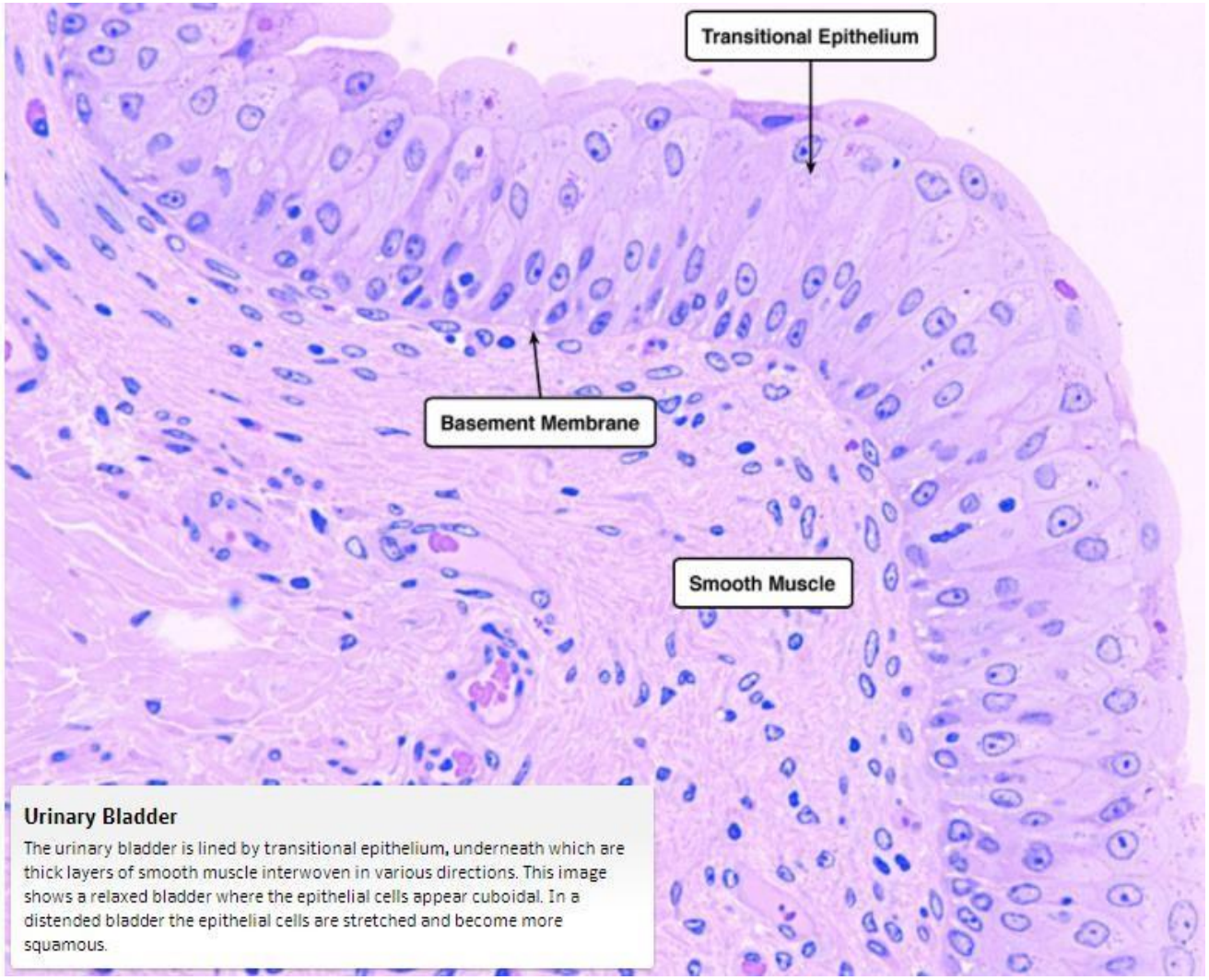


Ureter consists of mucosa, muscularis, and adventitia.

1. **Mucosa** lined by multilayer of **Transitional epithelium**.

2. **Muscularis: Inner longitudinal and outer circular smooth muscle layers.**

3. **Adventitia:** connective tissue.



Urinary Bladder

The urinary bladder is lined by transitional epithelium, underneath which are thick layers of smooth muscle interwoven in various directions. This image shows a relaxed bladder where the epithelial cells appear cuboidal. In a distended bladder the epithelial cells are stretched and become more squamous.

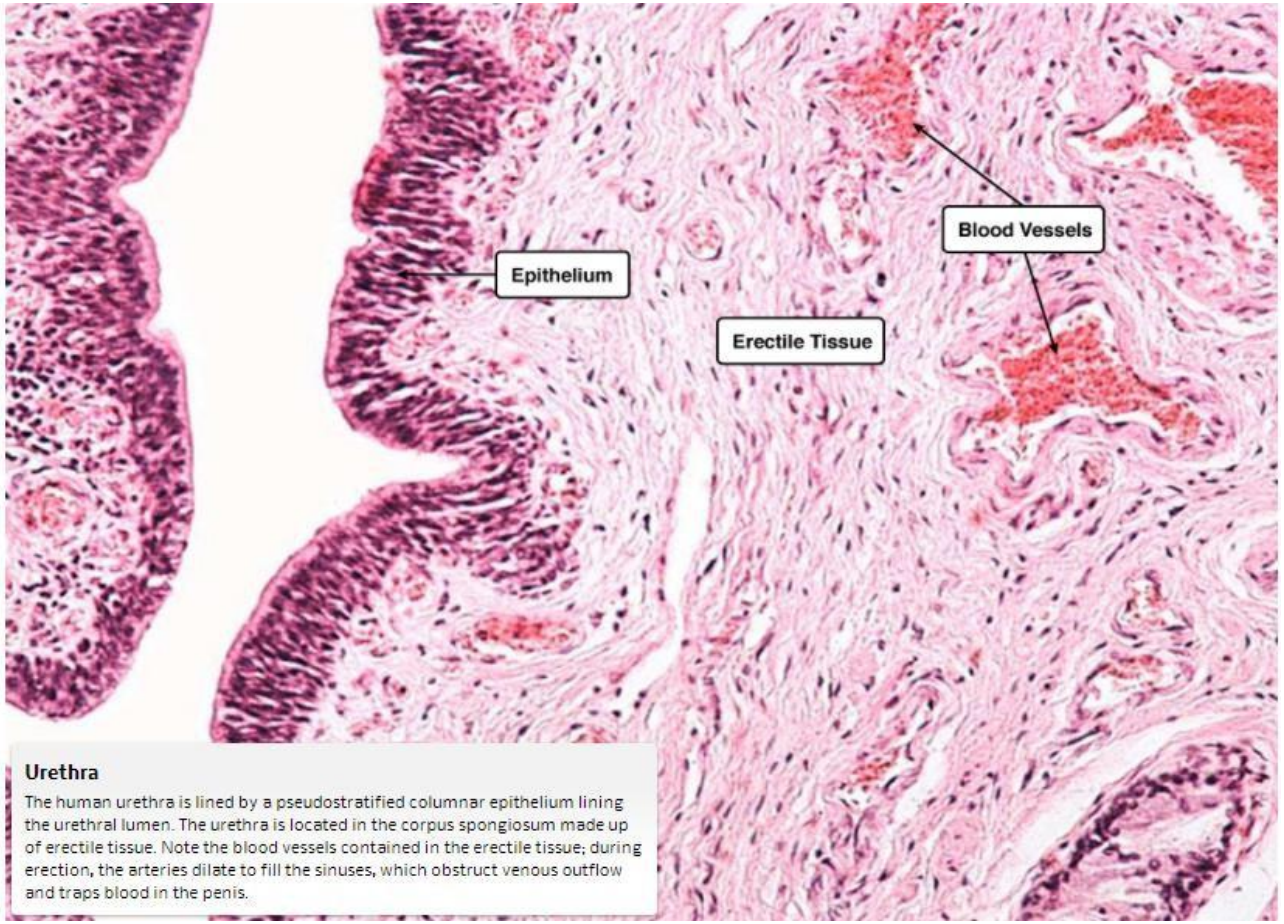
Urinary bladder consists of mucosa, muscularis, and adventitia.

1. **Mucosa** lined by **Transitional epithelium**.
- underneath it there is Basement membrane.

- If the transitional epithelium:
Cuboidal epithelium —> Empty bladder
Squamous flat epithelium —> Full bladder

2. **Muscularis:** consists of three smooth muscle layers collectively called the **detrusor muscle**: These are the inner longitudinal, middle circular, and outer longitudinal smooth muscle layers

3. **Adventitia:** connective tissue.



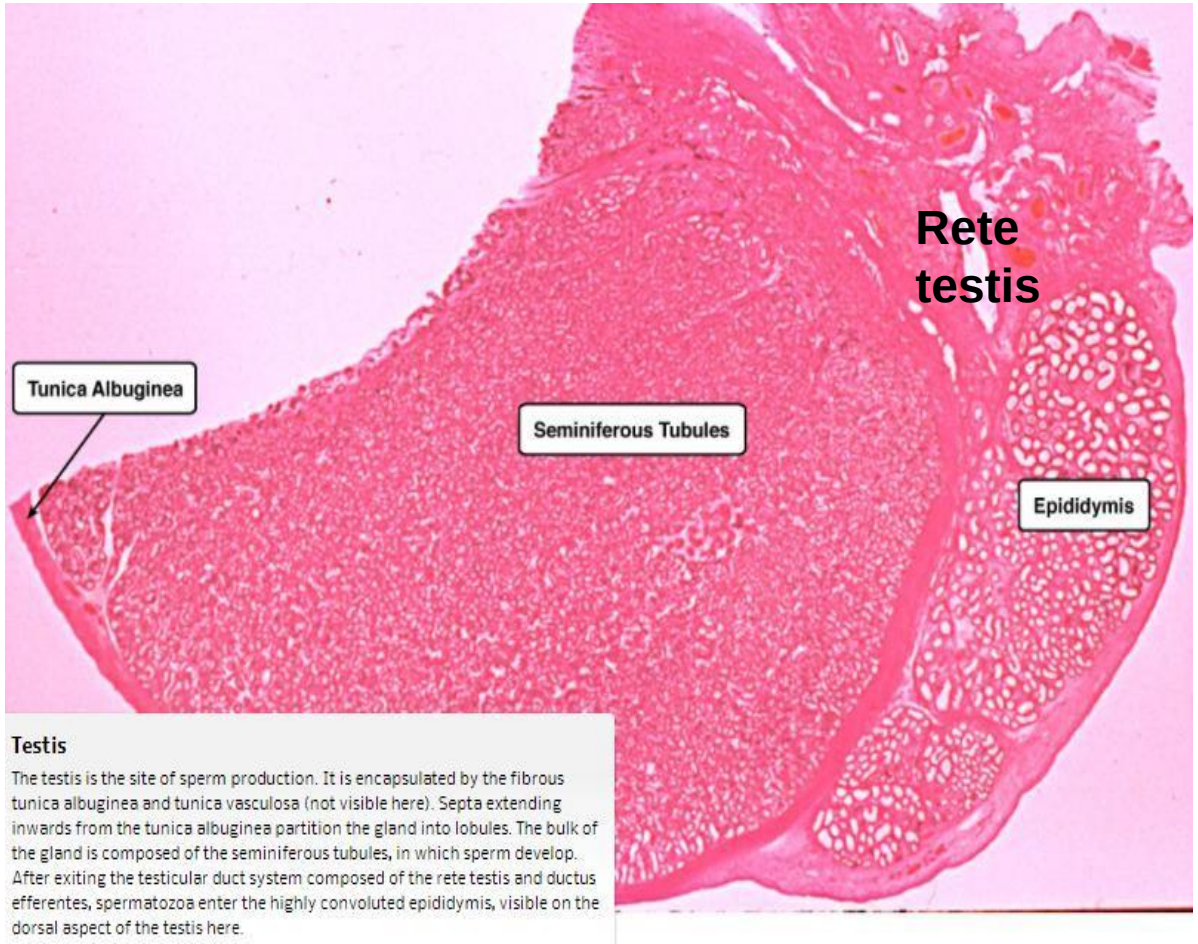
Urethra

The human urethra is lined by a pseudostratified columnar epithelium lining the urethral lumen. The urethra is located in the corpus spongiosum made up of erectile tissue. Note the blood vessels contained in the erectile tissue; during erection, the arteries dilate to fill the sinuses, which obstruct venous outflow and traps blood in the penis.

Urethra lined by pseudostratified columnar epithelium.

There are erectile tissue and blood vessels so this is spongy or penile urethra.

Male reproductive system

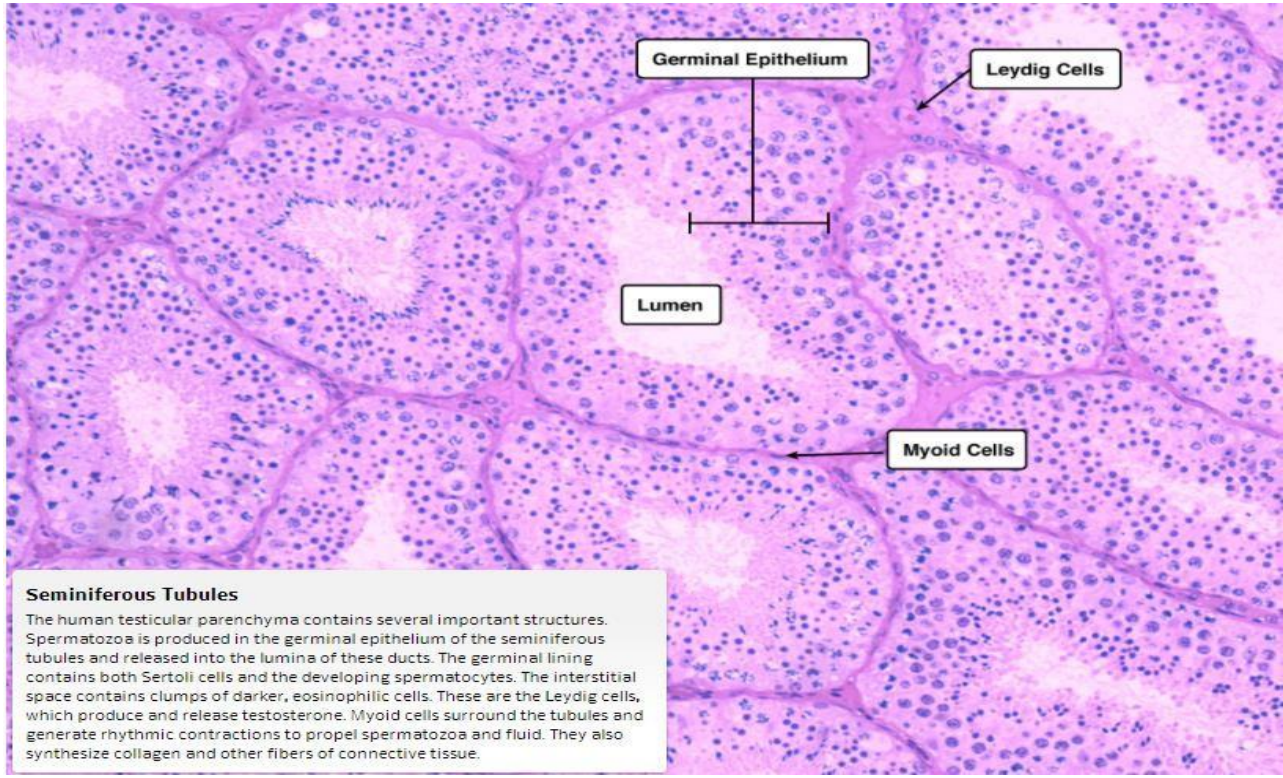


Testis

The testis is the site of sperm production. It is encapsulated by the fibrous tunica albuginea and tunica vasculosa (not visible here). Septa extending inwards from the tunica albuginea partition the gland into lobules. The bulk of the gland is composed of the seminiferous tubules, in which sperm develop. After exiting the testicular duct system composed of the rete testis and ductus efferentes, spermatozoa enter the highly convoluted epididymis, visible on the dorsal aspect of the testis here.

Testis is lined by tunica albuginea (fibrous capsule) which sends septa to divide the testis into lobules.

Posterolateral to the testis we will find the head of Epididymis located.



Seminiferous Tubules

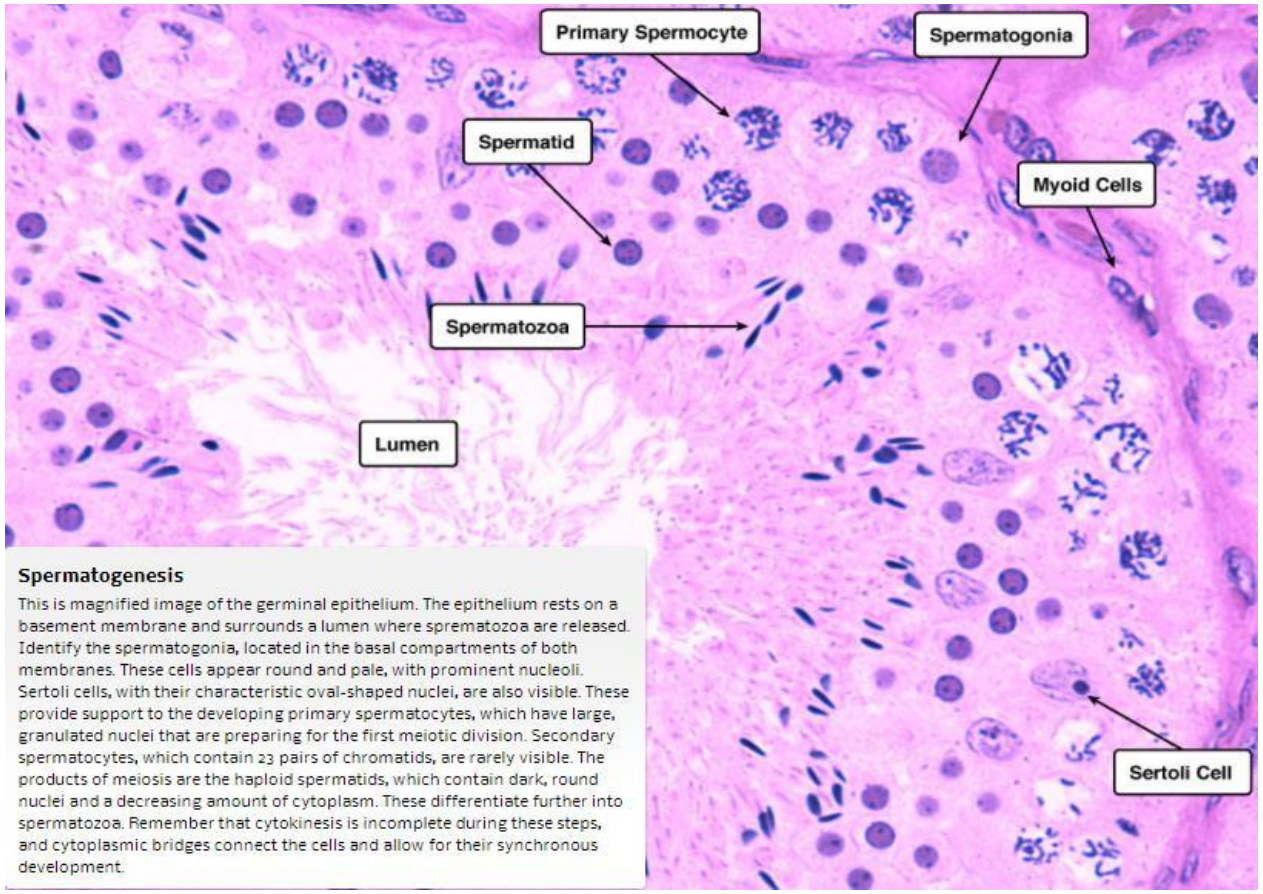
The human testicular parenchyma contains several important structures. Spermatozoa is produced in the germinal epithelium of the seminiferous tubules and released into the lumina of these ducts. The germinal lining contains both Sertoli cells and the developing spermatocytes. The interstitial space contains clumps of darker, eosinophilic cells. These are the Leydig cells, which produce and release testosterone. Myoid cells surround the tubules and generate rhythmic contractions to propel spermatozoa and fluid. They also synthesize collagen and other fibers of connective tissue.

Each lobule contains **seminiferous tubules** which Lined by **germinal epithelium** (consists of spermatogenic cells and Sertoli cells).

Between the seminiferous tubules we will find:

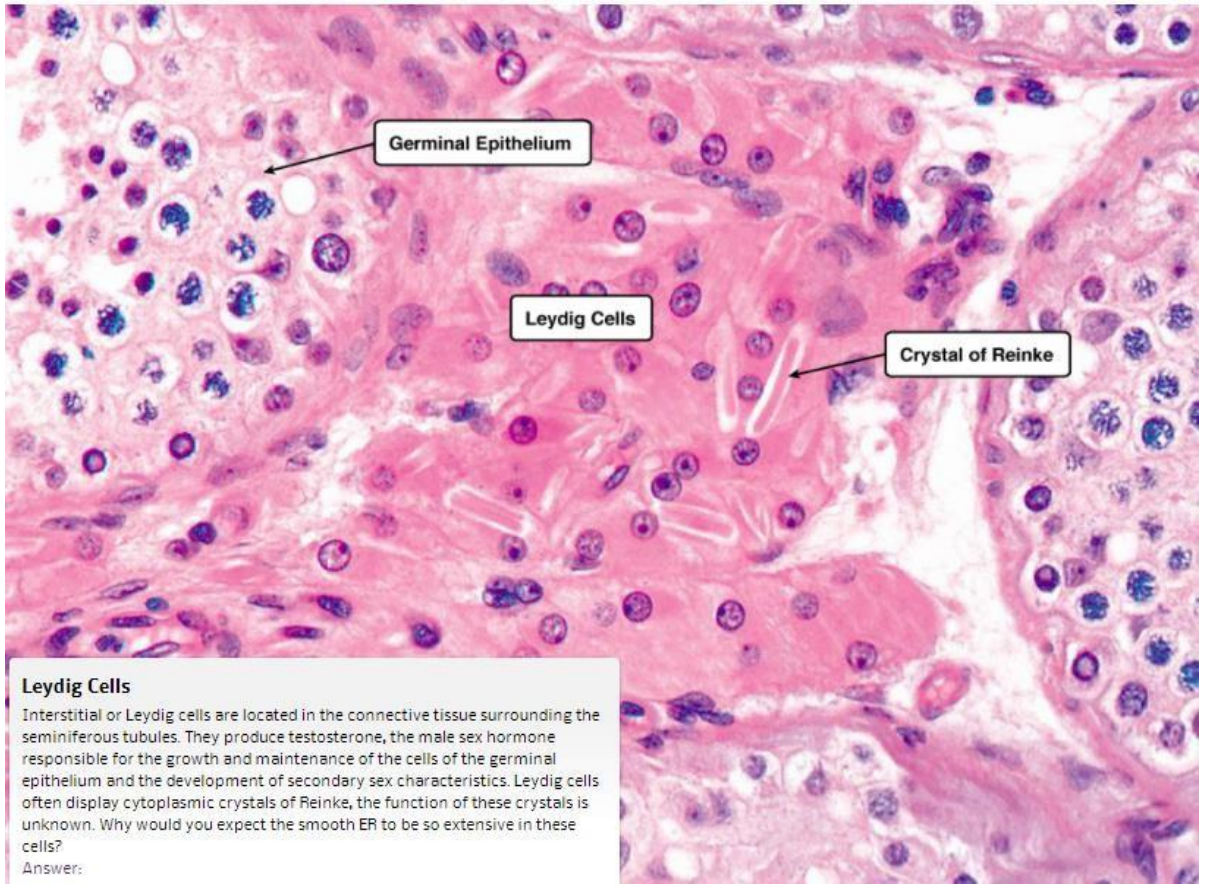
1. **Interstitial leydig cells** that secrete testosterone.

2. **Myoid cells:** smooth muscle like cells that contarct to eject the sperms outside.



Spermatogenesis

This is magnified image of the germinal epithelium. The epithelium rests on a basement membrane and surrounds a lumen where sprematozoa are released. Identify the spermatogonia, located in the basal compartments of both membranes. These cells appear round and pale, with prominent nucleoli. Sertoli cells, with their characteristic oval-shaped nuclei, are also visible. These provide support to the developing primary spermatocytes, which have large, granulated nuclei that are preparing for the first meiotic division. Secondary spermatocytes, which contain 23 pairs of chromatids, are rarely visible. The products of meiosis are the haploid spermatids, which contain dark, round nuclei and a decreasing amount of cytoplasm. These differentiate further into spermatozoa. Remember that cytokinesis is incomplete during these steps, and cytoplasmic bridges connect the cells and allow for their synchronous development.



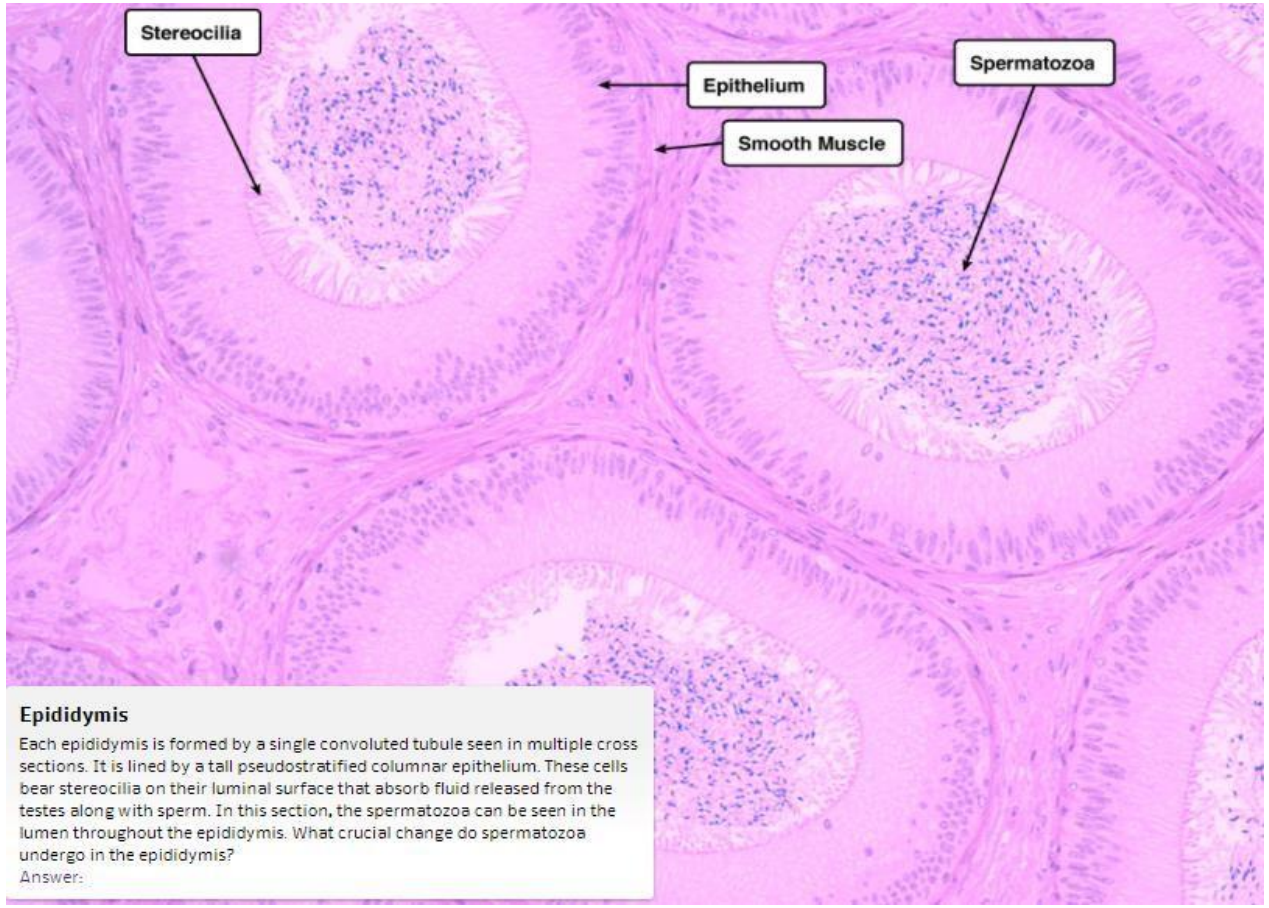
Leydig Cells

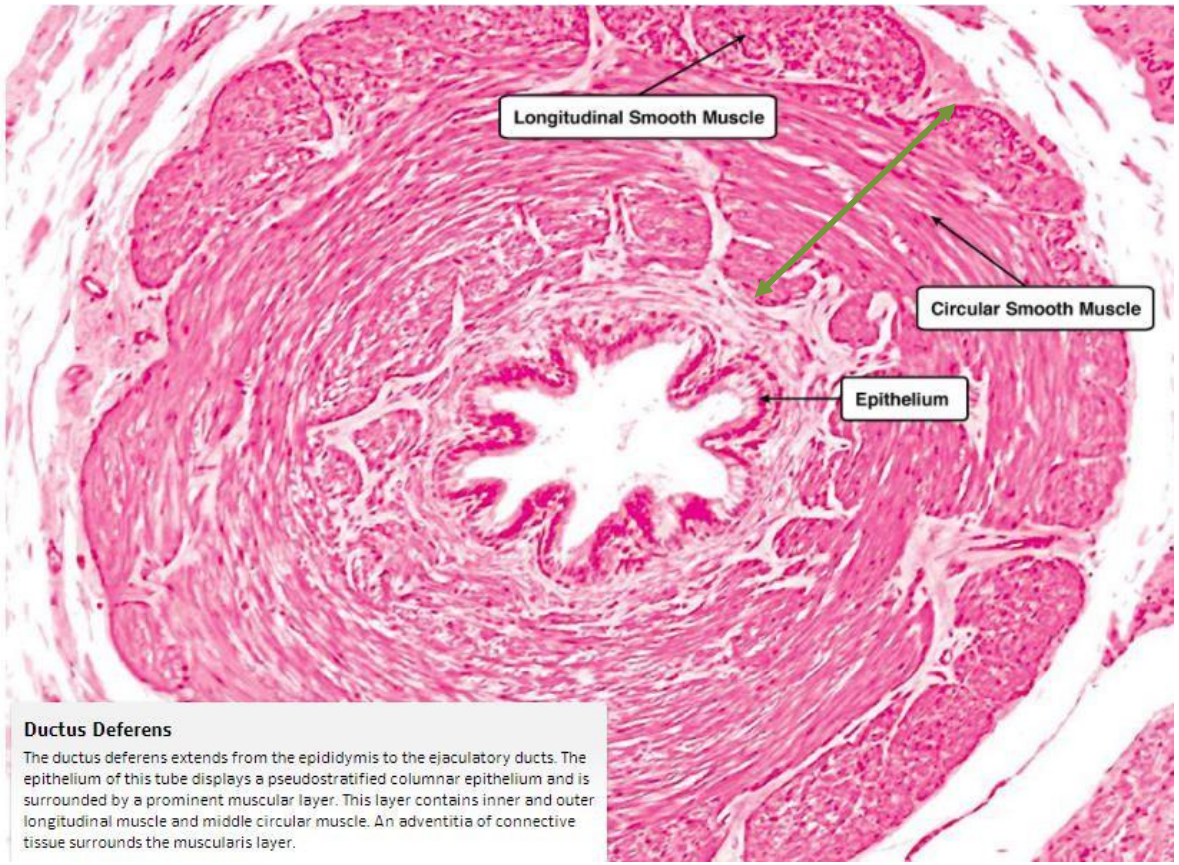
Interstitial or Leydig cells are located in the connective tissue surrounding the seminiferous tubules. They produce testosterone, the male sex hormone responsible for the growth and maintenance of the cells of the germinal epithelium and the development of secondary sex characteristics. Leydig cells often display cytoplasmic crystals of Reinke, the function of these crystals is unknown. Why would you expect the smooth ER to be so extensive in these cells?

Answer:

1. **Spermatogonia:** large pale cell with rounded nuclei.
2. **Primary spermatocytes:** granulated cells.
3. **Secondary spermatocytes** (rare to see it).
4. **Spermatids:** small pale cells.
5. **Spermatoza:** oval cell.
6. **Sertoili cell:** pale cell with oval nucleus

Between the seminiferous tubules you will find interstitial leydig cells.



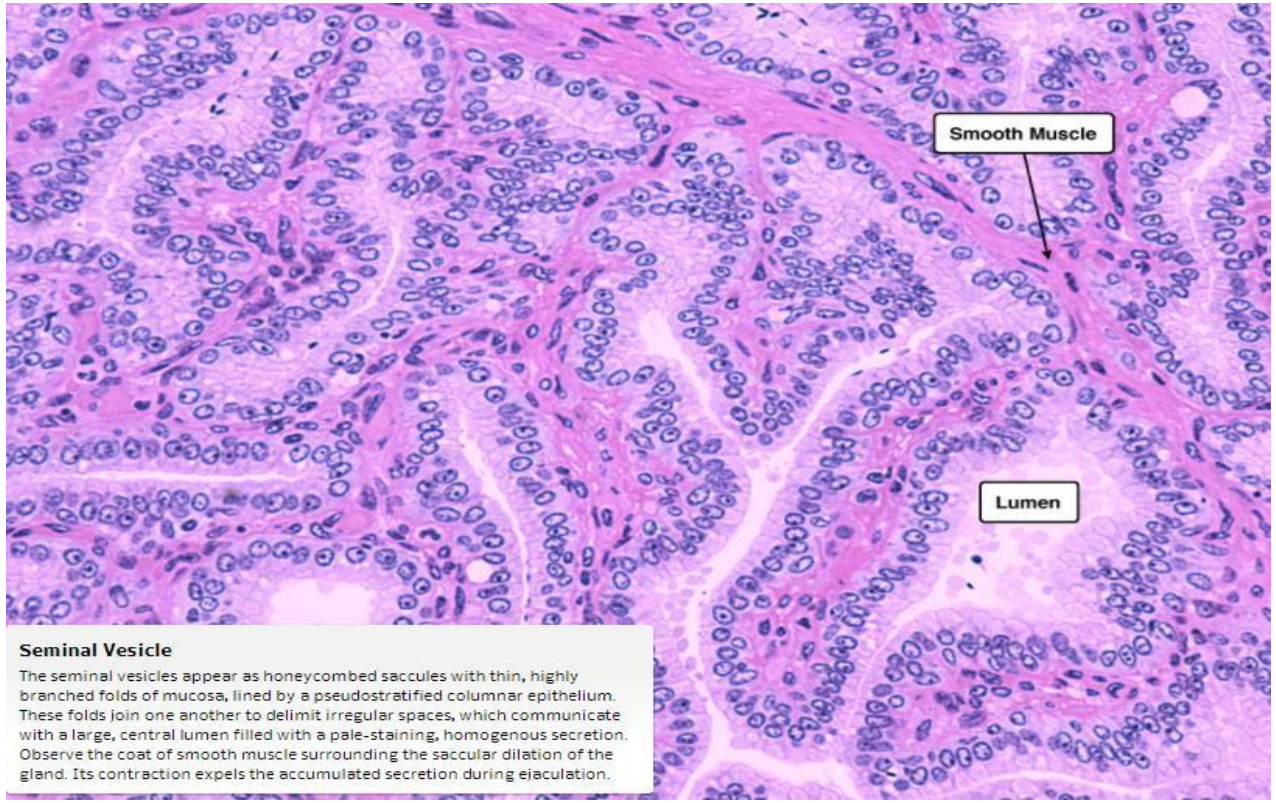


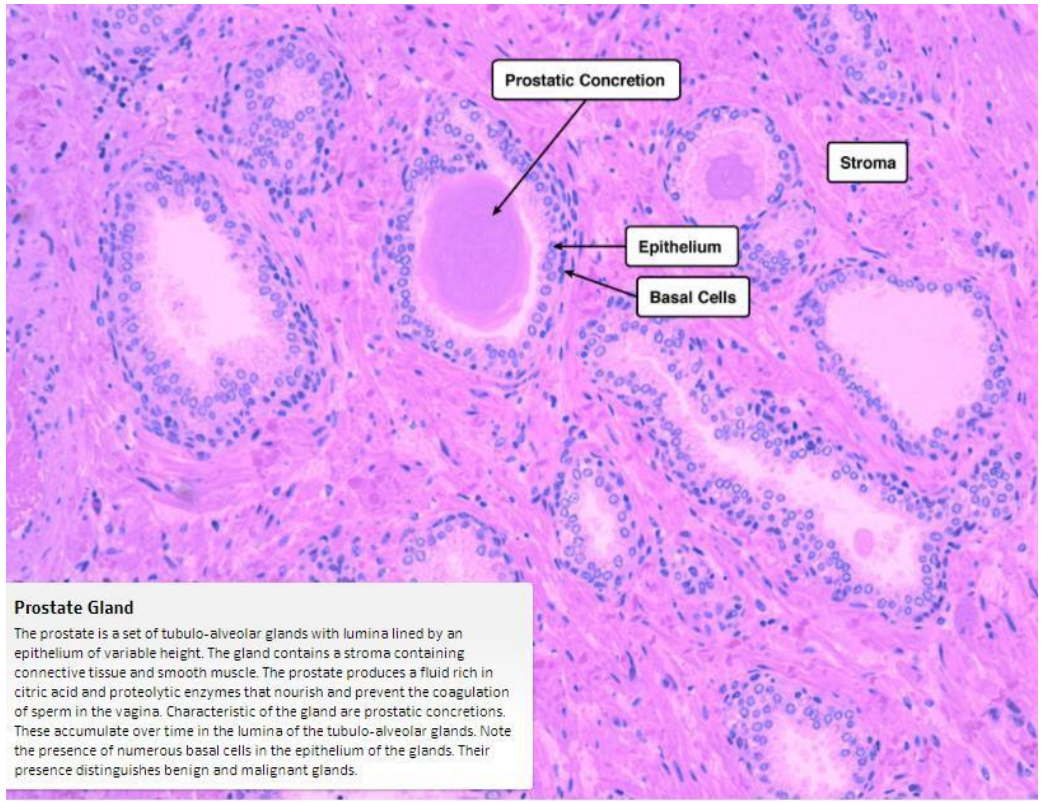
Epididymis:

1. The lining epithelium is pseudostratified columnar epithelium with long branched microvilli called “stereocilia".
2. A single circular smooth muscle layer.
3. Spermatozoa inside the lumen.

Vas deferens:

1. **The lining epithelium** is pseudostratified columnar epithelium with no or very short “stereocilia".
2. **Thick muscle layer** (well developed, consists of a thick circular layer of smooth muscle between thinner inner and outer longitudinal layers).
3. **Adventitia.**





Seminal Vesicle (branched gland):

1. **The lining epithelium** pseudostratified columnar secretory epithelium.

2. **The lumen** contains secretion of the seminal vesicles.

3. **Smooth muscle layer:** to eject the secretions to the ejaculatory duct

Prostate gland:

Full of **alveolar glands with CT in between.**

Characteristic feature: **Corpora amylacea that is concentrated prostatic secretions.**

Penis

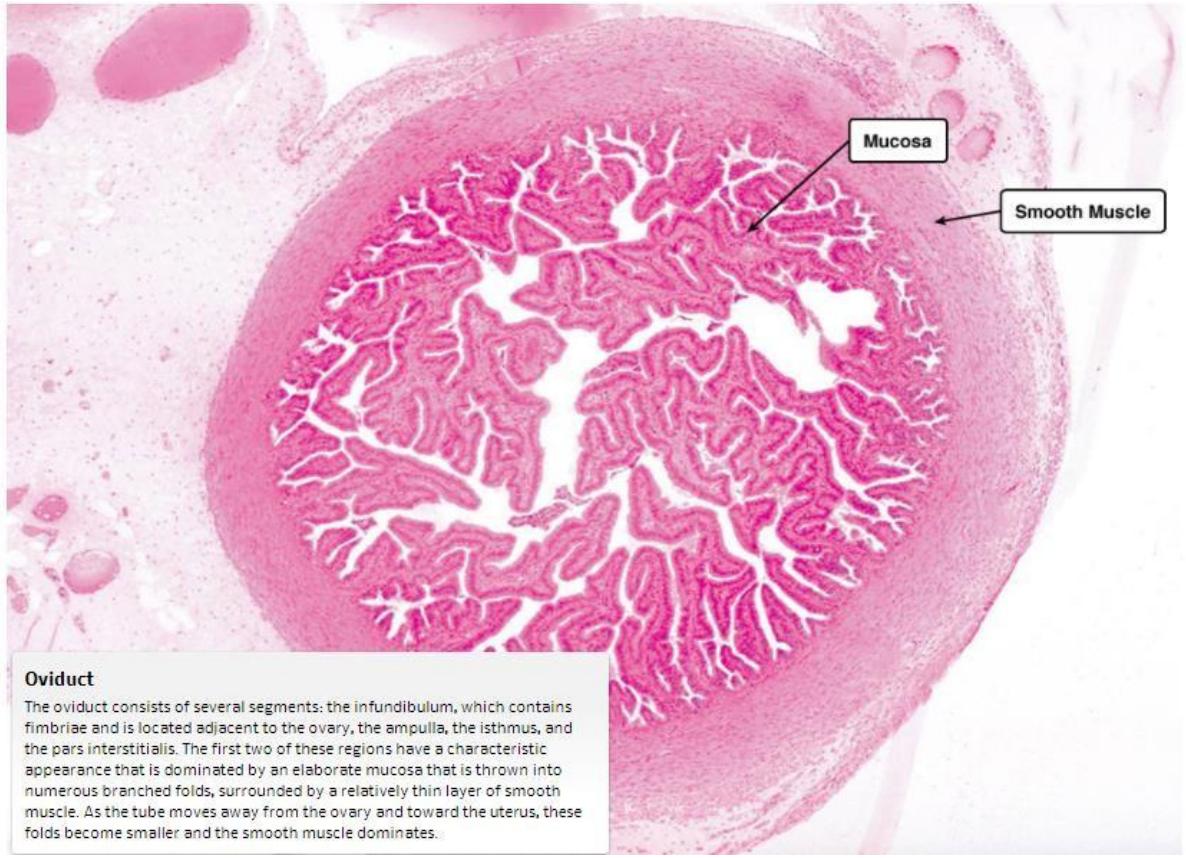
The penis contains three columns of erectile tissue: two corpus cavernosa and a single corpus spongiosum containing the penile urethra. Note the vast sponge-like arrangement of irregular vascular spaces intercalated between the arteries and veins.

Penis:

- Surrounded by **tunica albuginea** that sends septa to divide the penis into three compartments.

- Composed of 3 cylindrical masses of erectile tissue: **2 corpora cavernosa and corpus spongiosum** which **contains the urethra.**

Female reproductive system

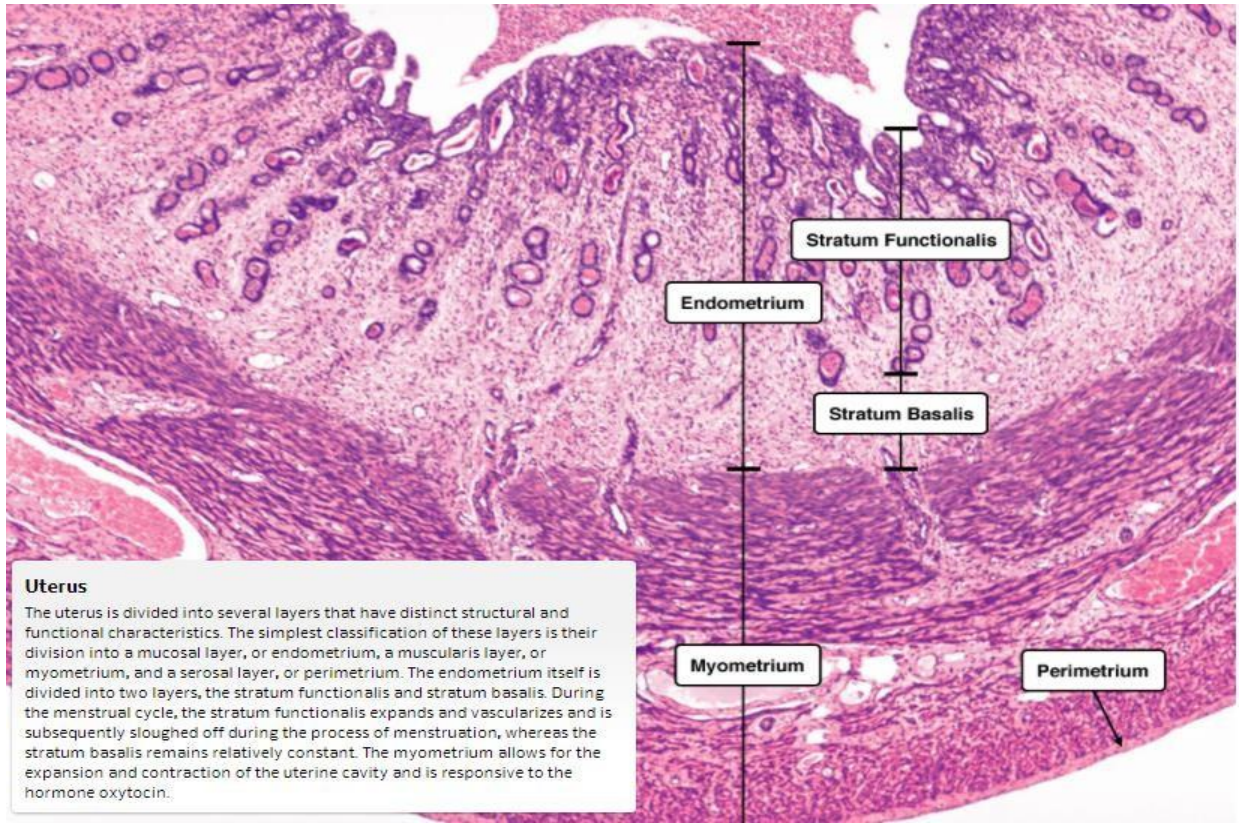


Oviduct

The oviduct consists of several segments: the infundibulum, which contains fimbriae and is located adjacent to the ovary, the ampulla, the isthmus, and the pars interstitialis. The first two of these regions have a characteristic appearance that is dominated by an elaborate mucosa that is thrown into numerous branched folds, surrounded by a relatively thin layer of smooth muscle. As the tube moves away from the ovary and toward the uterus, these folds become smaller and the smooth muscle dominates.

Uterine Tube:

- Contains lumens.
- The lining is simple columnar epithelium.
- The **Mucosa** consists of **many folds.**
- Muscularis consists of poorly defined Inner circular layer and outer longitudinal layer of smooth muscle cells.



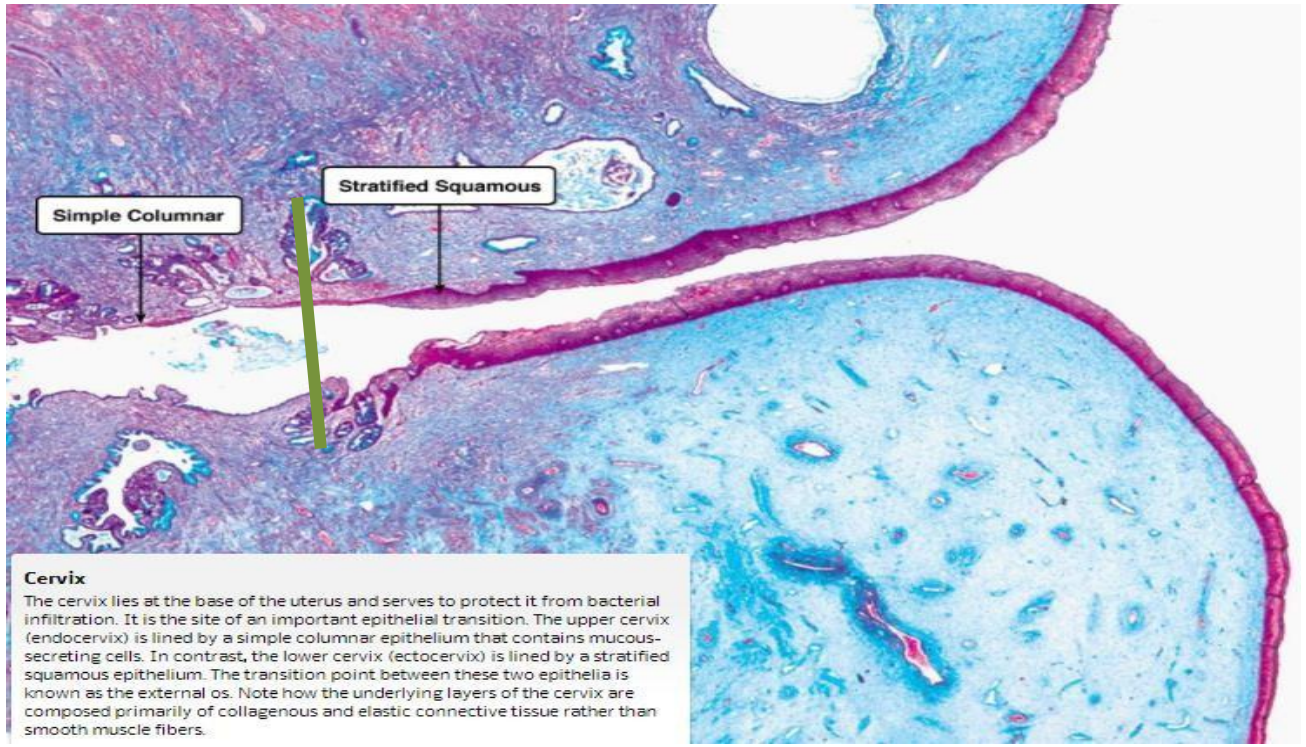
Uterus

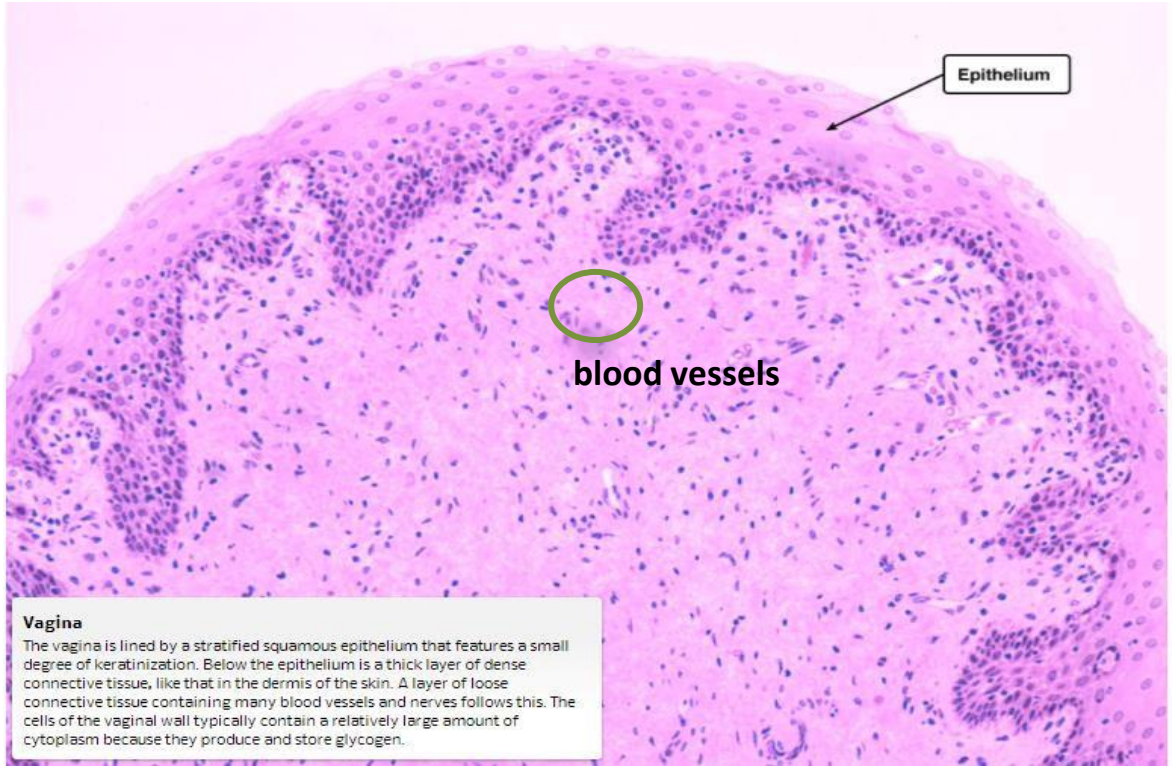
The uterus is divided into several layers that have distinct structural and functional characteristics. The simplest classification of these layers is their division into a mucosal layer, or endometrium, a muscularis layer, or myometrium, and a serosal layer, or perimetrium. The endometrium itself is divided into two layers, the stratum functionalis and stratum basalis. During the menstrual cycle, the stratum functionalis expands and vascularizes and is subsequently sloughed off during the process of menstruation, whereas the stratum basalis remains relatively constant. The myometrium allows for the expansion and contraction of the uterine cavity and is responsive to the hormone oxytocin.

Uterus:

- Consists of 3 layers: outer layer **(Perimetrium),** middle layer which is the musclar layer **(Myometrium)** and inner layer **(Endometrium).**

- Endometrium composed of Stratum Basalis (regenerate the mucosa after menstruation) **and Stratum Functionals** (which is sloughed off during menstruation).





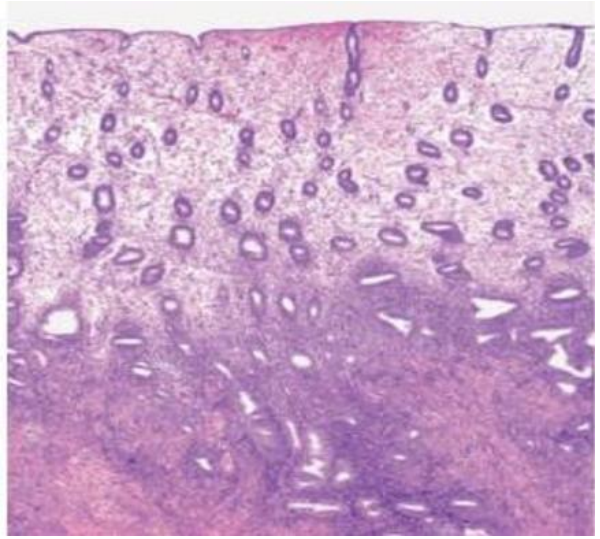
Cervix (two parts):

1. Endouterine cervix lined by **simple columnar epithelium.**
2. Vaginal cervix lined by **stratified squamous epithelium.**

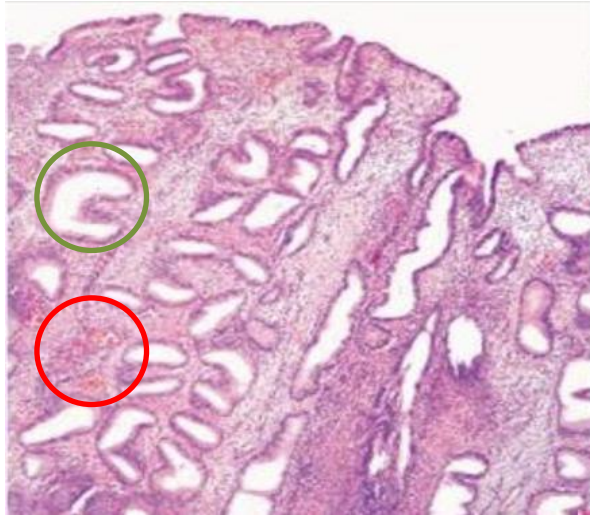
The line in the pic represents the line of transition between 2 parts.

Vagina:

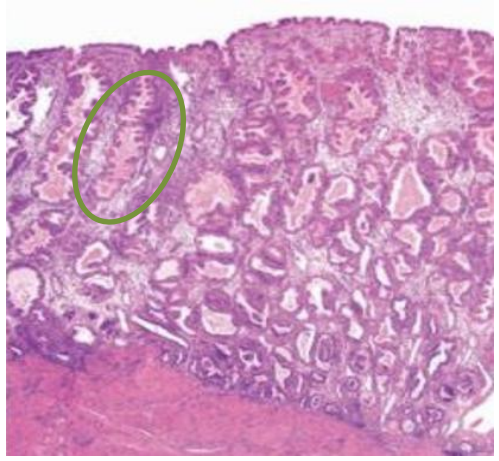
- The lining epithelium is **stratified squamous non keratinized epithelium.**
- Lamina propria: **CT with many elastic fibers and blood vessels.**
- Muscular layer of **inner circular and outer longitudinal** smooth muscle fibers.



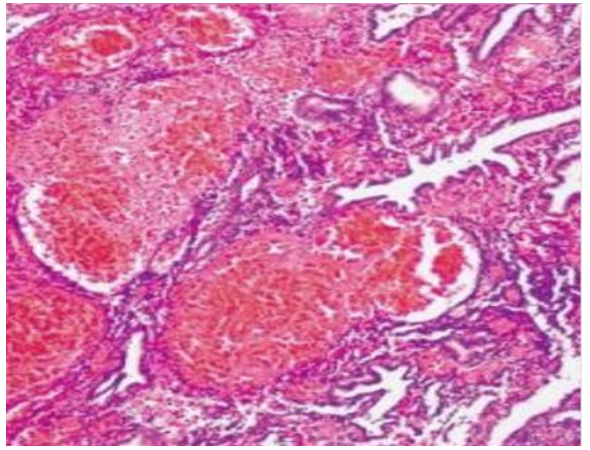
Early proliferative
Very small glands
Coiled arteries not developed



Late proliferative
Larger glands
Coiled arteries start to develop

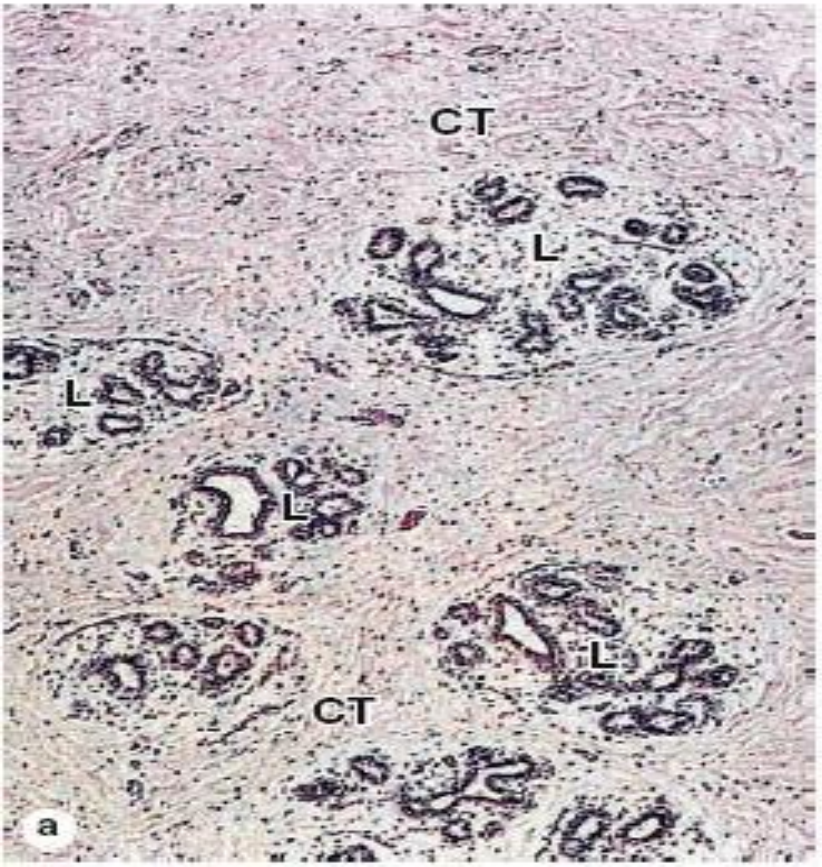


Secretory
Developed, full of secretions glands
Coiled arteries well developed

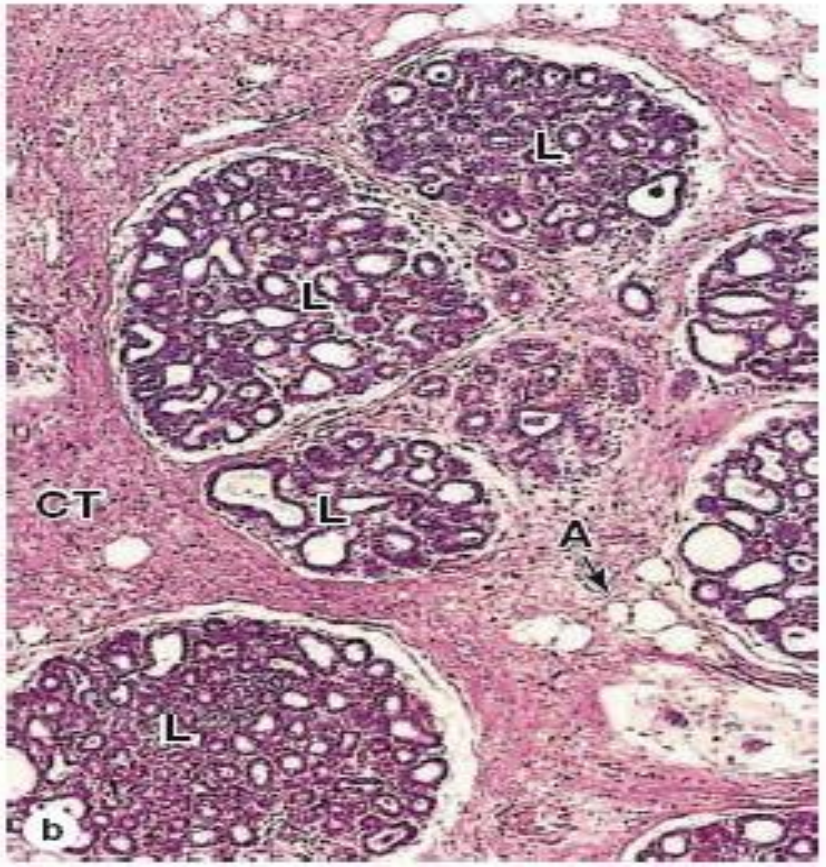


Menstrual
Blood in the endometrium.
Distruction of the glands.
Rupture of the coiled arteries.

FIGURE 22–26 Alveolar development in the breast during pregnancy.



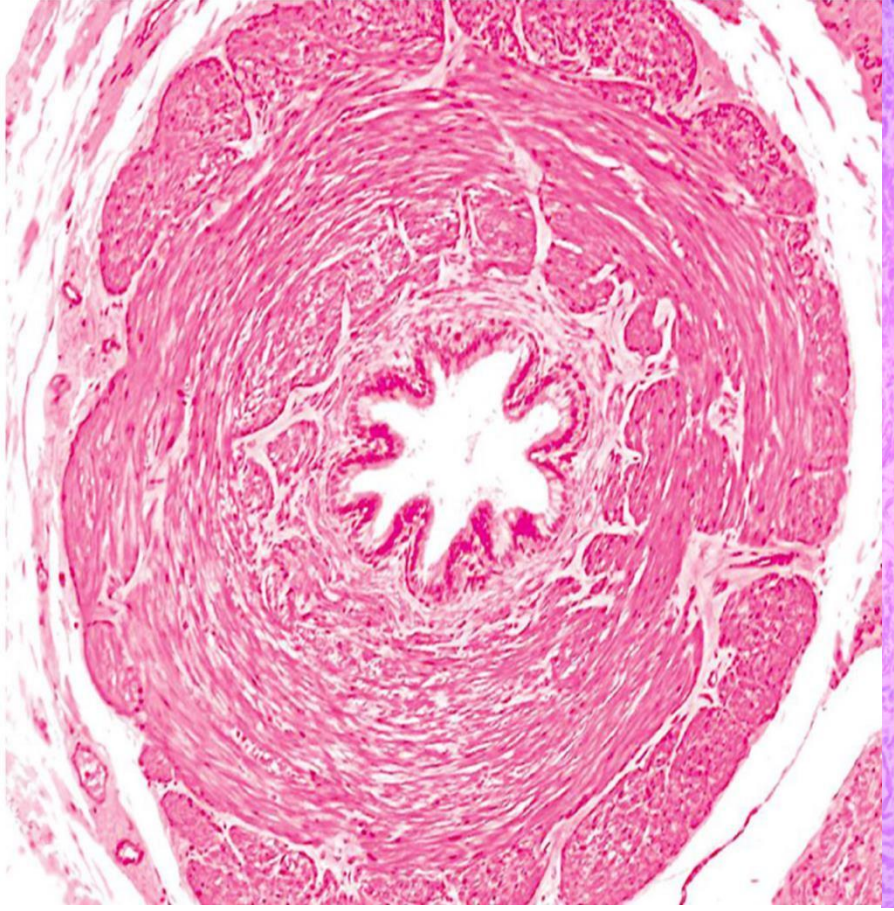
(a) The mammary glands of adult, non-pregnant women are inactive, with small ducts and few lobules. CT is more than the
secretory alveoli



(b) During pregnancy
Secretory alveoli starts to increase.
CT starts to reduce.
Vasculatory starts to Increase.

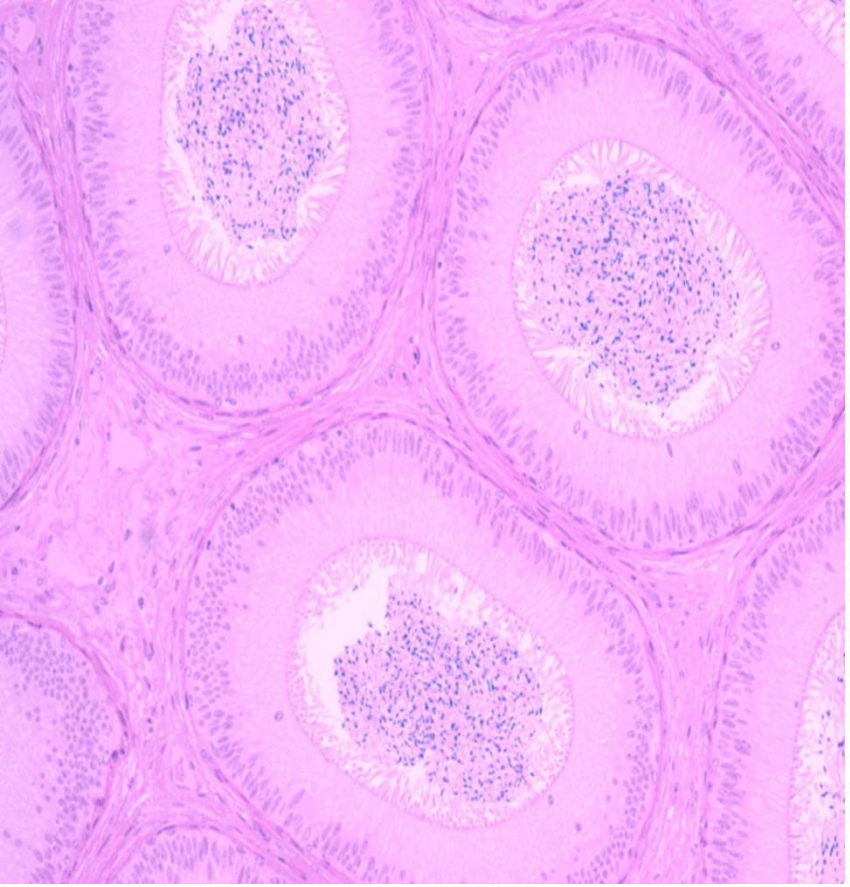
(c) During lactation, the lobules are greatly enlarged and the lumens of both the numerous glandular alveoli (**A**) and the excretory ducts (**D**) are filled with milk. CT disappears.

Uterine Tube

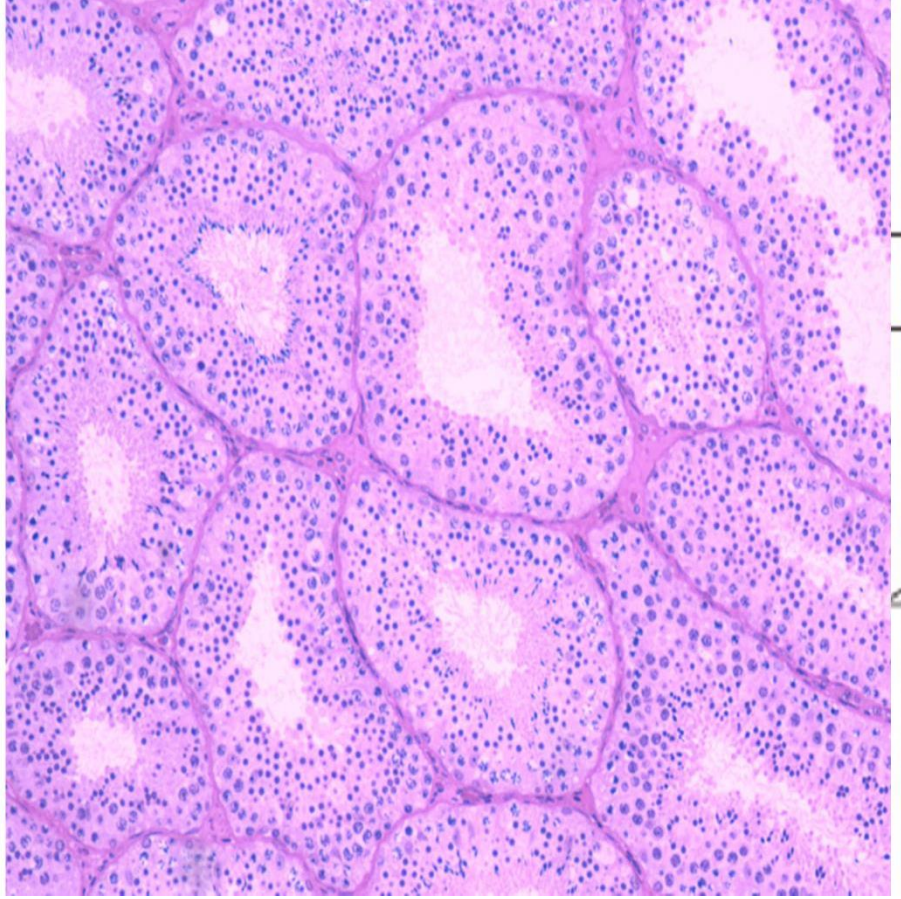


Vas Deference

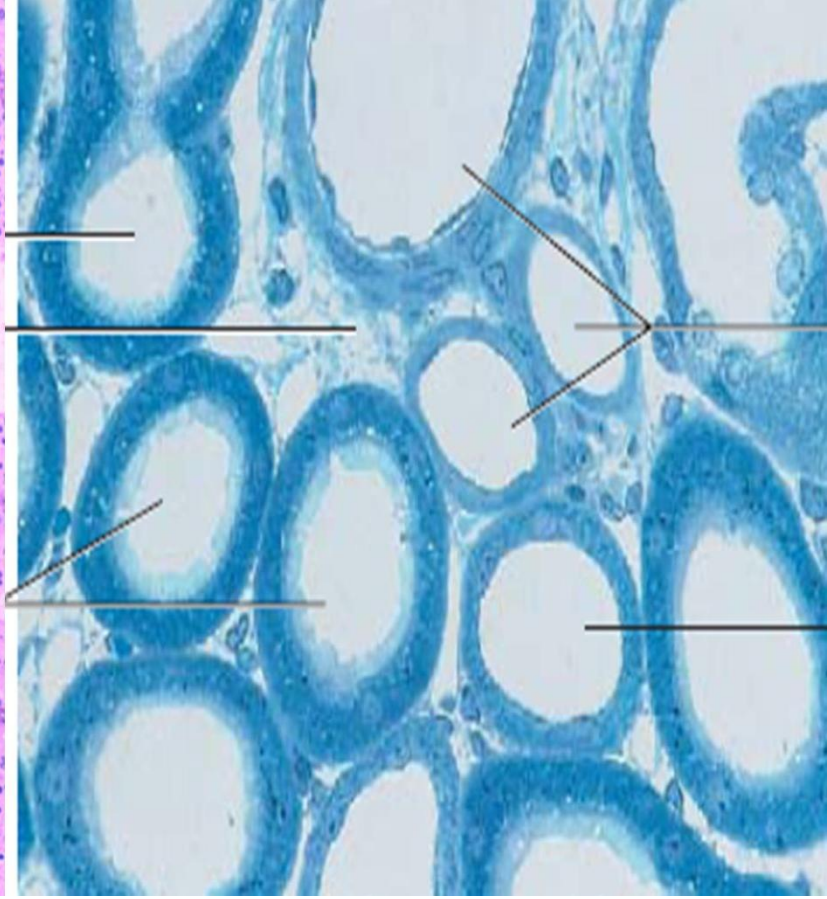
Ureter



Epididymis



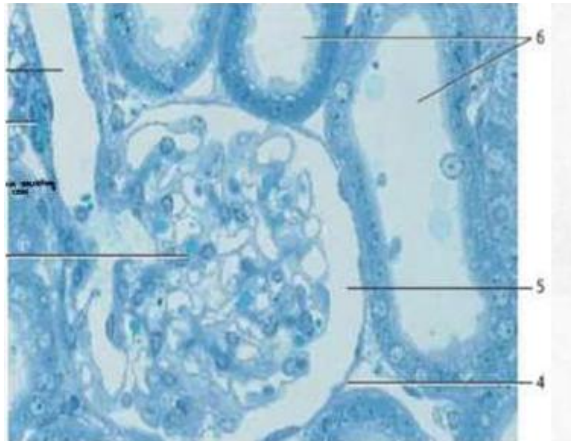
Testis



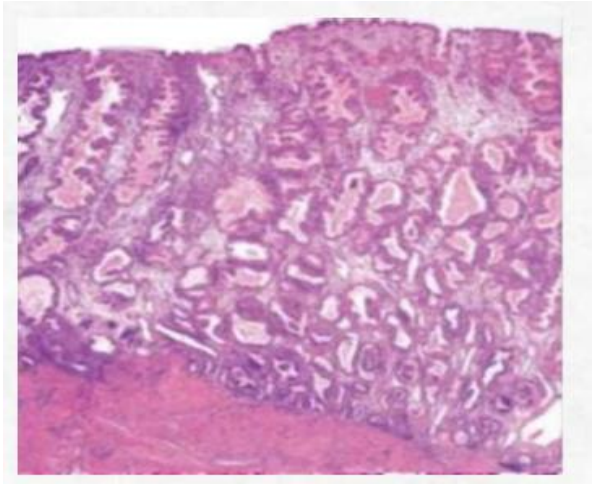
Kidney

Past Papers

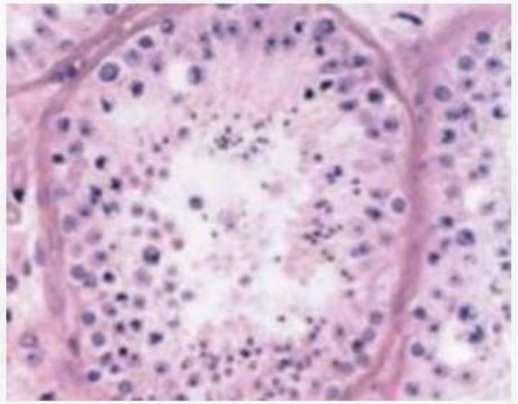
Q1) Number 6 represents:
A. Proximal convoluted tubules
B. Distal convoluted tubules
C. Thick loop of henle
D. Collecting duct
E. Thin loop of henle



Q2) The following picture represents which stage of endometrial cycle:
A. Ovulatory
B. Early proliferative
C. Late proliferative
D. Secretory
E. Menstrual

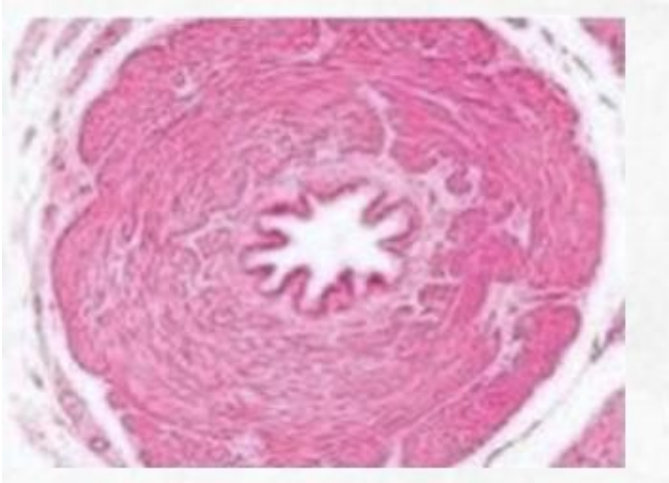


Q3) Which of the following cells are not seen in the tissue shown in the following section?
A. Myoid cells
B. Steroli cells
C. Secondary spermatocytes
D. Spermatogenic cells

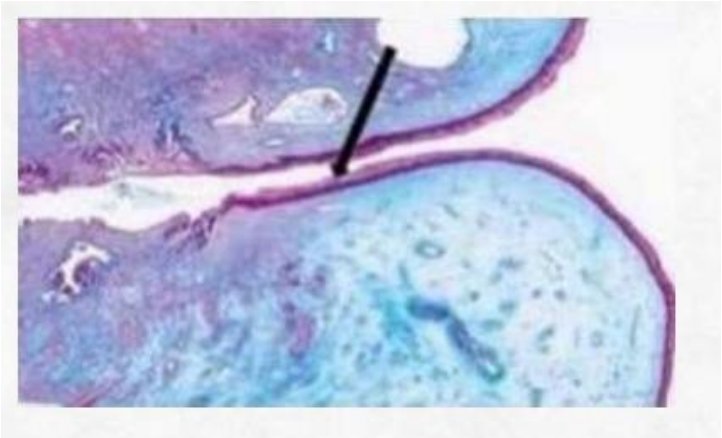


Past Papers

Q4) The function of this structure is to convey:
A. The urine from the urinary bladder to outside of the body.
B. The sperm from epididymis to ejaculatory duct.
C. The ovum from ovary to the uterus.
D. The urine from kidney to the urinary bladder .
E. The urine from loop of Henle to collecting ducts.



Q5) The pointed area is lined with epithelium:
A. Simple Cuboidal
B. Simple columnar
C. Stratified squamous non keratinized
D. Simple squamous
E. Stratified Columnar



A,D,C,B,C