

+ “You don't have to be great to start, you have to start to be great.”



Objectives:

By the end of this lecture, the student should be able to describe:

1. The microscopic structure of the renal cortex and medulla.
2. The histology of renal corpuscle, proximal and distal tubules, loop of Henle, and collecting tubules & ducts.
3. The histological structure of juxtaglomerular apparatus.
4. The functional structures of the different parts of the kidney.

1-

The kidney

Extra notes: Gray

Important notes: Red

The Kidney

Medulla:

6-12 pyramid-shape regions (renal pyramids)

The apex of the pyramid (Renal Papilla):

is towards the hilum, it is perforated by 12 opening of the **duct of bellini** in the region called area cribrosa. The apex is surrounded by a **minor calyx**

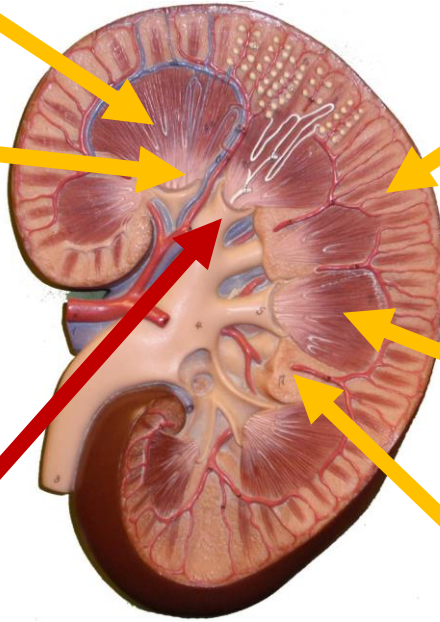
Calyx: 3 or 4 minor calyces join to form 3 or 4 major calyces that form the renal pelvis

Cortex:

Dark brown and granular

The base of the pyramids: is towards the cortex (cortico-medullary border)

The pyramids are separated by cortical columns of **Bertin**



Uriniferous tubule

It is the functional unit of the kidney.

Nephron is formed of :

- 1- Renal corpuscle.
- 2- Proximal tubule.
- 3- Thin limbs of Henle's loop.
- 4- Distal tubule

Formed of

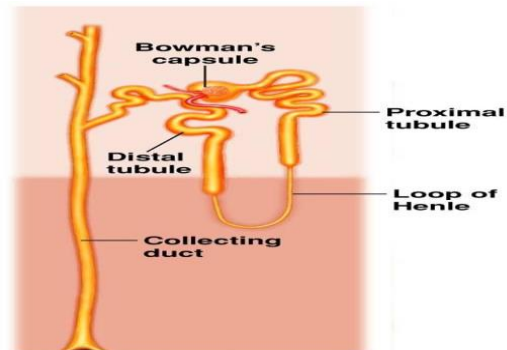
Nephron

Cortical nephrons

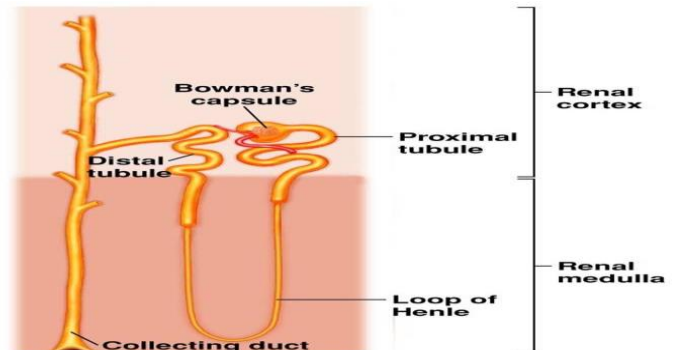
Juxtamedullary nephrons.

Collecting tubule

- The tubules are densely packed.
- The tubules are separated by thin stroma and basal lamina.



(a) Cortical nephron




(b) Juxtamedullary nephron

RENAL CORPUSCLE

1-Glomerulus: tuft **fenestrated** capillaries
“without diaphragm”

2-Bowman’s Capsule:

- Parietal layer
- Urinary space
- Visceral layer or **Podocytes**

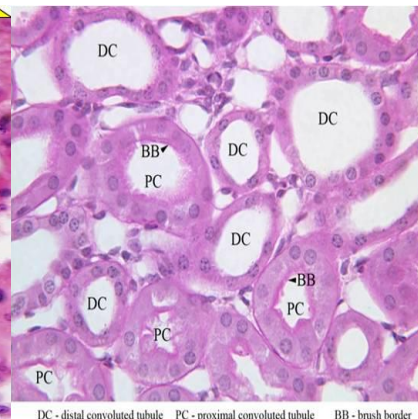
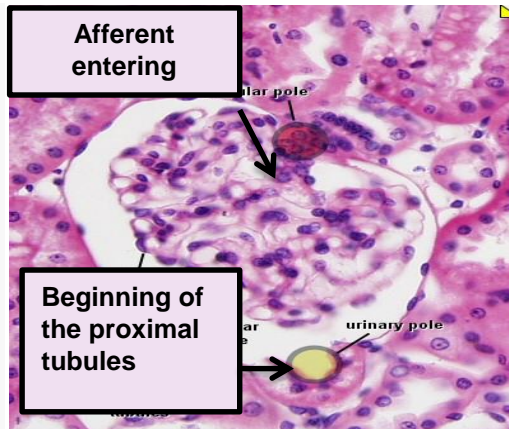
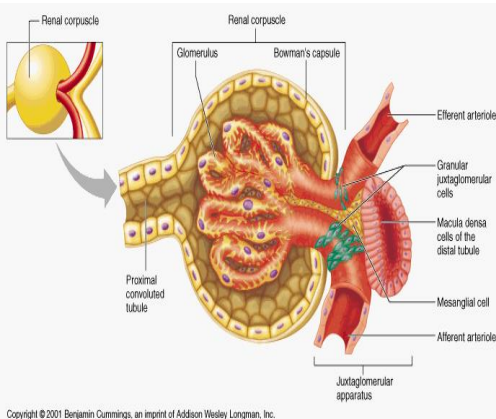
3-Mesangial cells: intra-glomerular cells 

PROXIMAL CONVOLUTED TUBULES

Composed of:
Simple Cuboidal Epithelium with
acidophilic cytoplasm

The cells have striated or brush border and
lateral inter-digitation

They have well defined basal lamina



THIN LIMBS OF HENLE’S LOOP

It has **3 regions:**

1. Descending thin limb.
2. Crest of Henle’s loop.
3. Ascending thin limb.

NB. It is **longer** in juxta-medullary nephron than in cortical nephron.

- It is composed of simple squamous epith.

DISTAL CONVOLUTED TUBULE

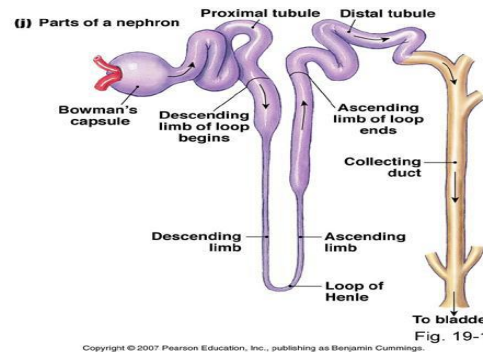
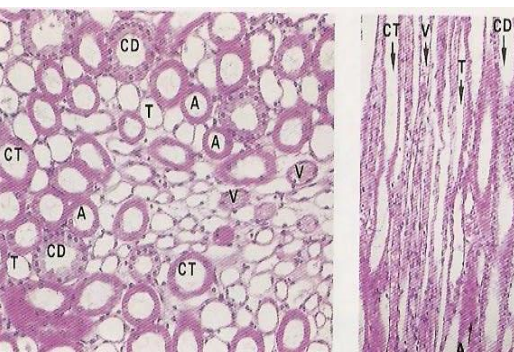
It starts at the macula densa.

macula densa (tall columnar & narrow cells).

The Distal convoluted tubule is formed of **low cuboidal epithelium**.

N.B. Because distal convoluted tubules are much shorter than proximal convoluted tubules, any section of renal cortex presents many more sections of proximal convoluted tubules.

*Distal tubules drain into collecting tubules





Collecting Tubules

- Composed of Simple Cuboidal Epithelium
- **NOT** a part of the nephron

THEY HAVE 3 REGIONS:

Cortical:

Simple Cuboidal Epithelium

Medullary:

Simple Cuboidal Epithelium

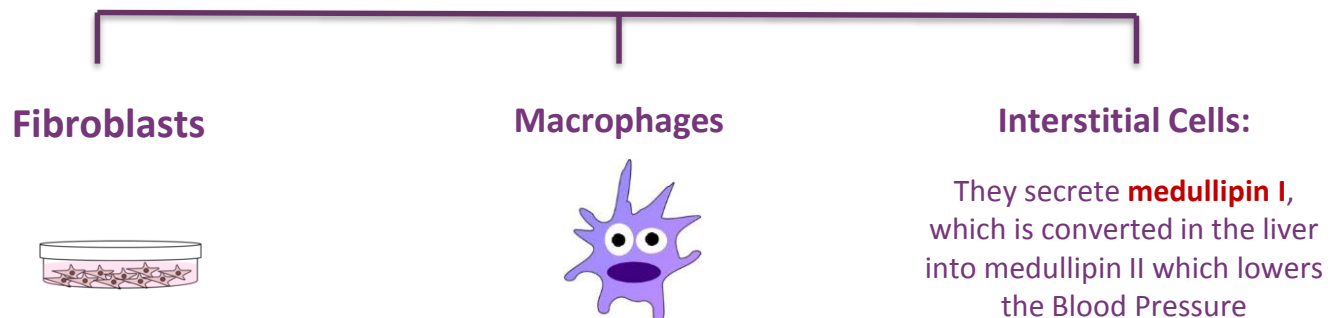
Papillary Ducts (Ducts of Bellini):

Simple Columnar Epithelium

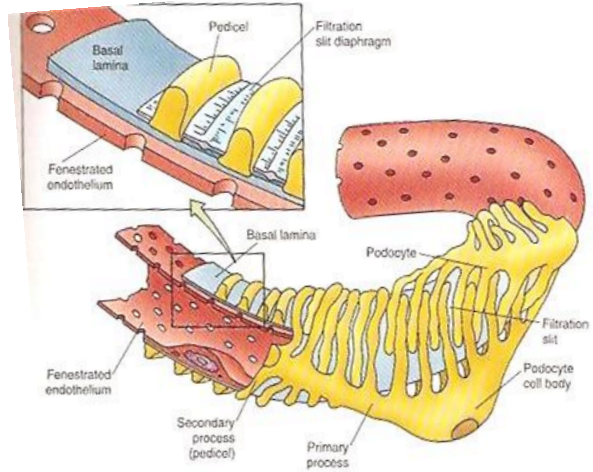
- They open in the Area Cribrosa.
- They are impermeable to water except in the presence of ADH

Renal Interstitium

It is a very flimsy (easily damaged), scant (little) amount of loose connective tissue that contains:



+ GLOMERULAR FILTRATION BARRIER



Glomerular Filtration Barrier

Endothelial wall of glomerular capillaries

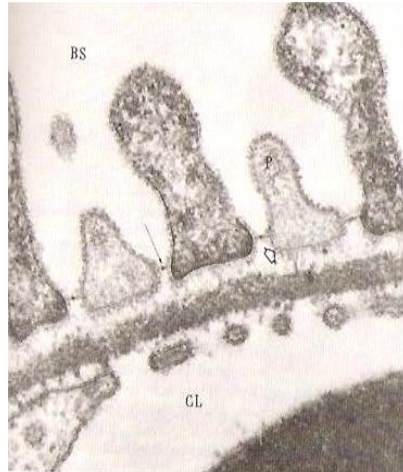
Glomerular basal lamina

Podocyte pedicles

inner and outer laminae rare and middle lamina densa

Podocytes: Visceral layer of Bowman's capsule

- Podocytes have primary (major) processes and secondary (minor) processes (pedicles).
- Between pedicles (on the surface of capillaries) there are **filtration slits** that have **filtration slit diaphragms**.





1 What are the ducts of Bellini?

- a. Collecting tubules
- b. Distal convoluted tubule
- c. Proximal convoluted tubule
- d. Loop of Henle

2 What is the glomerulus?

- a. Afferent arteriole
- b. Efferent arteriole
- c. Capillary tuft
- d. Peritubular capillaries
- e. Vasa recta

3 Approximately how many nephrons are there in each kidney?

- a. 1,000
- b. 10,000
- c. 100,000
- d. 1,000,000
- e. 10,000,000

4 What are the foot processes on podocytes?

- a. Visceral layer of Bowman's capsule
- b. Parietal layer of Bowman's capsule
- c. Pedicels
- d. Juxtaglomerular cells
- e. Macula densa

5 What type of tissue composes the kidney tubules?

- a. Simple squamous epithelium
- b. Simple cuboidal epithelium
- c. Simple columnar epithelium
- d. Stratified squamous epithelium
- e. Transitional epithelium

6 Where are podocytes seen?

- a. Visceral layer of Bowman's capsule
- b. Parietal layer of Bowman's capsule
- c. Pedicels
- d. Juxtaglomerular cells
- e. Macula densa

7 What is the functional unit of the kidney?

- a. Medulla
- b. Lobe
- c. Renal columns
- d. Nephron
- e. Medullary ray

7D
6A
5B
4C
3D
2C
1A

Done by:

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Thanks for checking our work,
Good luck.

-Team histology.

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