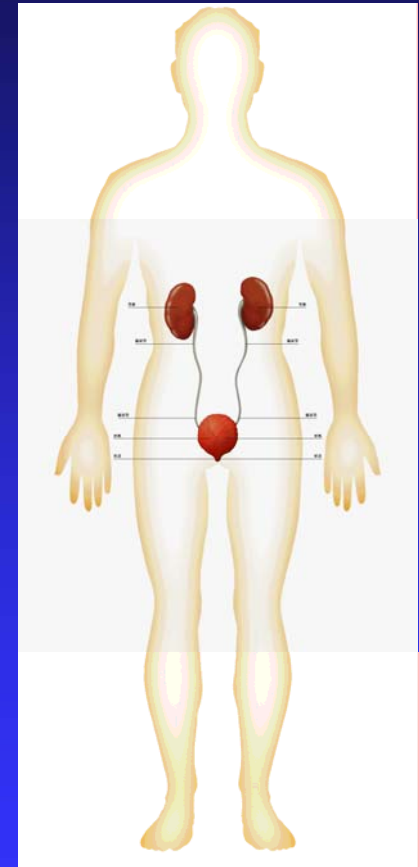
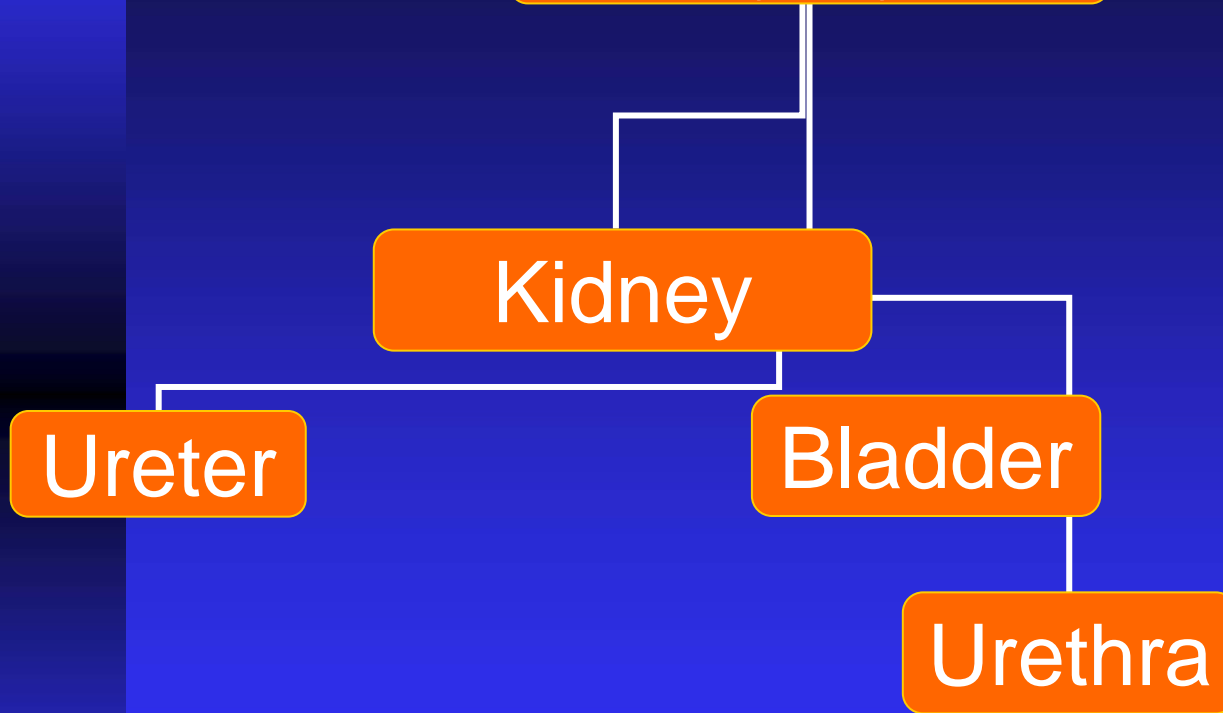


URINARY SYSTEM

Dept. of Histology and Embryology

周莉 教授

Urinary System



I .KIDNEY

Hilum

Renal Capsule

Cortex, medulla

Renal Pyramid

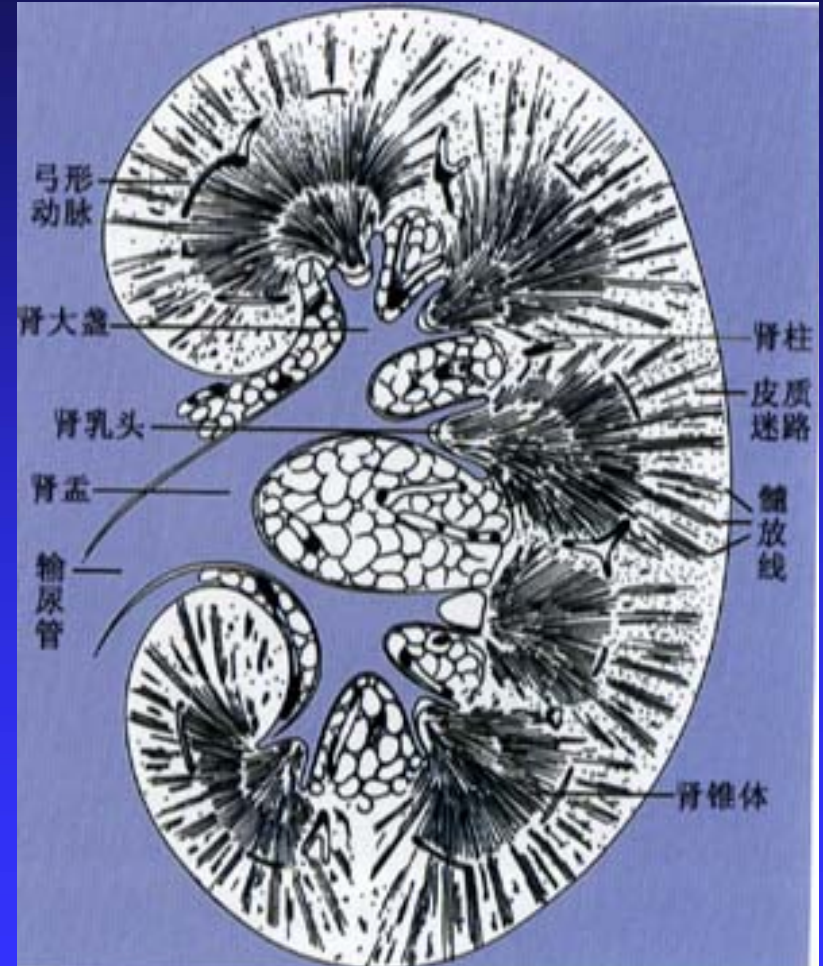
Renal Papillae

Renal Column

Medullary Ray

Cortical Labyrinth

Renal Lobule



Renal Parenchyma

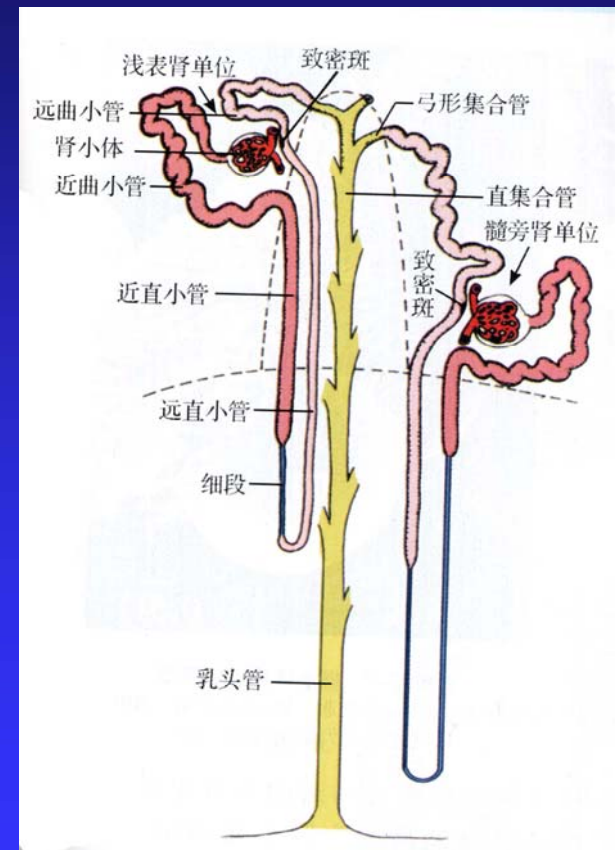
- Renal parenchyma is composed of many nephron and collecting duct.
- A nephron including a renal corpuscle and a renal tubule
- Renal interstitium is connective tissue between nephrons

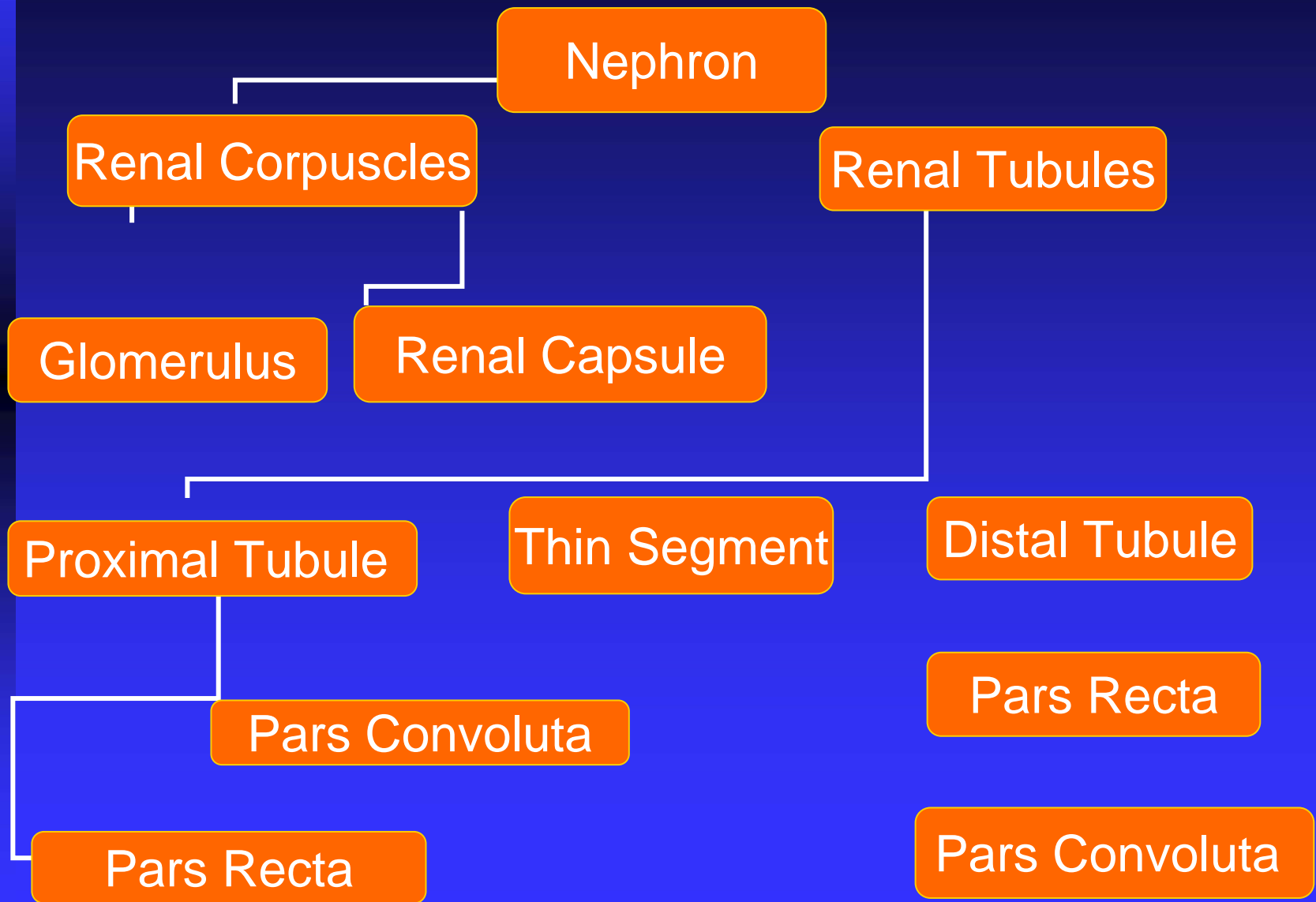
1. Structure and Function of Nephron

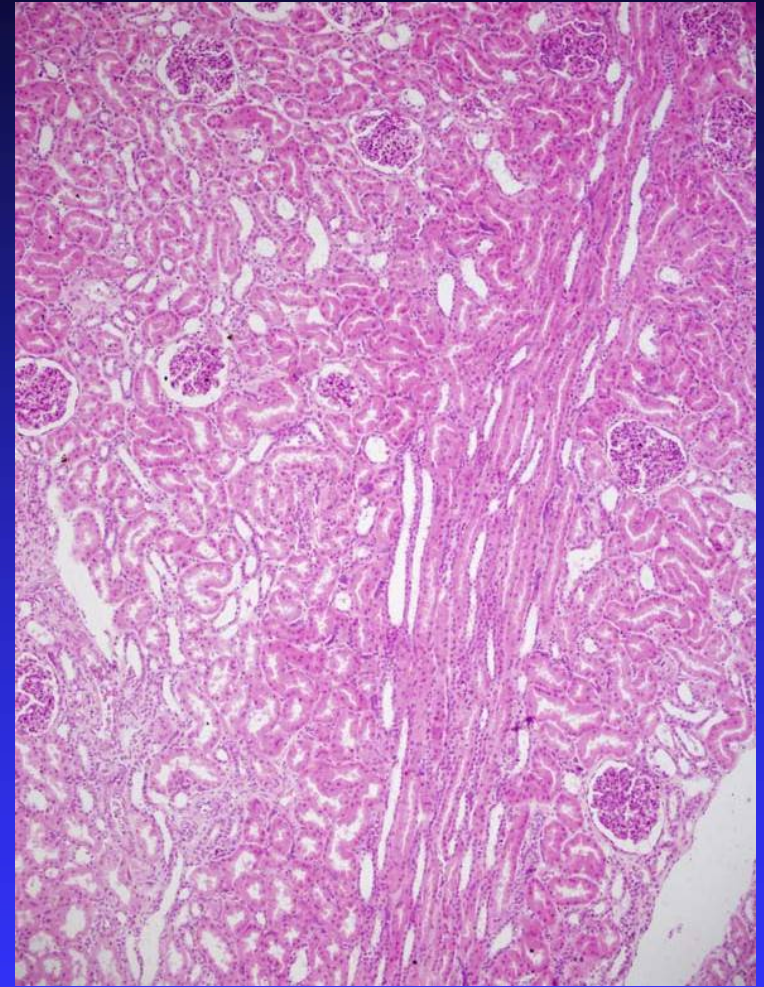
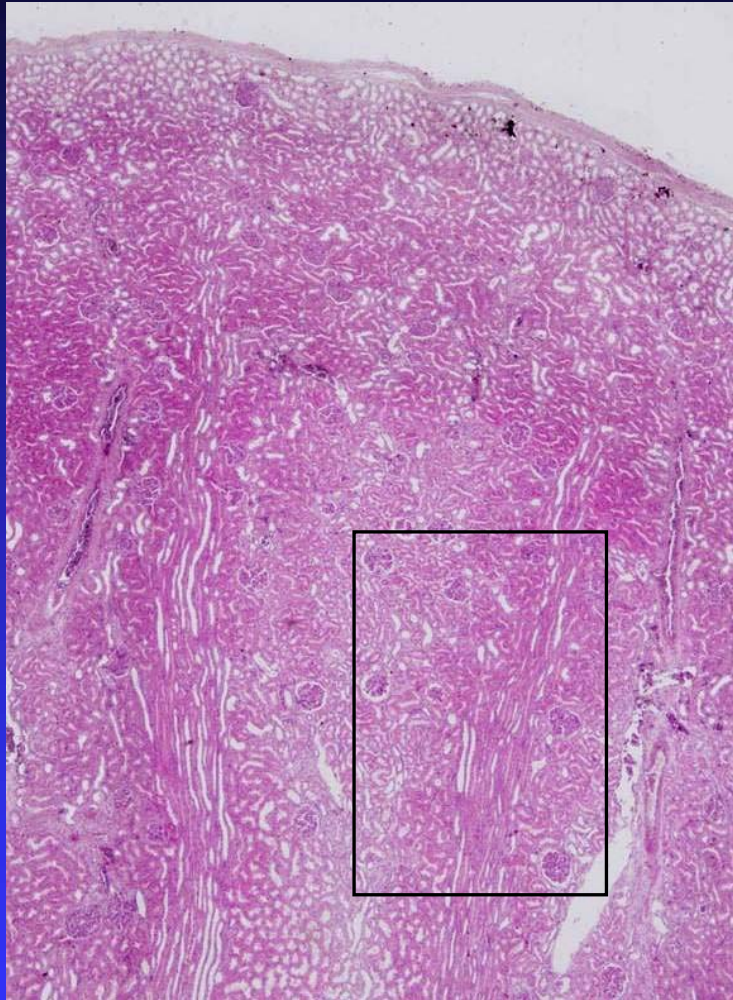
The nephron is the structure and functional unit of the kidney.

Superficial nephrons

Paramedullar nephrons







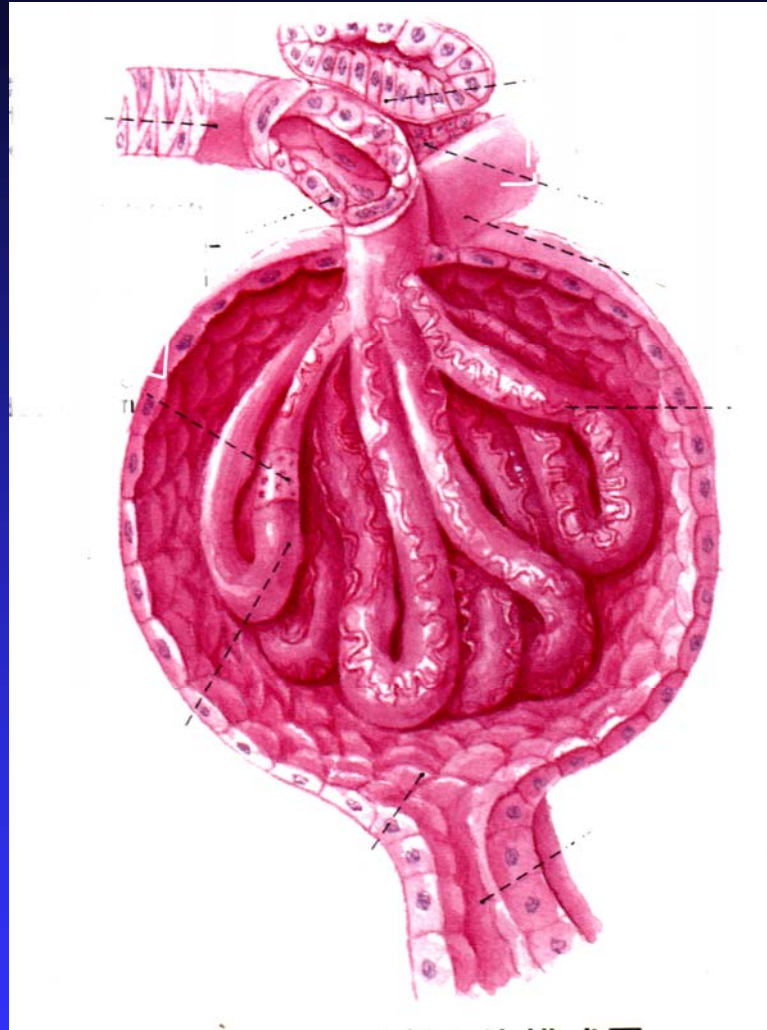
Renal cortex (LM)

1.1 Renal Corpuscle

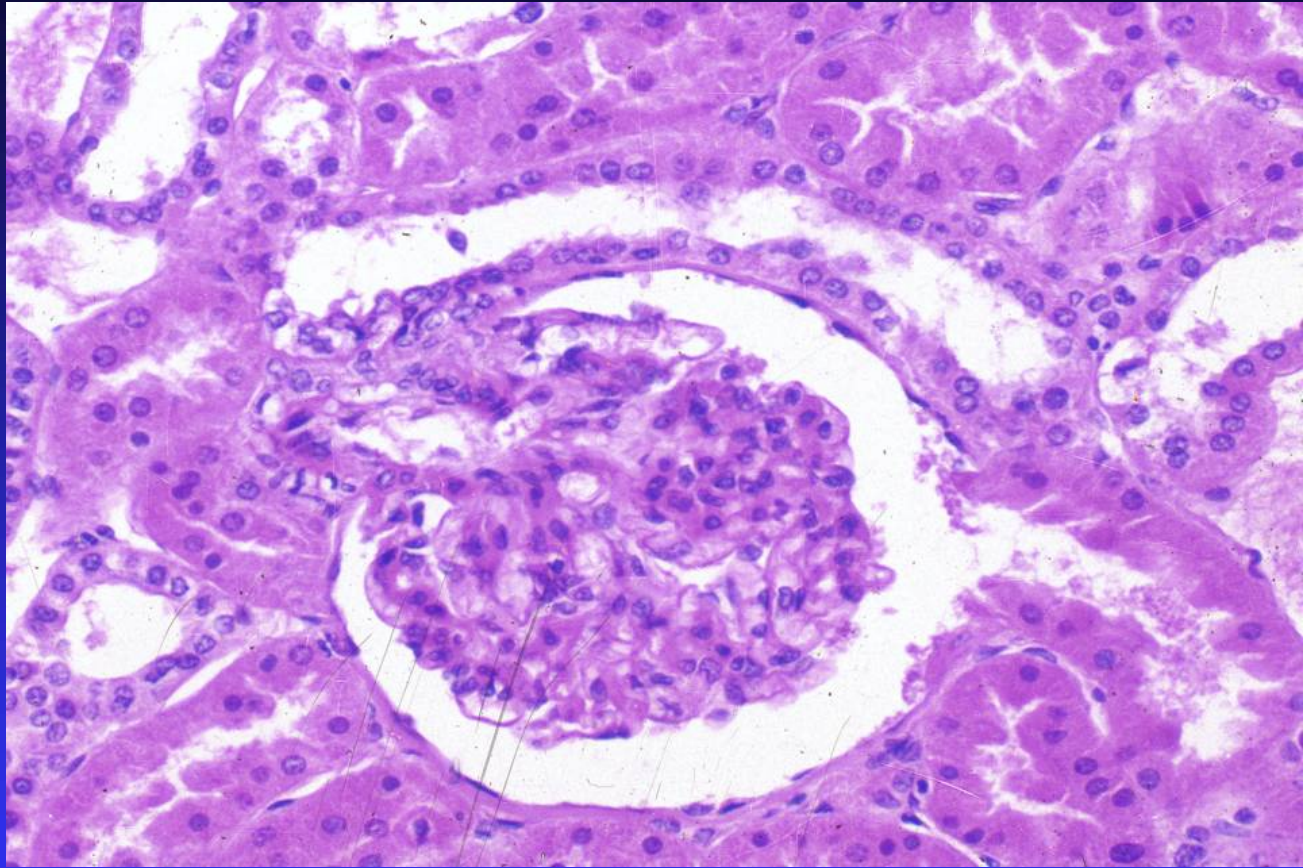
Vascular pole and urinary pole,
Being composed of glomerulus
and renal capsules (Bowman
capsules)

(1) Glomerulus

afferent arteriole, 2-5 primary
branches, each of which
subdivides into a capillary loops,
efferent arteriole



Renal corpuscle (Model)



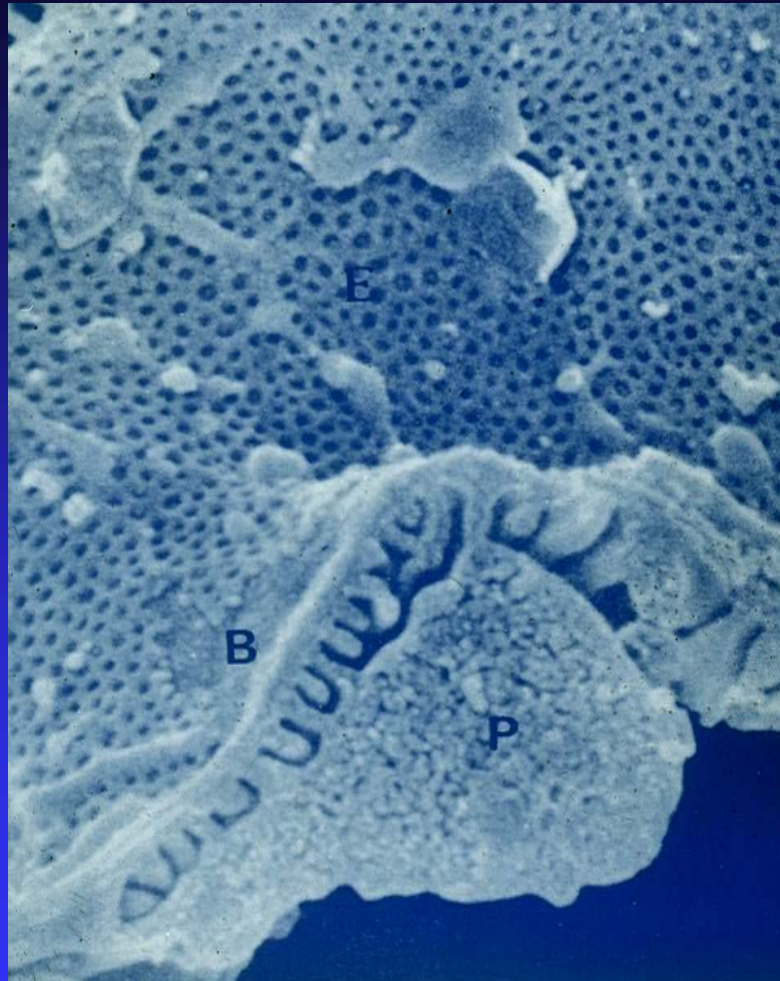
Renal corpuscle (LM)

Fenestrated capillaries, cell coat with negative charges (sialic acid) on lumen of endothelium

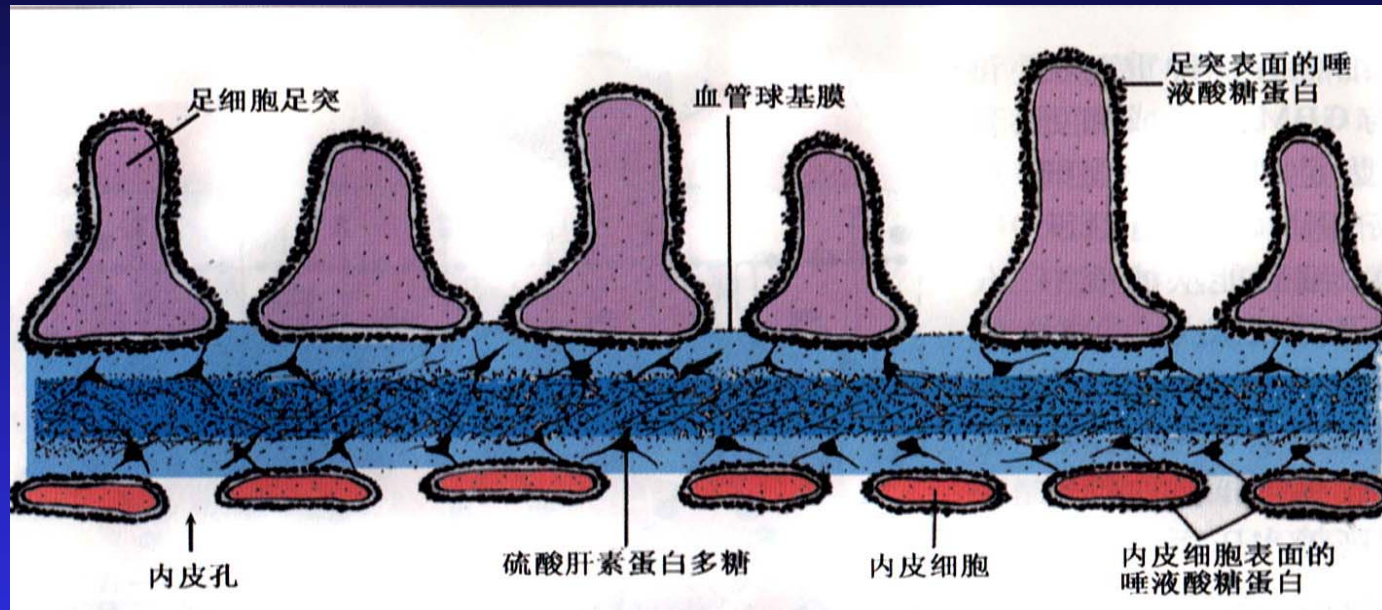
Thick basal lamina (330nm)

Mesangium (intraglomerular mesangium):

being composed of mesangial cells and mesangial matrix



Fenestrated capillaries (SEM)

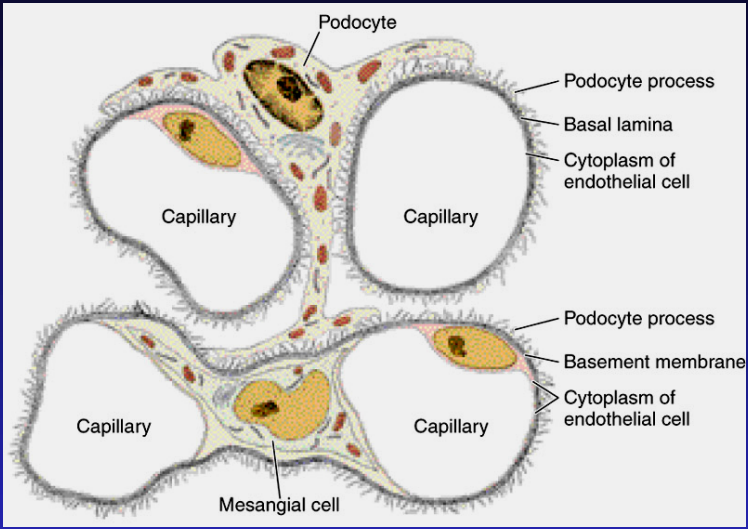


Filtration membrane(Model)

Mesangial cells

Their processes stretch between endothelium and basal lamina

Function: producing basal lamina and mesangial matrix; having phagocytosis and so on.



Mesangial cells



(2) Renal capsule

Parietal layer

(simple squamous epithelium)

Visceral layer (podocytes)

capsular space

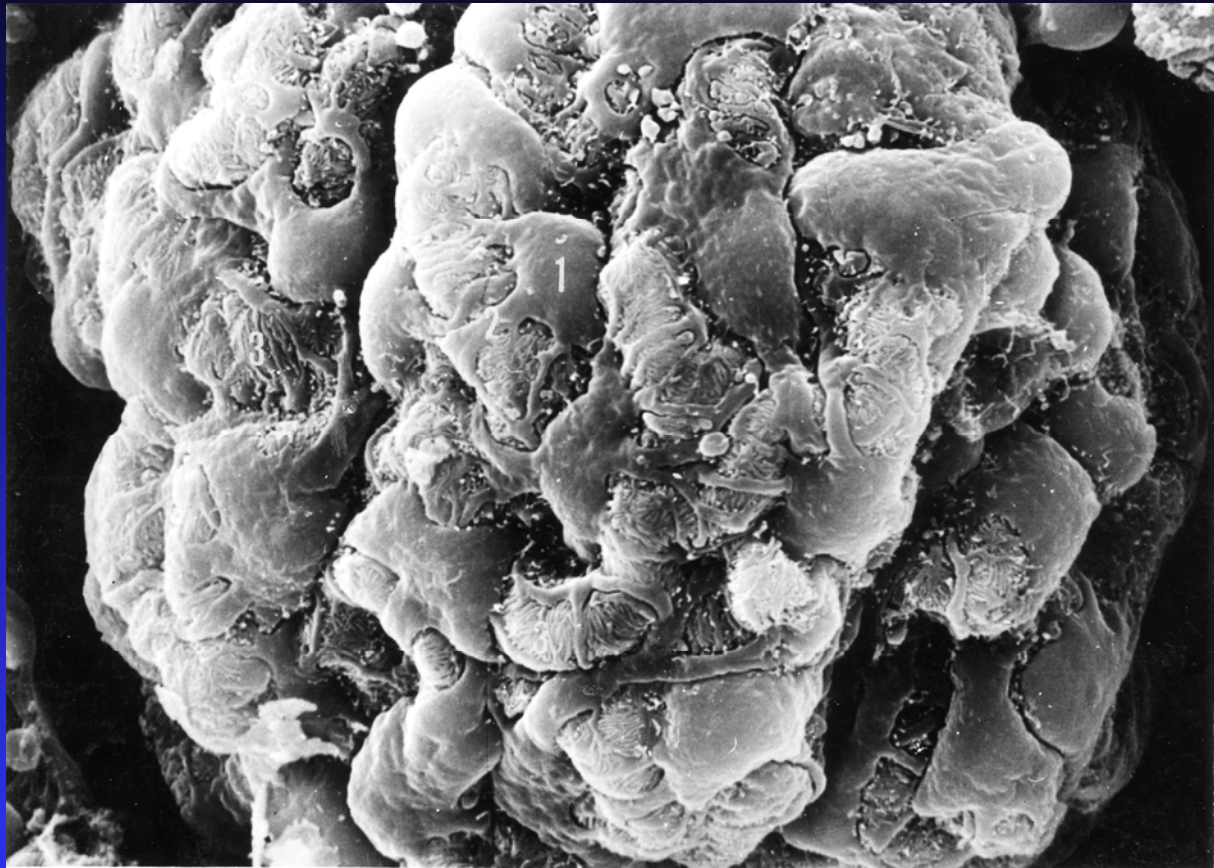
Podocyte

SEM: primary processes, Secondary processes

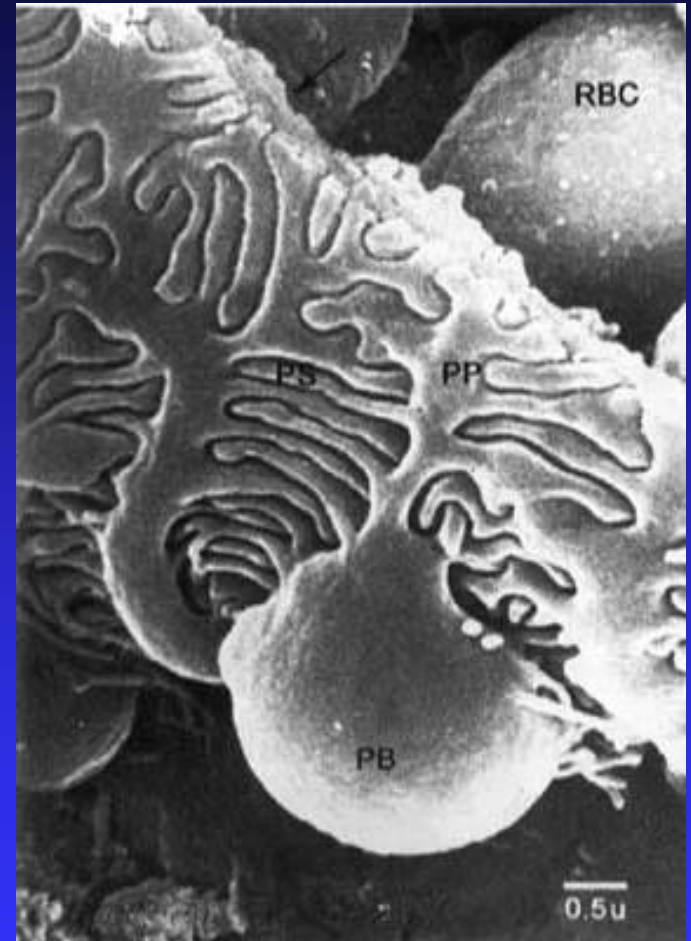
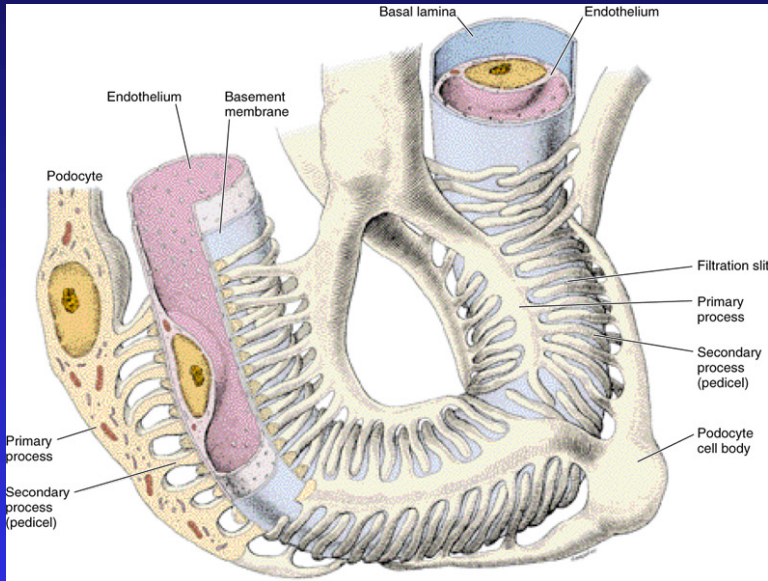
Slit pore, slit membrane

Filtration membrane: Fenestrated endothelium, basement membrane and slit membrane of podocytes

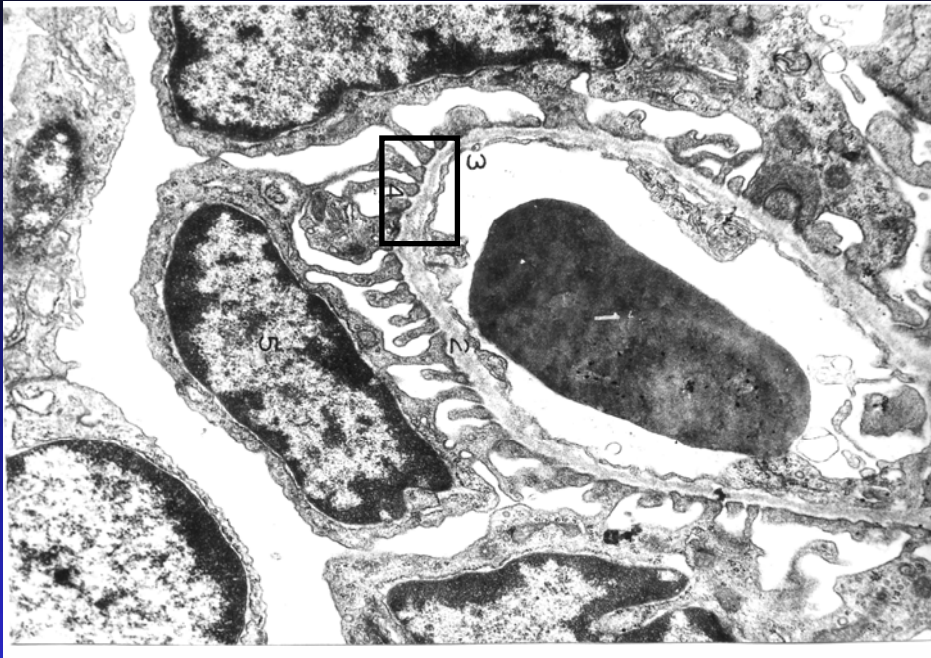
Function: to filter for blood plasma



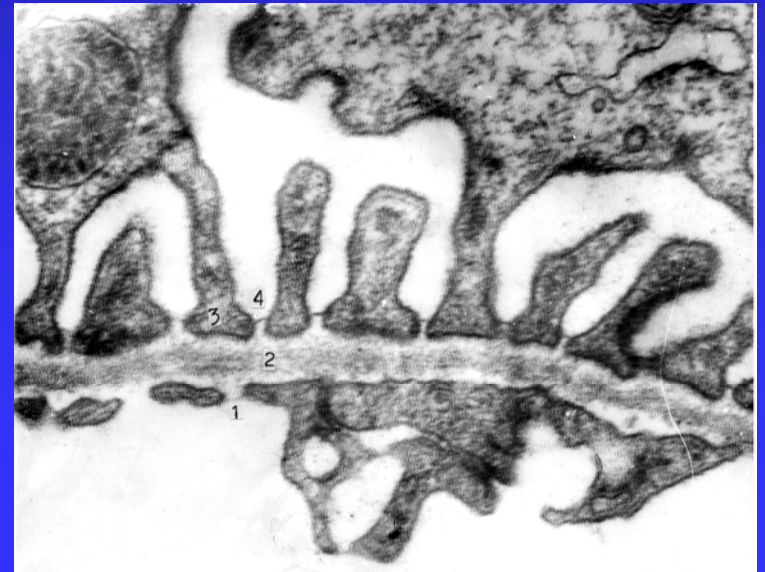
Glomerulus (SEM)



Podocyte (SEM)



Filtration barrier
(TEM)



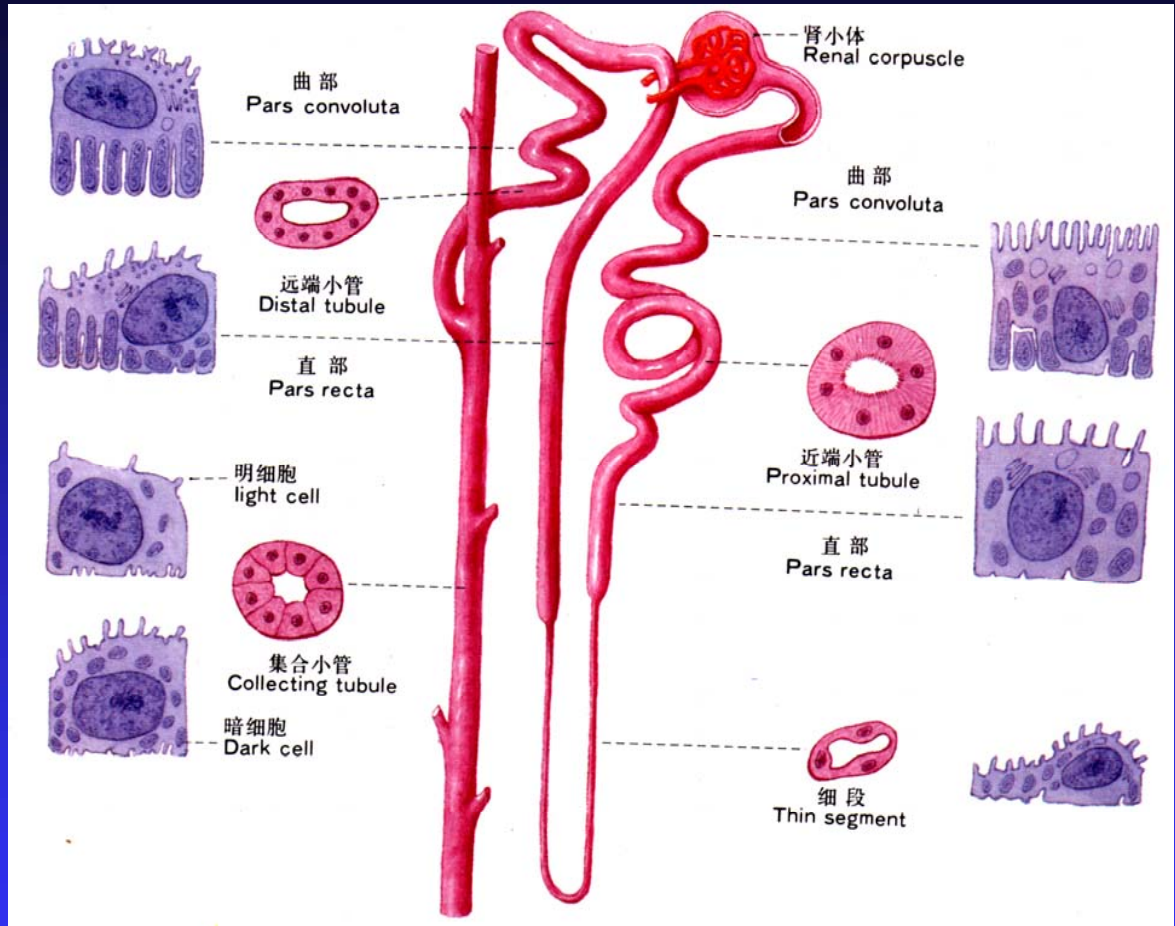
1.2 Renal Tubules

- Being lined by simple cuboidal epithelium, basement membrane and less numerous connective tissue

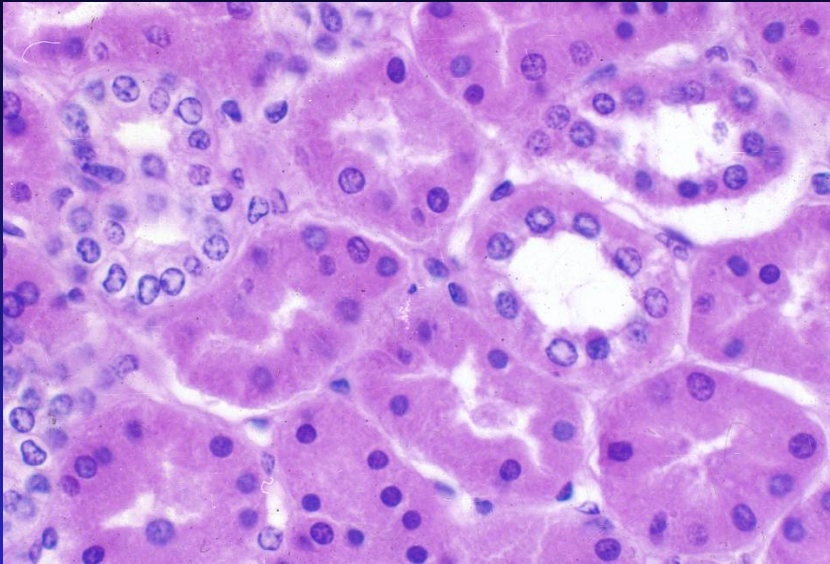
(1) Proximal Tubules

1) proximal convoluted tubule :
(pars convoluta)

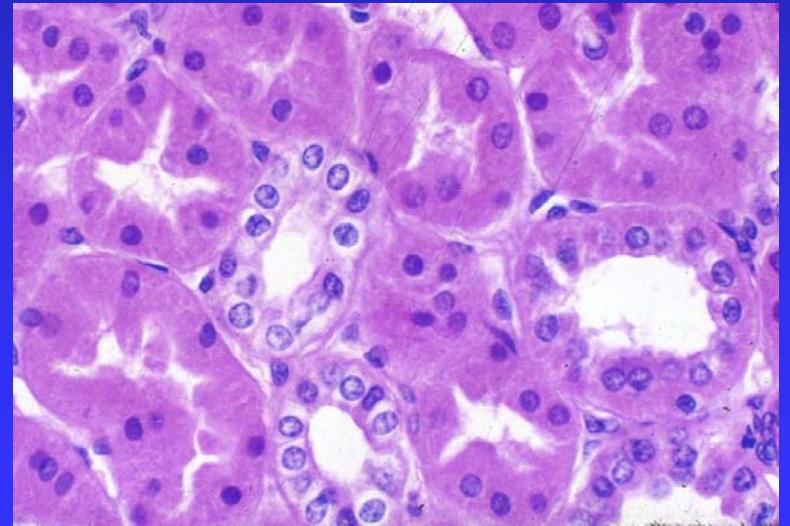
LM: strongly acidophilic cytoplasm,
brush border

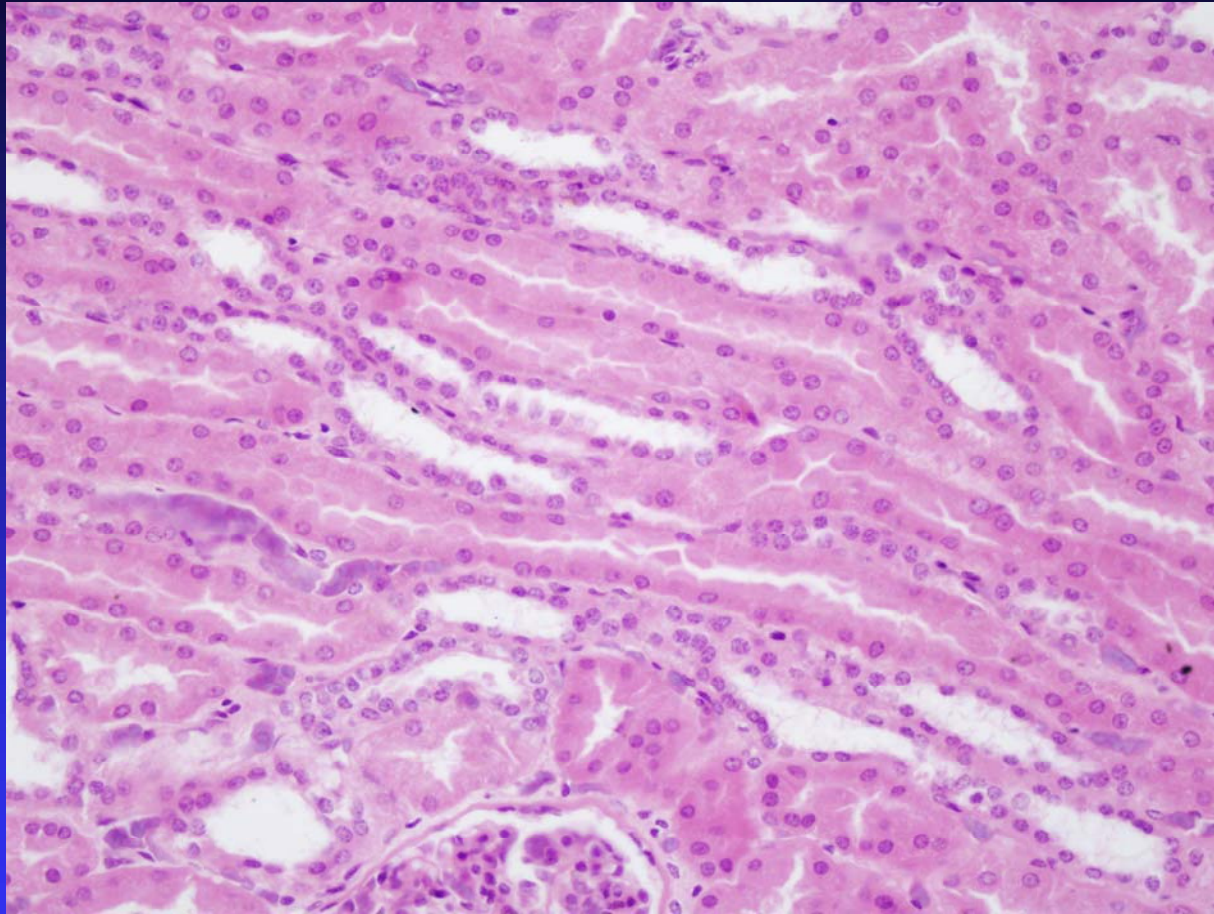


Renal tubule (Model)



Cortical Labyrinth





Medullary ray

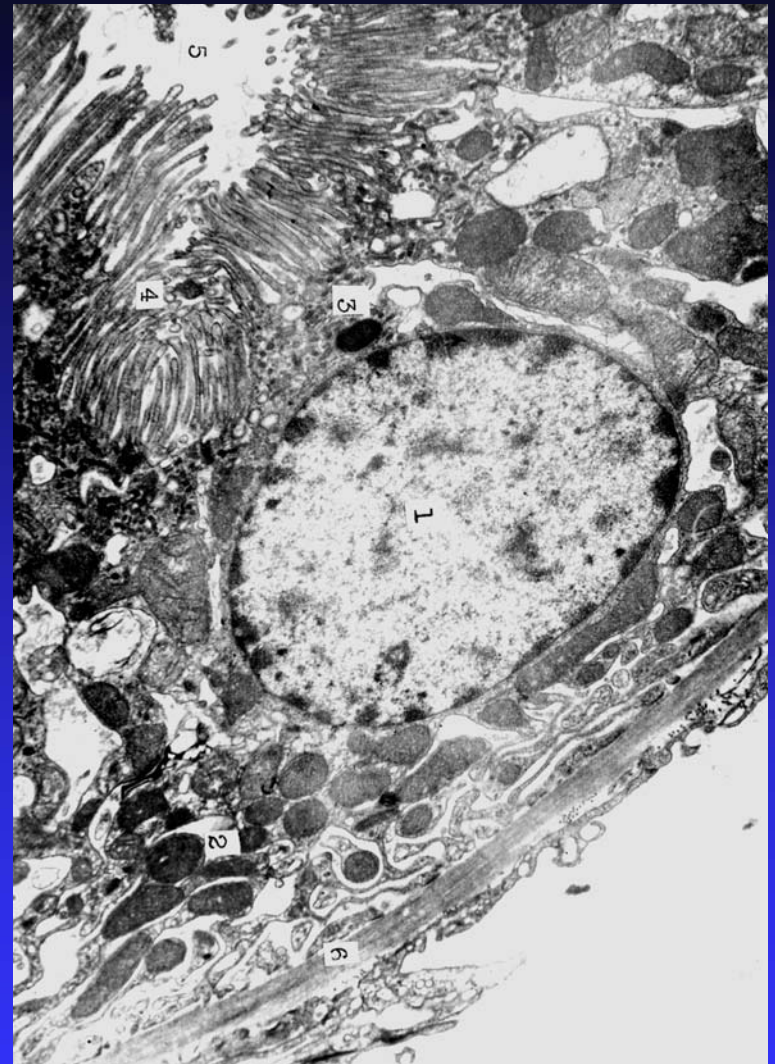
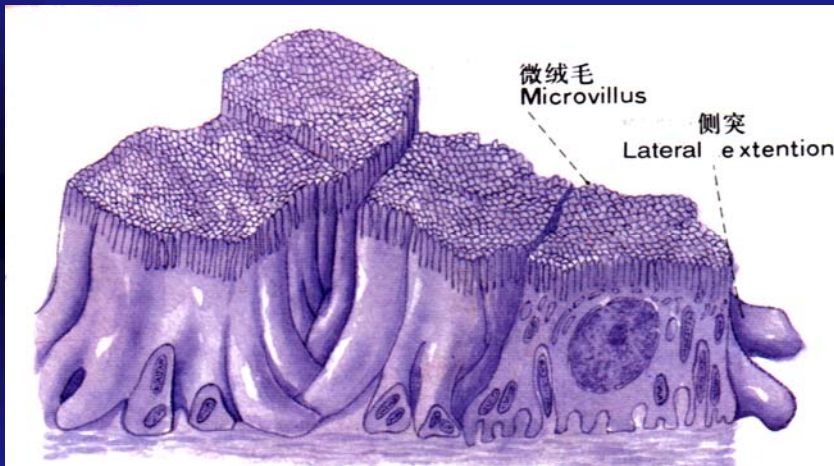
EM: microvilli, canaliculi and small vesicles, lateral processes, plasma membrane infolding, numerous mitochondria

Function: repeated absorption 65% Na⁺ and 85% H₂O, all glucose, amino acid, polypeptide and small molecule

protein, secreting H⁺ NH₃ so on.

2) Proximal straighted tubule :

(pars recta)



Proximal convoluted tubule (EM)

(2) Thin Segment

(3) Distal Tubules

distal straighted tubule (pars recta)

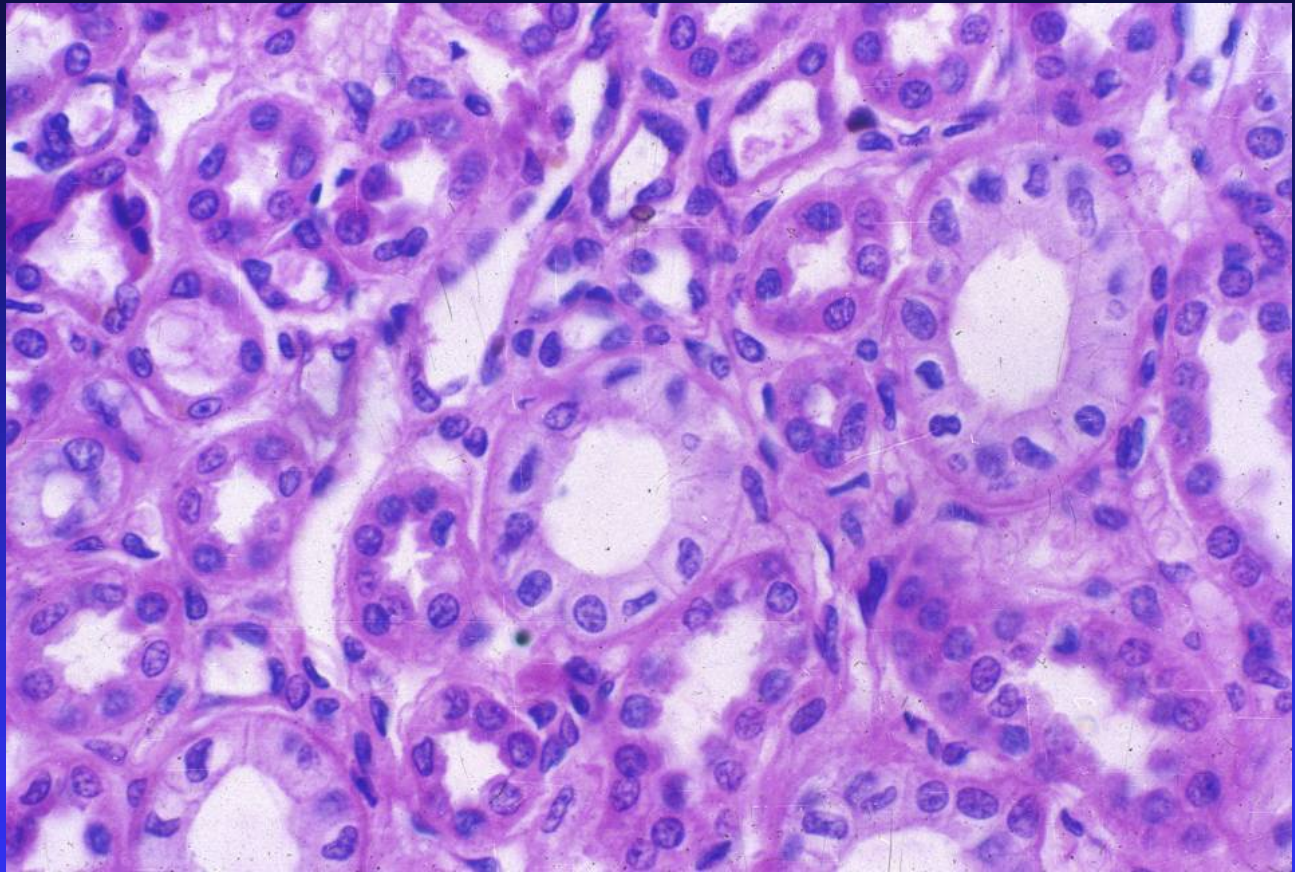
distal convoluted tubule

(pars convoluta)

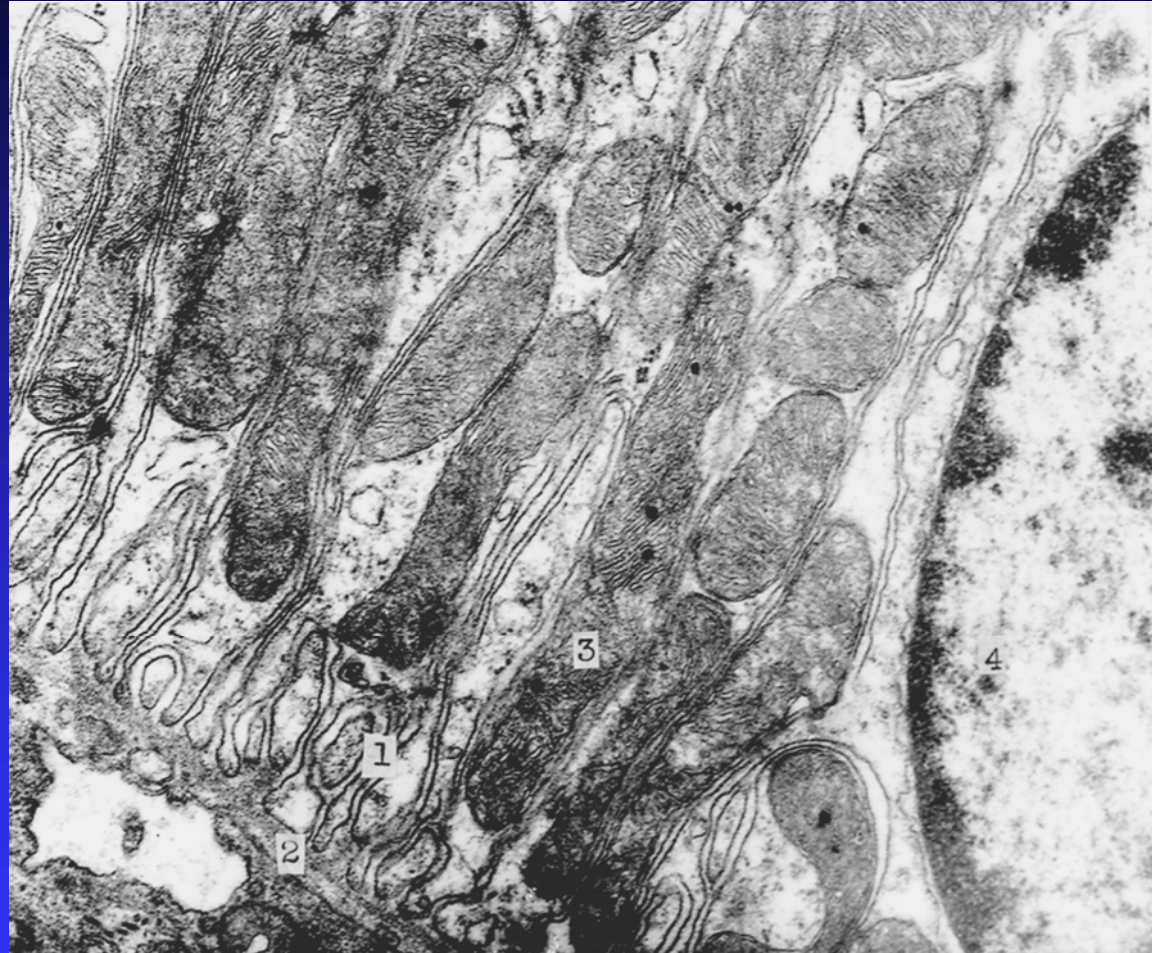
Function: ion exchange,

controlled by aldosterone and

antidiuretic hormones



Renal medulla (LM)



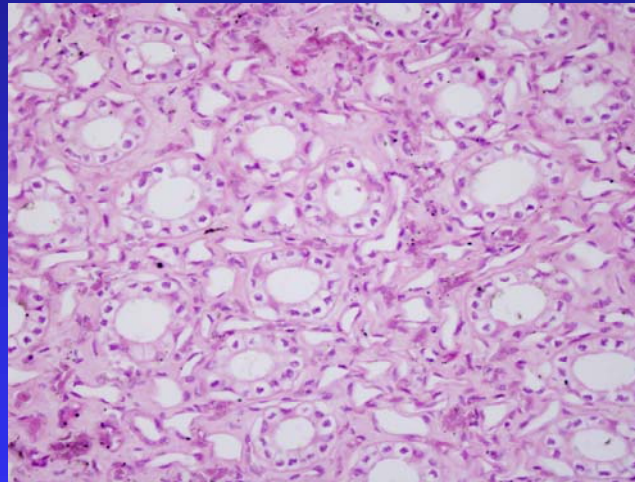
Distal convoluted tubule (EM)

2. Collecting duct

Arched collecting tubules

Straightened collecting tubules

Papillar duct



Function: ion exchange controlled by aldosterone and antidiuretic hormone

3. Juxtaglomerular Complex

juxtaglomerular cells, macula densa and extraglomerular mesangial cells

1. Juxtaglomerular Cells

secreting renin (proteolytic enzyme)

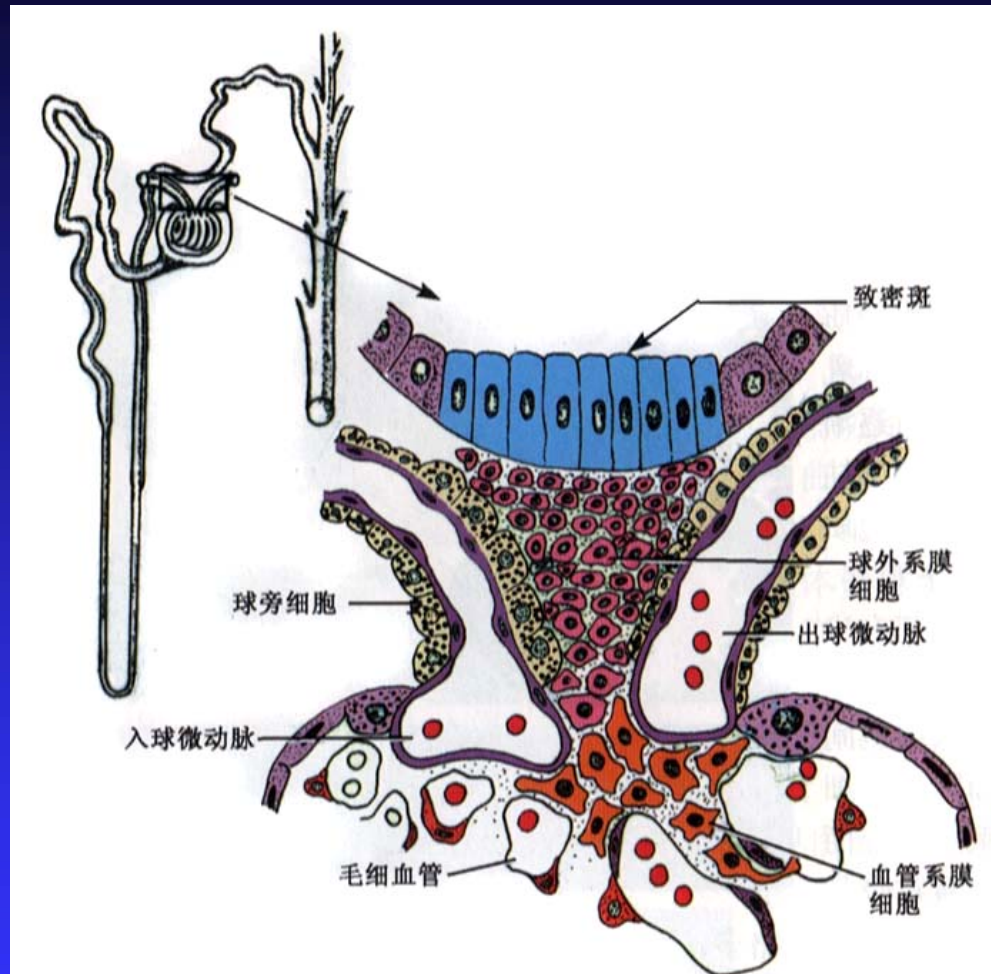
2. Macula Densa

Na ion receptor

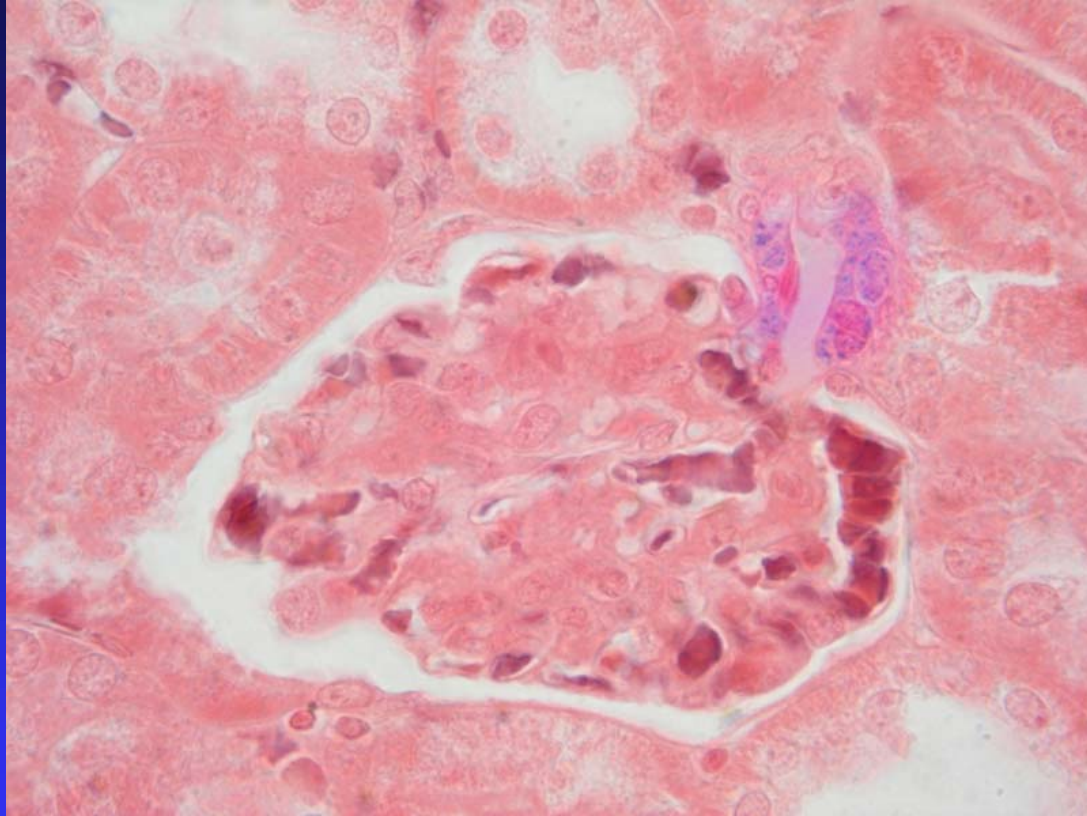
3. Extraglomerular Mesangial Cells

function: to transfer information

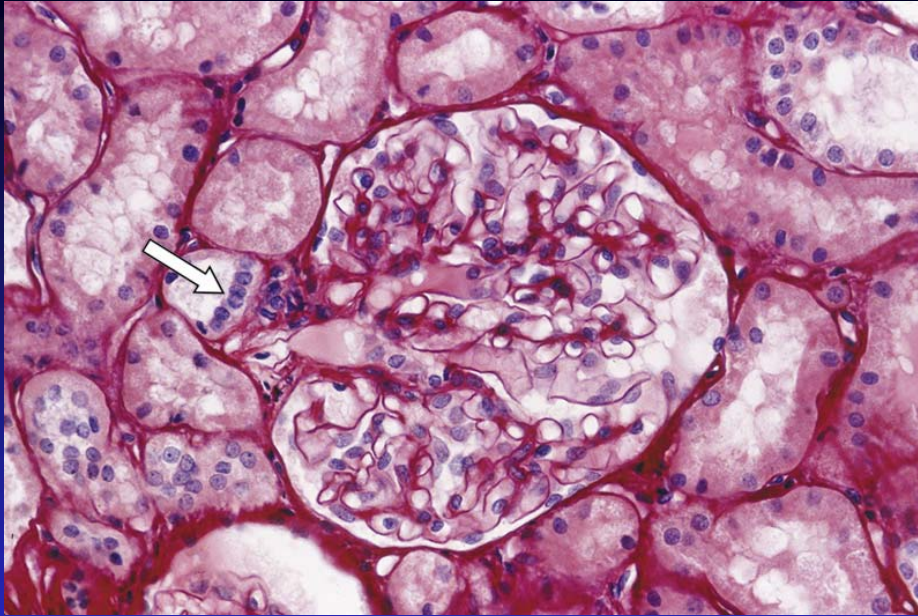
erythropoitin



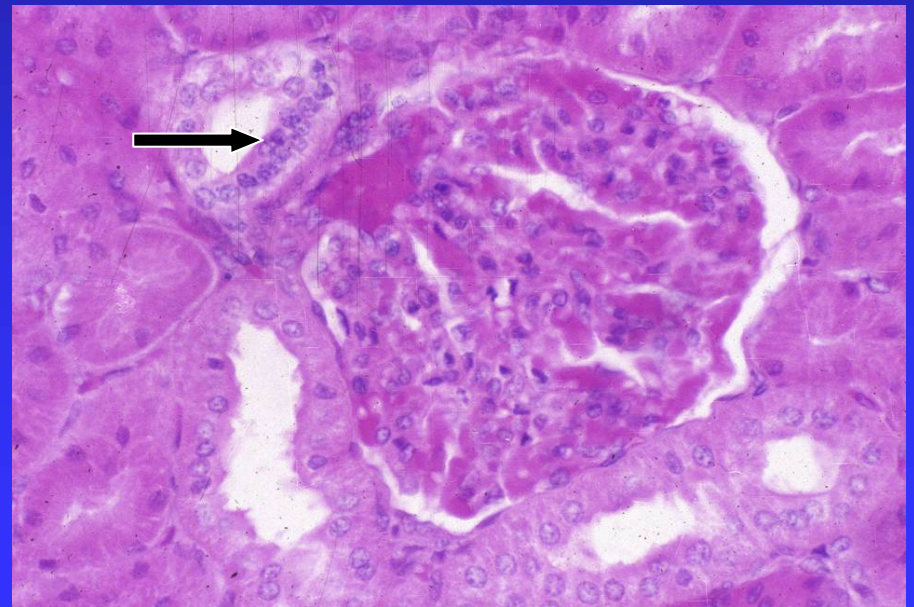
Juxtaglomerular Complex (model)



Juxtaglomerular Cells (LM)



Macula densa



4. Renal Interstitium

Interstitial cells: osmiophilic lipid droplet in the cytoplasm, secreting PG and participating in producing fibers and matrix in the interstitium.



Interstitial cells

5. Blood Circulation of Kidney

The characteristics:

- ① Renal artery deriving from abdominal main artery, and having larger blood stream;
- ② Forming double capillary network in the pathway of blood vessels;
- ③ Straight small blood vessels accompany medullar loops in the medulla.

The highlights this chapter

- What structures does nephron consist of ?
- Structure and function of renal corpuscle
- Structure in light and electron microscope and function of proximal convoluted tubule
- Juxtaglomerular Cell
- Macula Densa