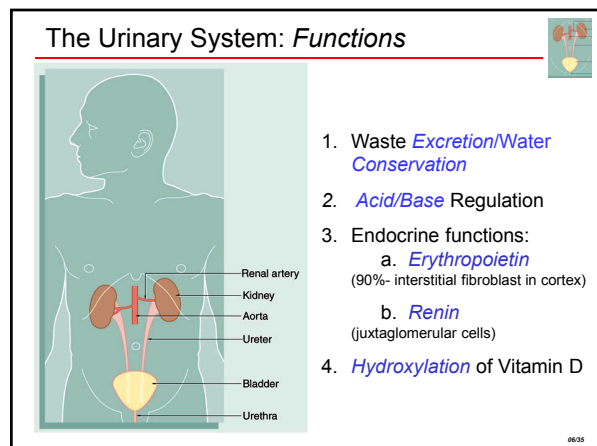
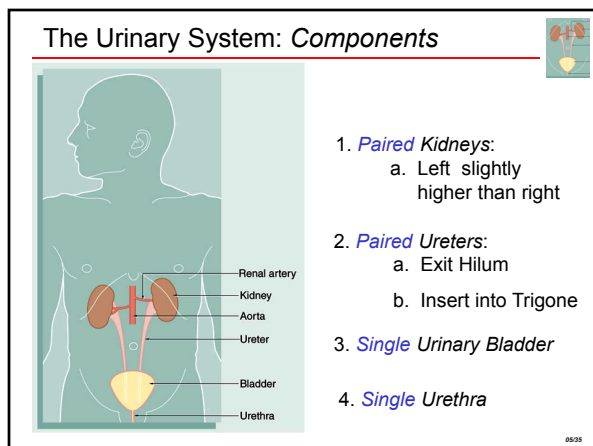
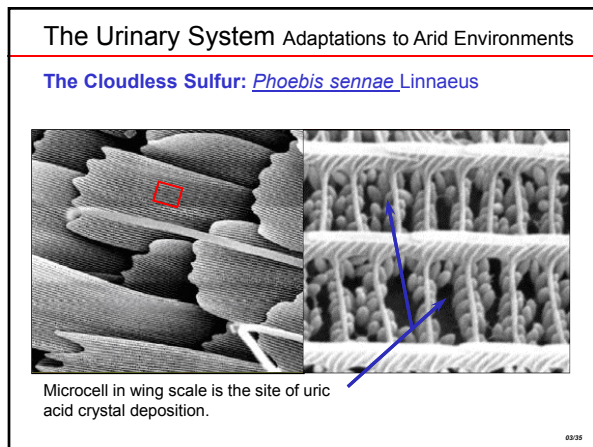
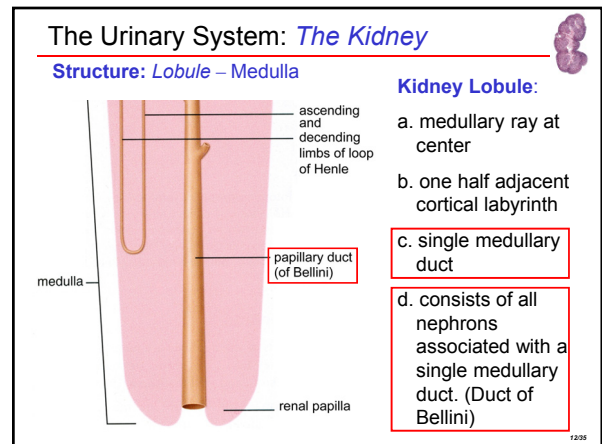
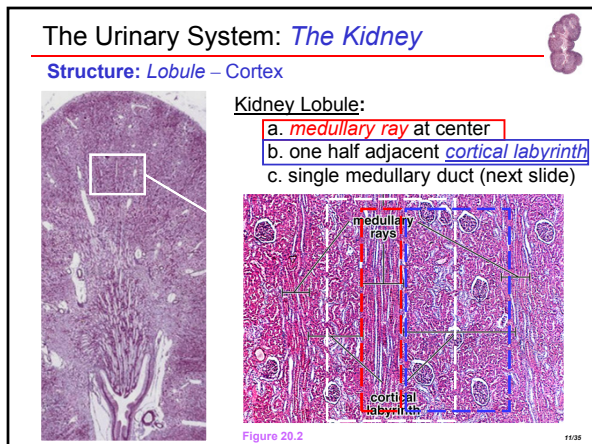
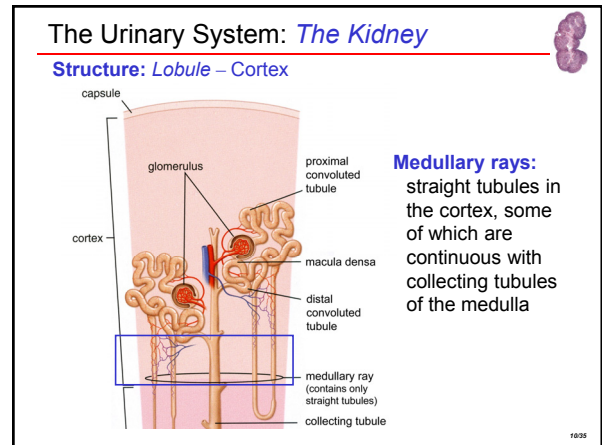
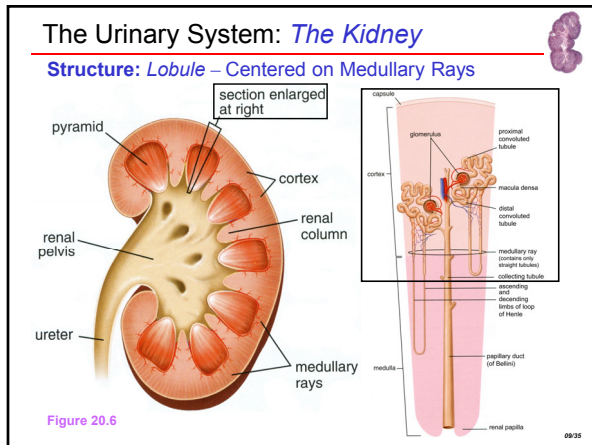
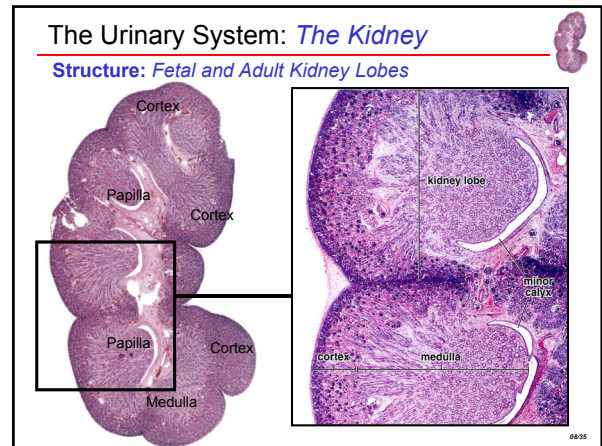
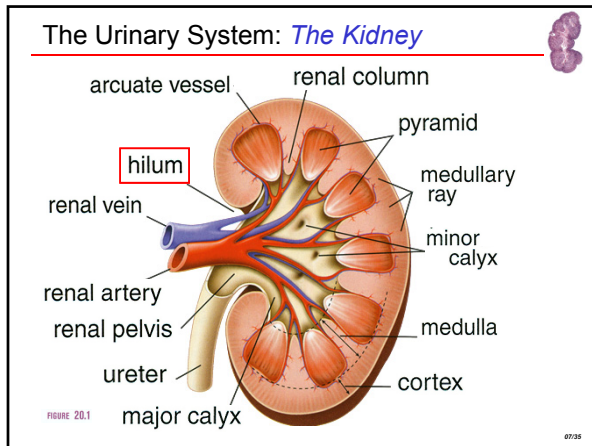
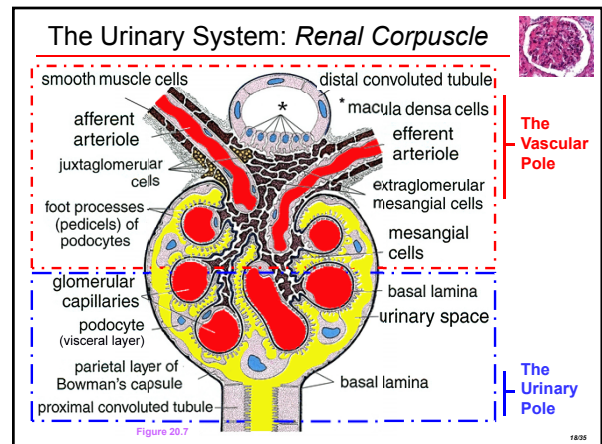
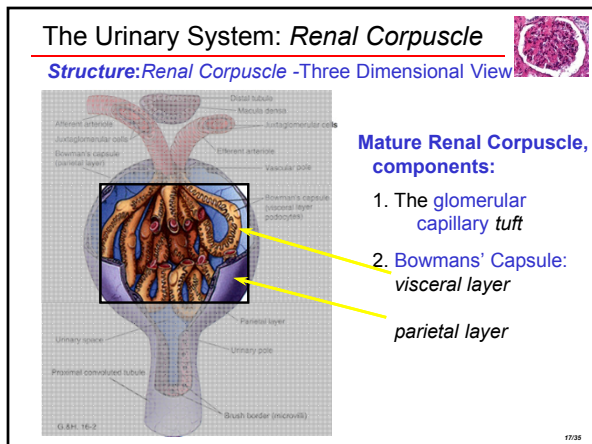
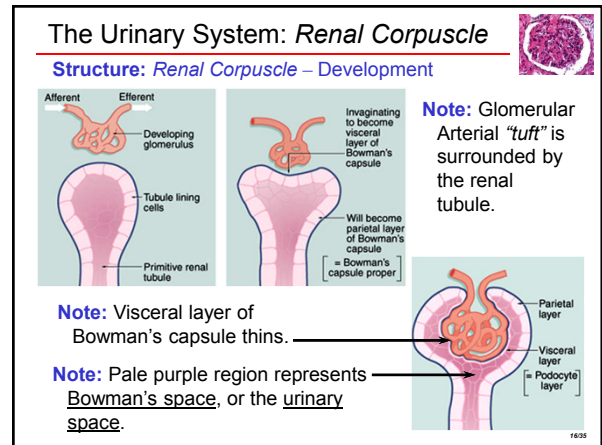
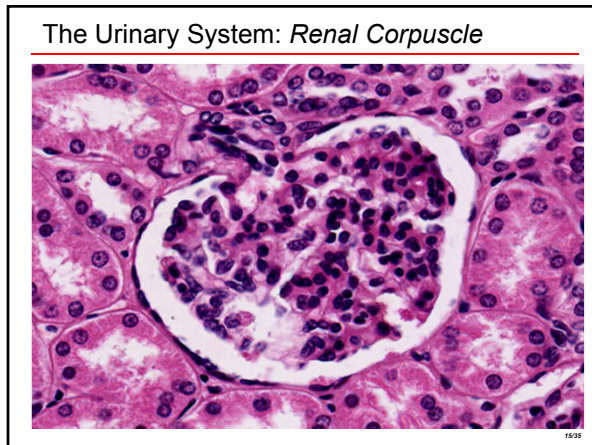
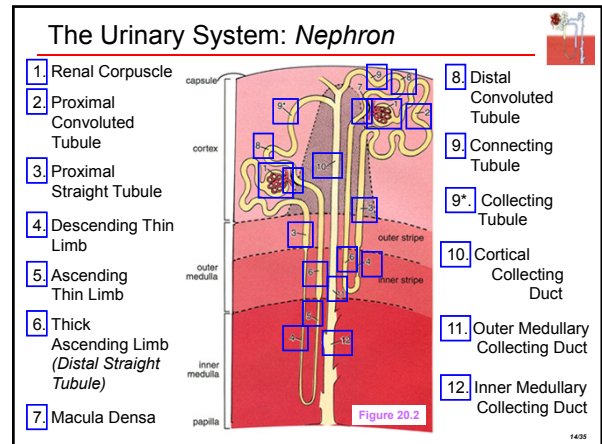
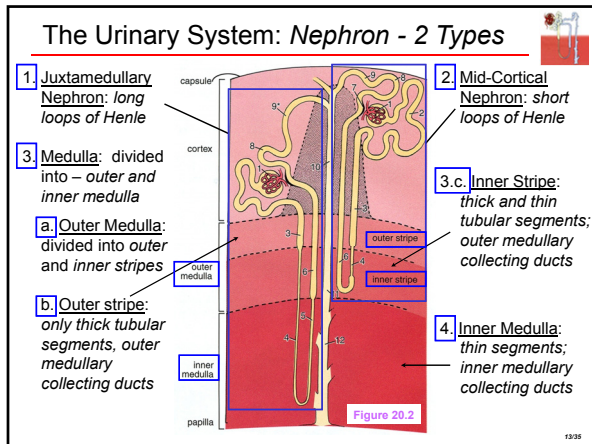




- ### The Urinary System: *Outline*
1. Adaptation to Arid Environments
 2. Urinary System Components and Functional Overview
 3. Kidney Lobes and Lobules
 4. The Nephron and Tubular Nomenclature
 5. The Renal Corpuscle
 6. The Glomerulus, Podocytes and the Filtration Barrier
 7. The Proximal Tubule
 8. The Loop of Henle
 9. The Distal Tubule
 10. Renal Circulation
 11. The Juxtaglomerular Apparatus
- 02/19







The Urinary System: *Renal Corpuscle*

Structure: Podocytes – Visceral Layer Bowman's Capsule

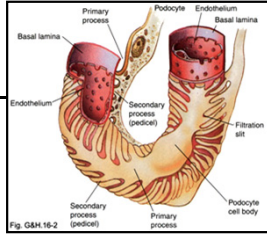
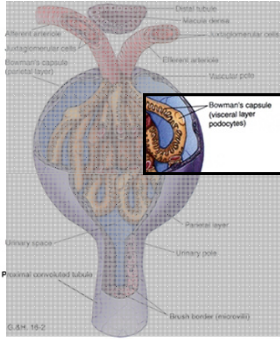


Fig. G&H.16-2

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Renal Corpuscle: *Podocytes – Visceral Layer*

Structure: Podocytes – Visceral Layer Bowman's Capsule

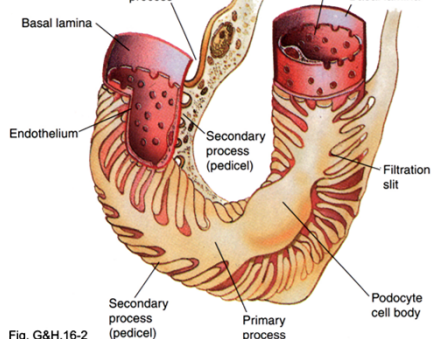


Fig. G&H.16-2

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The Urinary System: *Renal Corpuscle*

Structure: Podocytes – Visceral Layer Bowman's Capsule

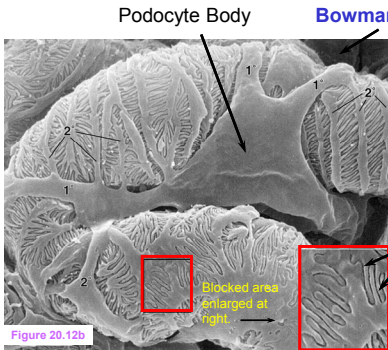


Figure 20.12b

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The Urinary System: *Renal Corpuscle*

Structure: Electron Microscopy of Renal Corpuscle

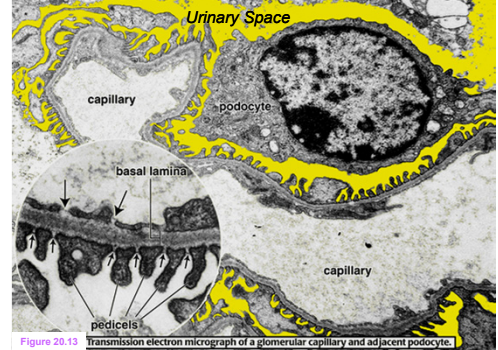


Figure 20.13

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The Urinary System: *Renal Corpuscle*

Structure: Glomerular Filtration Barrier – Components (3)

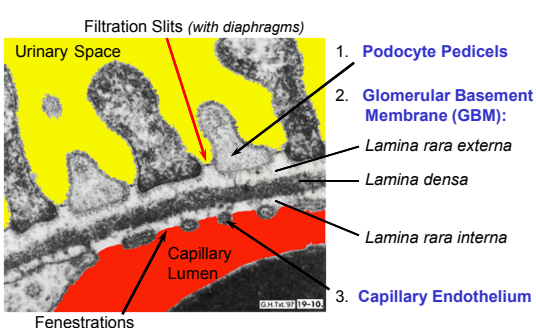


Figure 20.14

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The Urinary System: *Renal Corpuscle*

Structure: Mesangial Cells – Functions

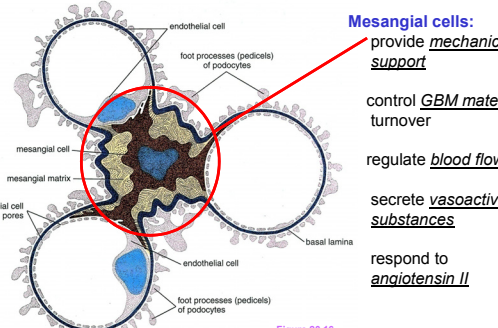


Figure 20.16

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The Urinary System: *Renal Corpuscle*

Structure: *Urinary Pole – Proximal Tubule, pars convoluta*

The diagram shows the renal corpuscle with labels: Afferent arteriole, subcapsular space, Bowman's capsule (parietal layer), vascular pole, Efferent arteriole, and Proximal tubule. The histological section shows the proximal tubule with labels: Distal Tubule, Afferent A., and Proximal tubule. A magnified view of the proximal tubule shows the brush border (microvilli) and the basal lamina.

The Urinary System: *Proximal Tubule*

Structure: *Proximal Convolted Tubules – Cytology*

The 3D model shows a proximal tubule cell with labels: Primary Cilia, Cell Border, Microvilli: Brush Border, Extensive lateral interdigitations, Plicae: lateral infolding, and Basal lamina.

The Urinary System: *Loop of Henle*

Structure: *The Kangaroo Rat and the Loop of Henle*

Concentrated Urine: Counter-Current Multiplier

- conserves water
- depends on length of the Loop of Henle

The diagram shows the Loop of Henle with labels: proximal straight tubule, thin ascending limb, Loop of Henle, distal straight tubule, collecting duct, and collecting tubule. A photograph of a kangaroo rat is shown next to it.

Kangaroo Rats:

- live in arid conditions and need to conserve water
- therefore, have the longest Loop of Henle of all the mammals

The Urinary System: *Distal Tubule*

Structure: *Distal Tubules: reabsorption of ~7% filtrate*

DTs: sensitive to Aldosterone and Antidiuretic Hormone

Histology: low cuboidal cells; lateral and basal infoldings

The diagram shows the distal tubule with labels: proximal convoluted tubule, distal convoluted tubule, proximal straight tubule, distal straight tubule, thin ascending limb, Loop of Henle, collecting duct, and collecting tubule. The histology shows low cuboidal cells with lateral and basal infoldings, labeled as DC.

The Urinary System: *Collecting Tubule*

Structure: *Cortical Collecting Tubules/ Medullary Ray*

Histology: Collecting Tubules – low cuboidal cells

The diagram shows the collecting tubule with labels: proximal convoluted tubule, distal convoluted tubule, proximal straight tubule, distal straight tubule, thin ascending limb, Loop of Henle, collecting duct, and collecting tubule. The histology shows low cuboidal cells, labeled as MR.

The Urinary System: *Collecting Tubule*

Structure: *Outer Medullary Collecting Tubules/Ducts*

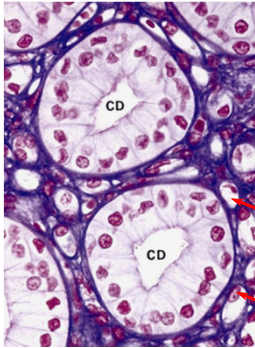
Histology: low cuboidal epithelium, central nuclei, lateral cell borders. Intercalated (Dark) & Principal cells (sensitive to Aldosterone).

Vasa recta Thin Loop of Henle

The diagram shows the outer medullary collecting tubule with labels: proximal convoluted tubule, distal convoluted tubule, proximal straight tubule, distal straight tubule, thin ascending limb, Loop of Henle, collecting duct, and collecting tubule. The histology shows low cuboidal epithelium with central nuclei and lateral cell borders, labeled as Vasa recta and Thin Loop of Henle.

The Urinary System: Collecting Ducts

Structure: Inner Medullary Collecting Ducts of Bellini



Papillary Collecting Ducts:
columnar cells
clear cytoplasm
lateral cell boundaries

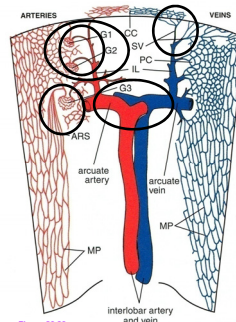
Note: Vasa recta with blood elements in the lumen.

Note: Thin loops of Henle with prominent nuclei in the lumen.

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The Urinary System: Blood Supply

Structure: The Cortical and Medullary Vasculature



G1 and G2 glomeruli:
efferent arterioles give rise to peritubular capillaries (pc)

G3 glomeruli:
efferent arterioles give rise to vasa recta capillaries (ARS, MP—medullary plexus)

Arcuate aa. and vv.:
boundary between cortex and medulla

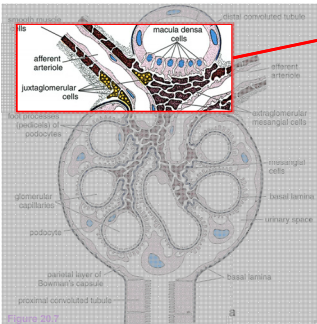
Interlobular (IL) aa/vv.:
give rise to stellate aa/vv (sv) afferent arterioles

Figure 20.23

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The Urinary System: The JG Apparatus

Structure: The Juxtaglomerular apparatus



The Juxtaglomerular Apparatus

Components of the JGA:

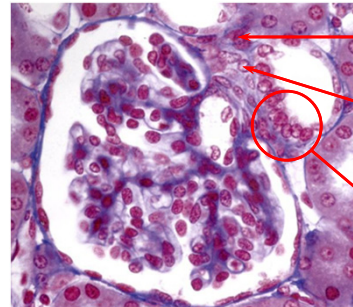
1. Juxtaglomerular cells of the afferent arteriole
2. Macula Densa cells of the Distal Tubule
3. Extra-glomerular Mesangial Cells (Lacis cells)

33/08

The Urinary System: The JG Apparatus

Function: The Juxtaglomerular apparatus

Vascular Pole of Renal Corpuscle



Function of the JGA:

1. Juxtaglomerular secrete renin cells react to stretch
2. Extra-glomerular Mesangial Cells modify activity of JG cells
3. Macula Densa cells sense changes in Na and regulate JG cells

34/08

The Urinary System: Summary

1. The Function of the Urinary System is Carefully Tied to Its Structural Components.
2. The Kidney is divided into a Cortex, containing the filtering structures (Glomeruli) and a Medulla containing a collection system composed of tubular units (Collecting Ducts and Loops of Henle).
3. Loops of Henle within the Medulla are responsible for establishing an interstitial concentration gradient which is part of a Counter-current Multiplier.
4. The Kidney contains a unique circulation responsible for returning materials reabsorbed from the ultrafiltrate to general circulation and helping to maintain a hypertonic interstitial medulla necessary for developing a Concentrated Urine (*Counter-current Exchange System*).
5. The Juxtaglomerular Apparatus is important in regulating both renal and systemic blood pressure.

35/08