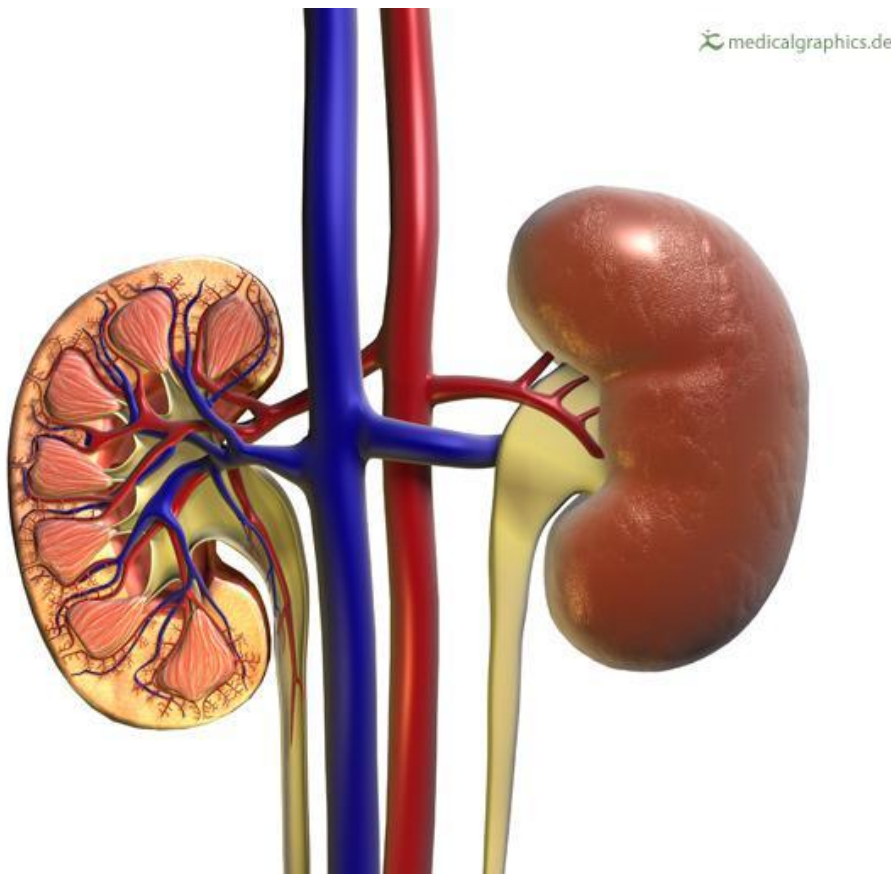


**Teaching Demo  
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# Open Educational Resources

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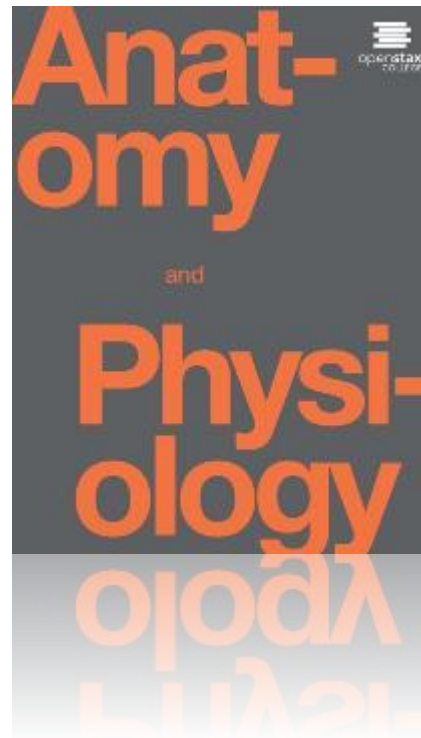
Improve  
URINARY  
Powerpoints  
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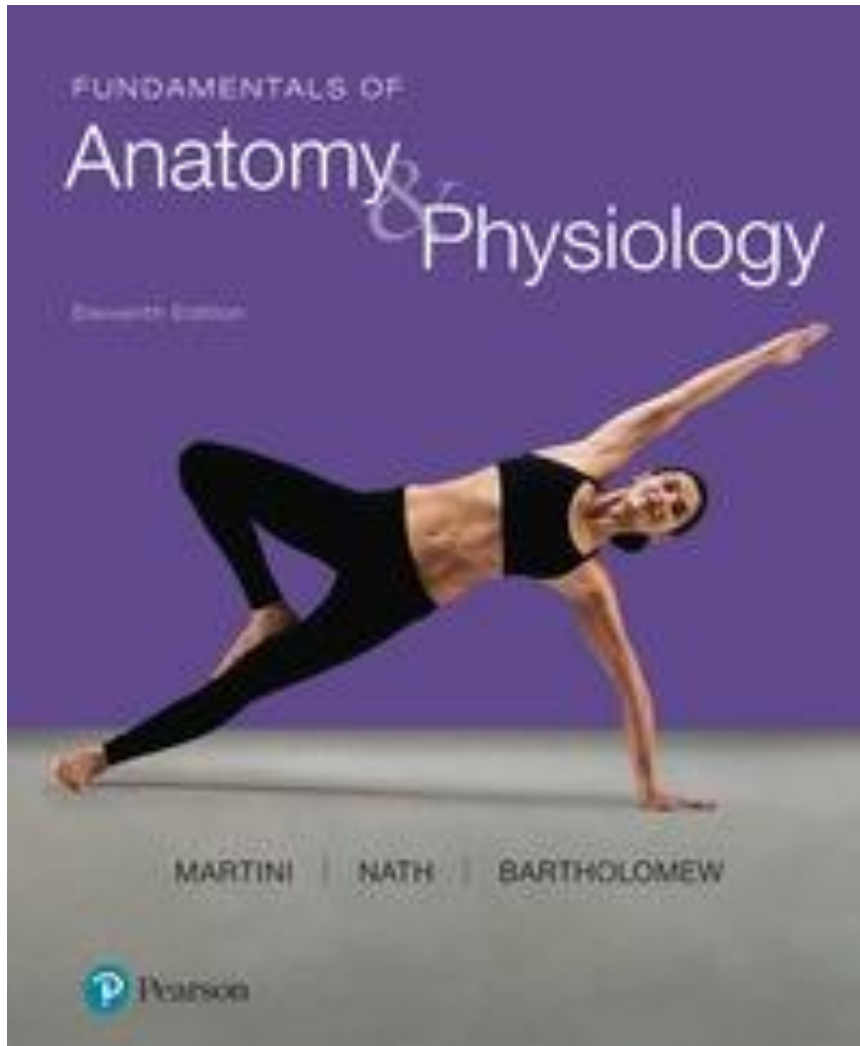
# ANATOMY & PHYSIOLOGY

## Chapter 25 THE URINARY SYSTEM

PowerPoint Image Slideshow



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# Urinary System Functions

Cleansing the blood and ridding the body of wastes

Regulation of pH

The regulation of blood pressure

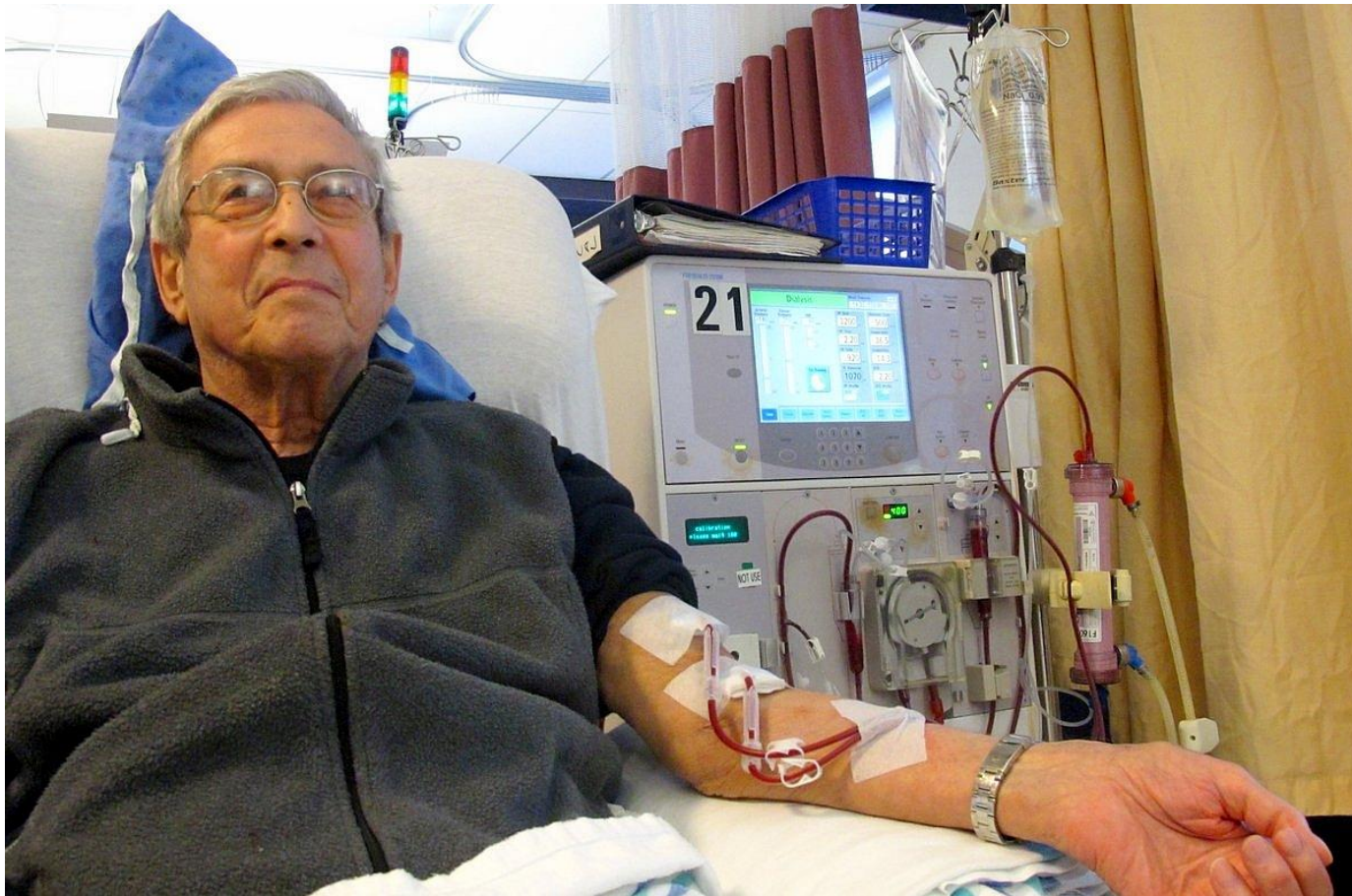
Regulating the concentration of solutes in the blood

Important in determining the concentration of red blood cells

Perform the final synthesis

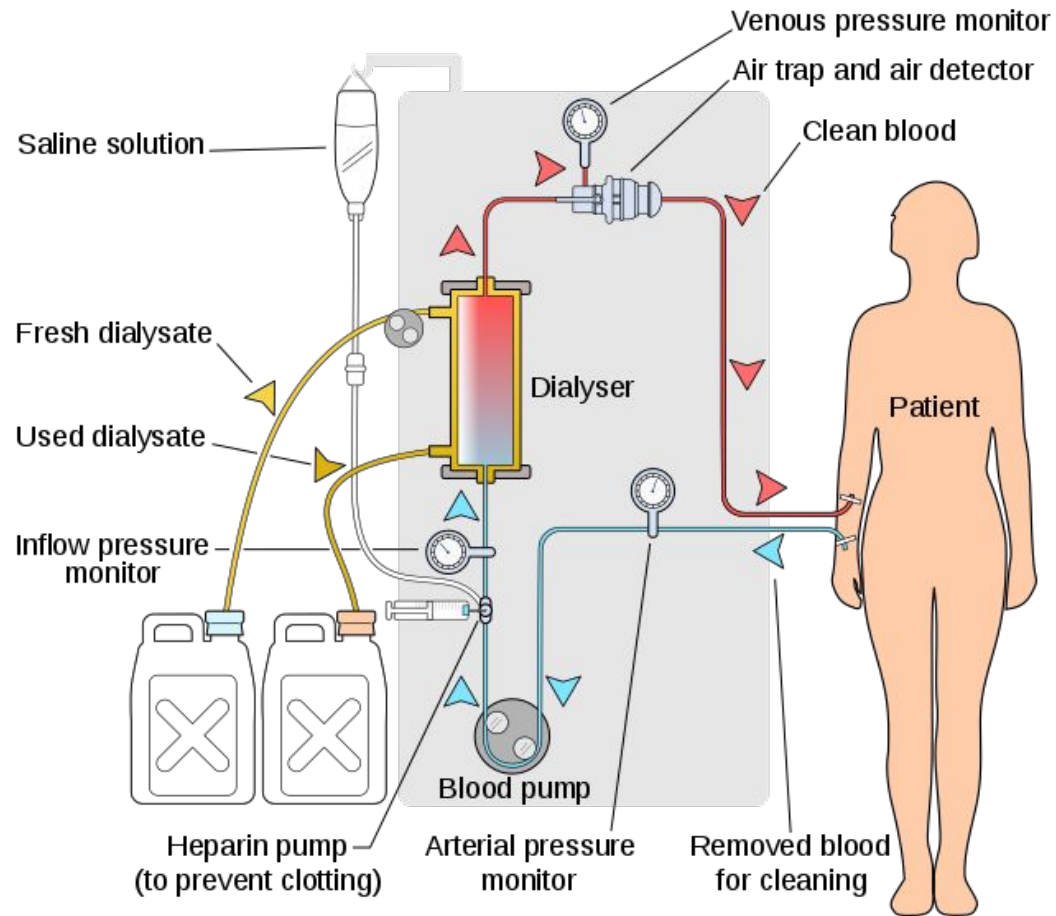
Step of vitamin D production

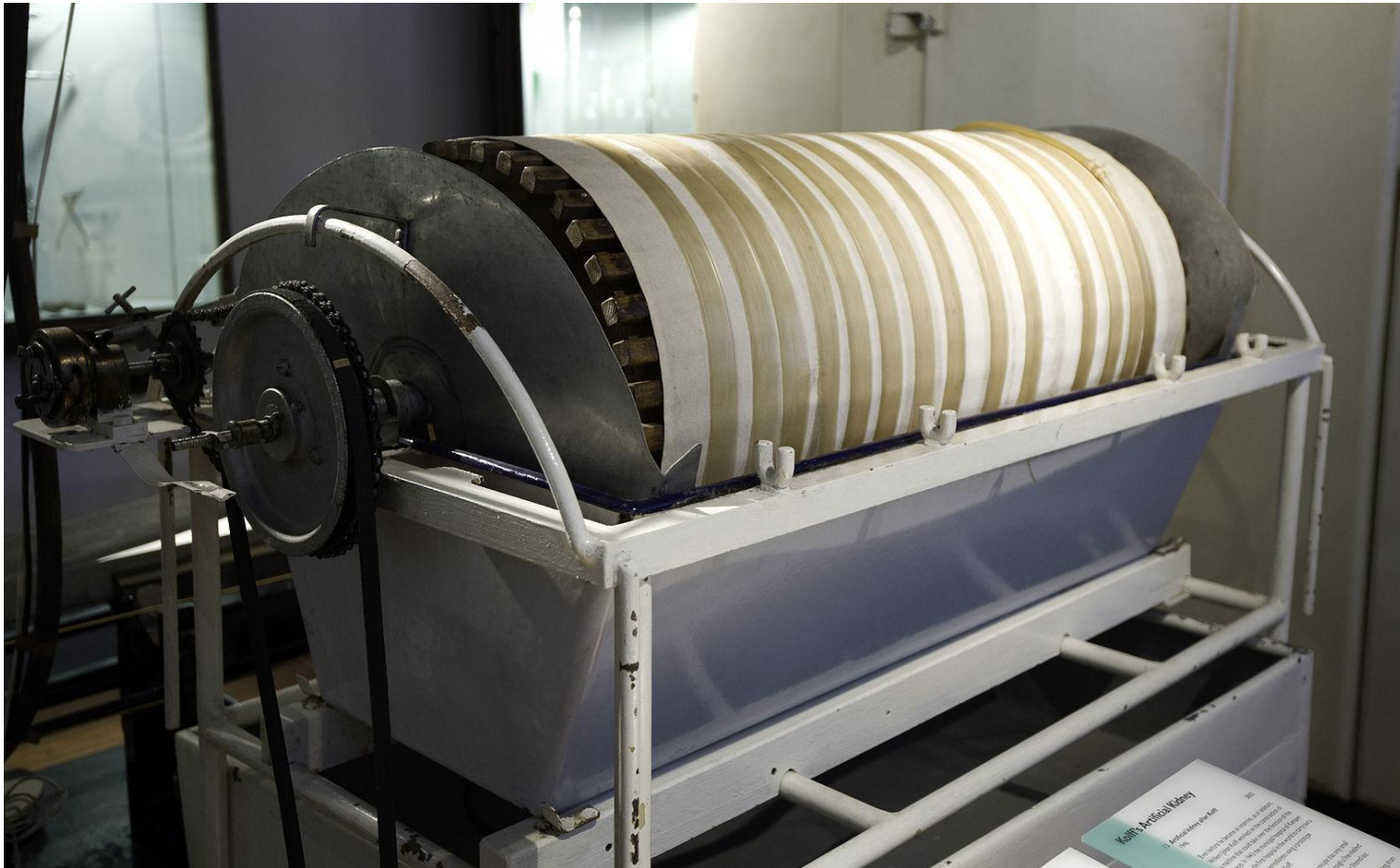
Storage and excretion of urine



By Anna Frodesiak (Own work) [CC0], via [Wikimedia Commons](#)

# Dialysis





By Rob Koopman from Leiderdorp, Netherlands ([Flickr](#)) [[CC BY-SA 2.0](#)] via Wikimedia Commons  
Built by Dutch Physician Willem Kolff in 1943

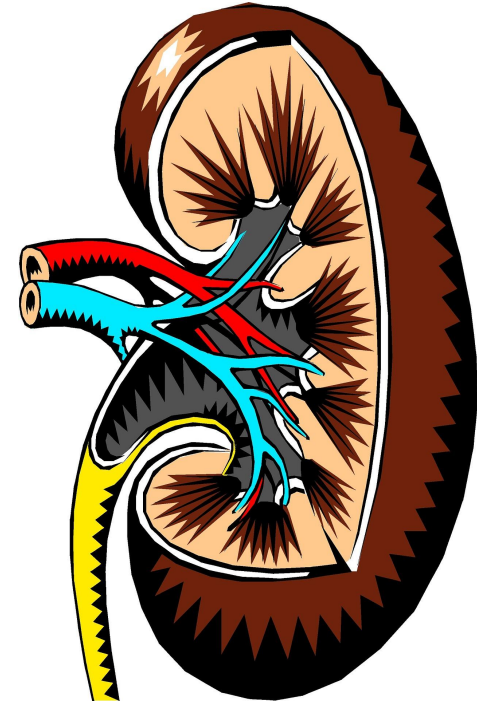
# KIDNEY FAILURE

In 2015, **660,000** Americans are being treated for kidney failure

Of these, **468,000** are dialysis patients.

**193,000** have a functioning kidney transplant.<sup>1</sup>

In 2017, the average hospital billed charges for a kidney transplantation in the United States was \$414,800.<sup>2</sup>



[Kidney-cross-section by Balik CC0](#)

<sup>1</sup> [U.S. Renal Data System Annual Data Report \(2015\)](#)

<sup>2</sup> [2017 U.S. organ and tissue transplant cost estimates and discussion](#)

## Transplants Performed in 2016 by Organ

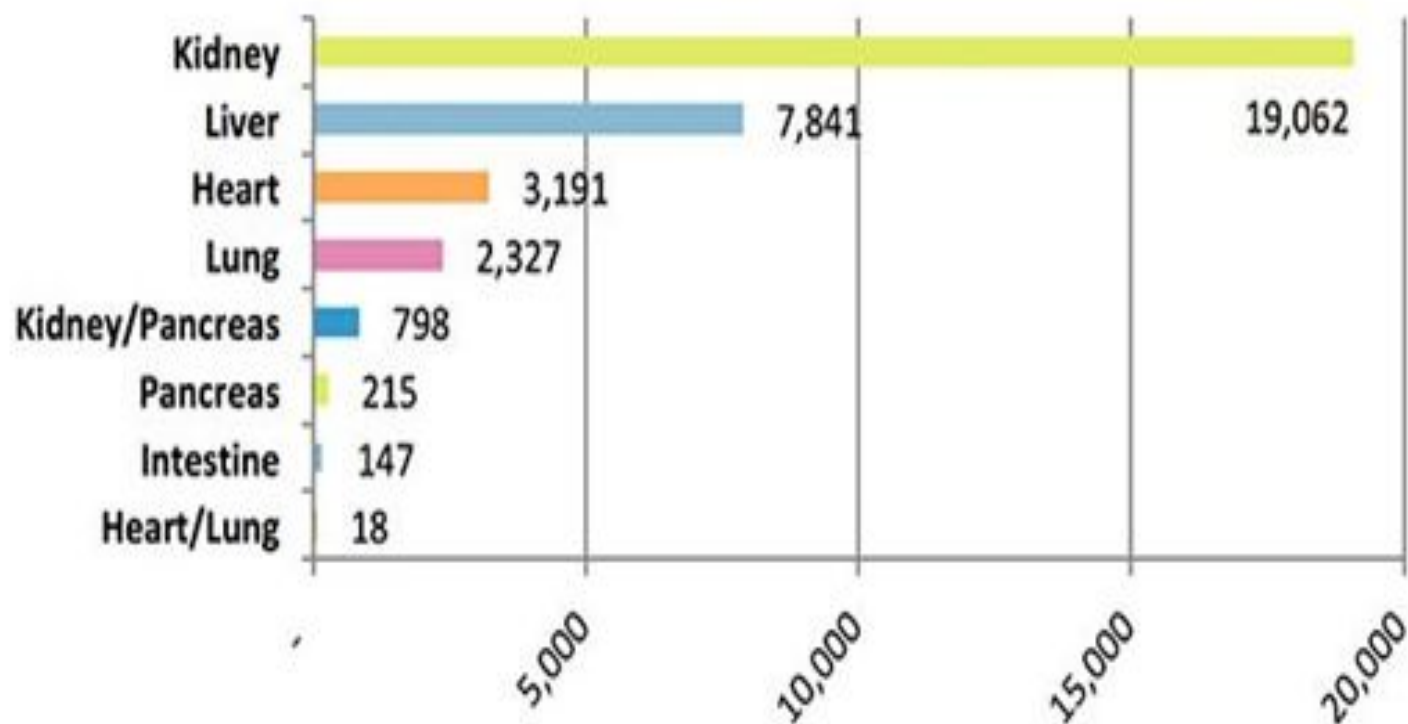


Table from the United States [Organdonor.gov](https://organdonor.gov)

# Structures of the Urinary System

Kidneys

Ureters

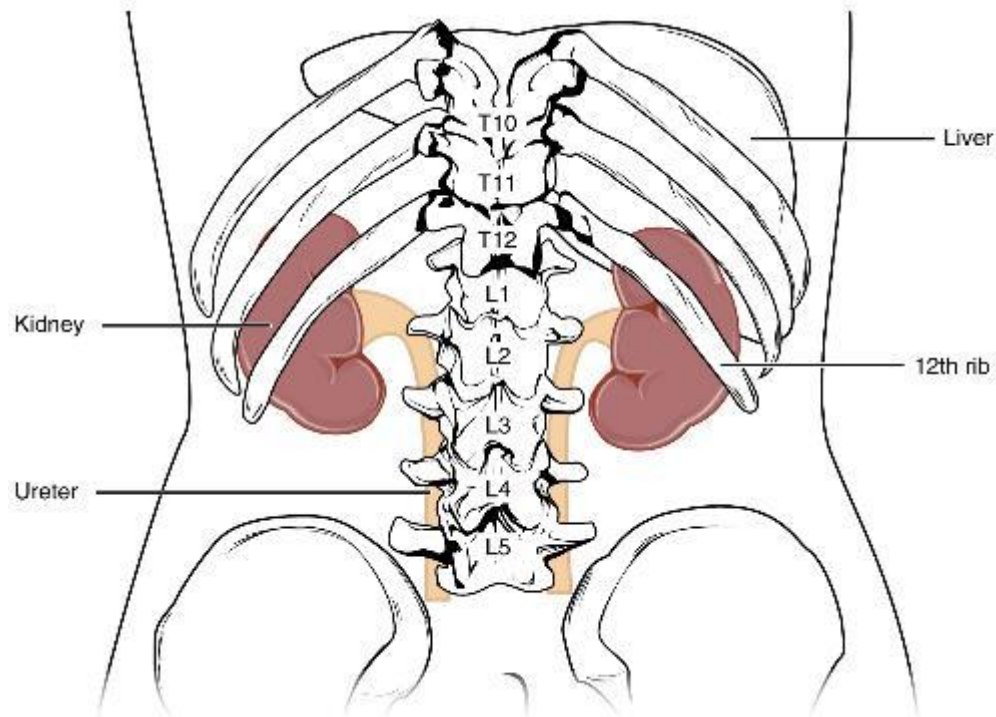
Bladder

Urethra

Overview of system

<http://www.hhmi.org/biointeractive/kidney-function>

## FIGURE 25.7



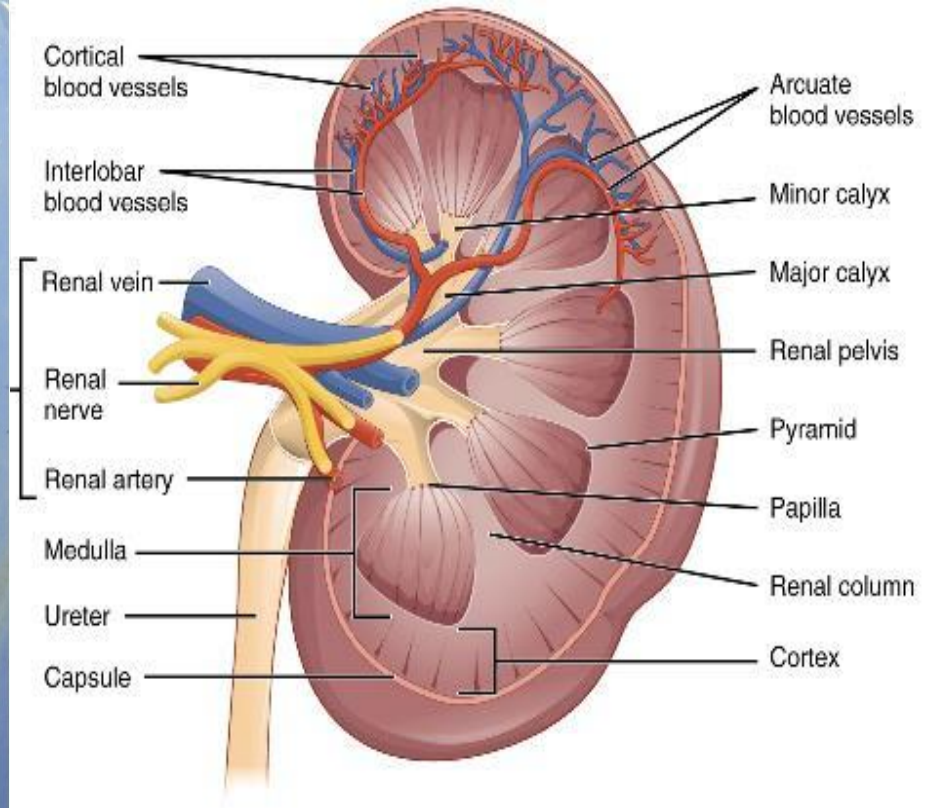
### Kidneys

The kidneys are slightly protected by the ribs and are surrounded by fat for protection (not shown).

# SHEEP KIDNEY- inject contrast



**FIGURE 25.8**



**Yellow Renal Pyramids with intervening Columns in Medulla.  
Glomerulus (red and blue vessels) in outer Renal Cortex**

## KIDNEY FIGURE 25.8

A frontal section through the kidney reveals an outer region called the **renal cortex** and an inner region called the **medulla**

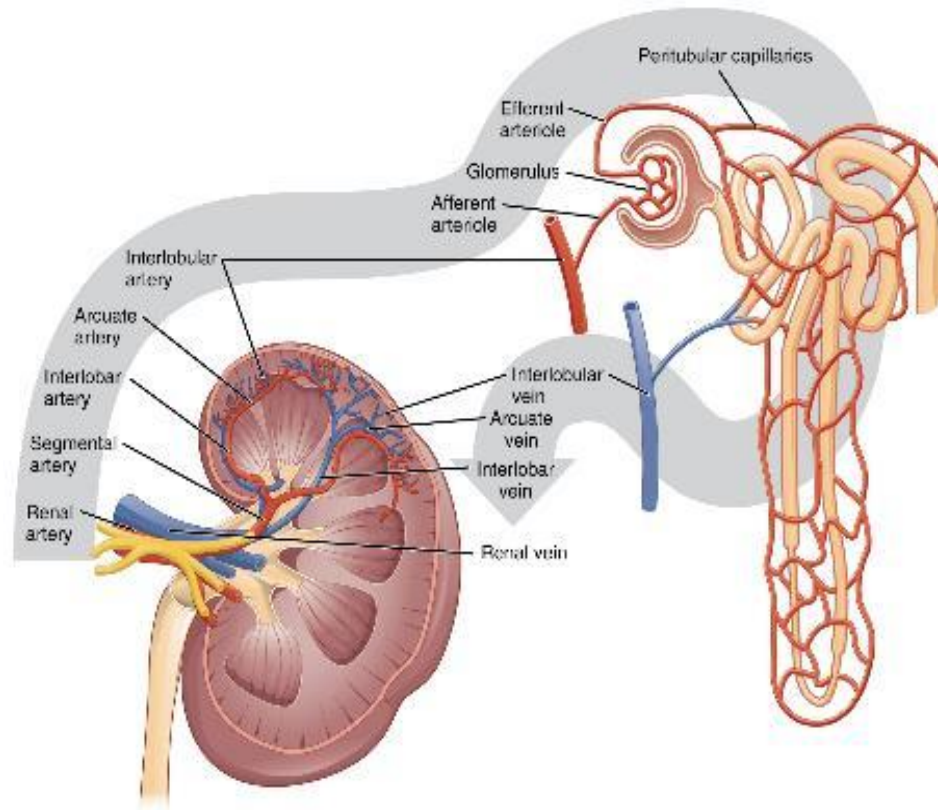
The **renal columns** are connective tissue extensions that radiate downward from the cortex through the medulla to separate the most characteristic features of the medulla, the **renal pyramids** and **renal papillae**.

The papillae are bundles of collecting ducts that transport urine made by nephrons to the **calyces** of the kidney for excretion.

The renal columns also serve to divide the kidney into 6–8 lobes and provide a supportive framework for vessels that enter and exit the cortex.

The **renal hilum** is the entry and exit site for structures servicing the kidneys: vessels, nerves, lymphatics, and ureters.

## FIGURE 25.9



Blood Flow in the Kidney

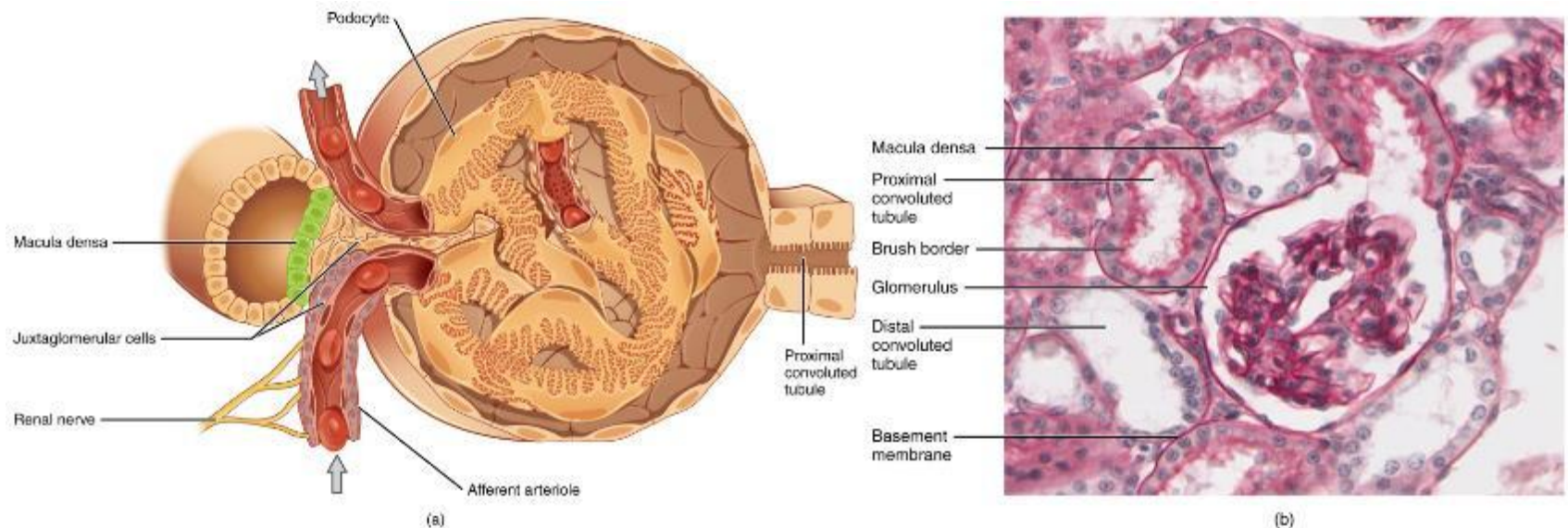
## NEPHRONS AND VESSELS FIGURE 25.9

The renal artery first divides into segmental arteries, followed by further branching to form interlobar arteries that pass through the renal columns to reach the cortex (**Figure 25.9**).

The interlobar arteries, in turn, branch into arcuate arteries, cortical radiate arteries, and then into afferent arterioles. The afferent arterioles service about 1.3 million nephrons in each kidney.

**Nephrons** are the “functional units” of the kidney; they cleanse the blood and balance the constituents of the circulation.

# FIGURE 25.13



## Juxtaglomerular Apparatus and Glomerulus

- (a) The JGA allows specialized cells to monitor the composition of the fluid in the DCT and adjust the glomerular filtration rate.
- (b) This micrograph shows the glomerulus and surrounding structures. LM × 1540. (Micrograph provided by the Regents of University of Michigan Medical School © 2012)

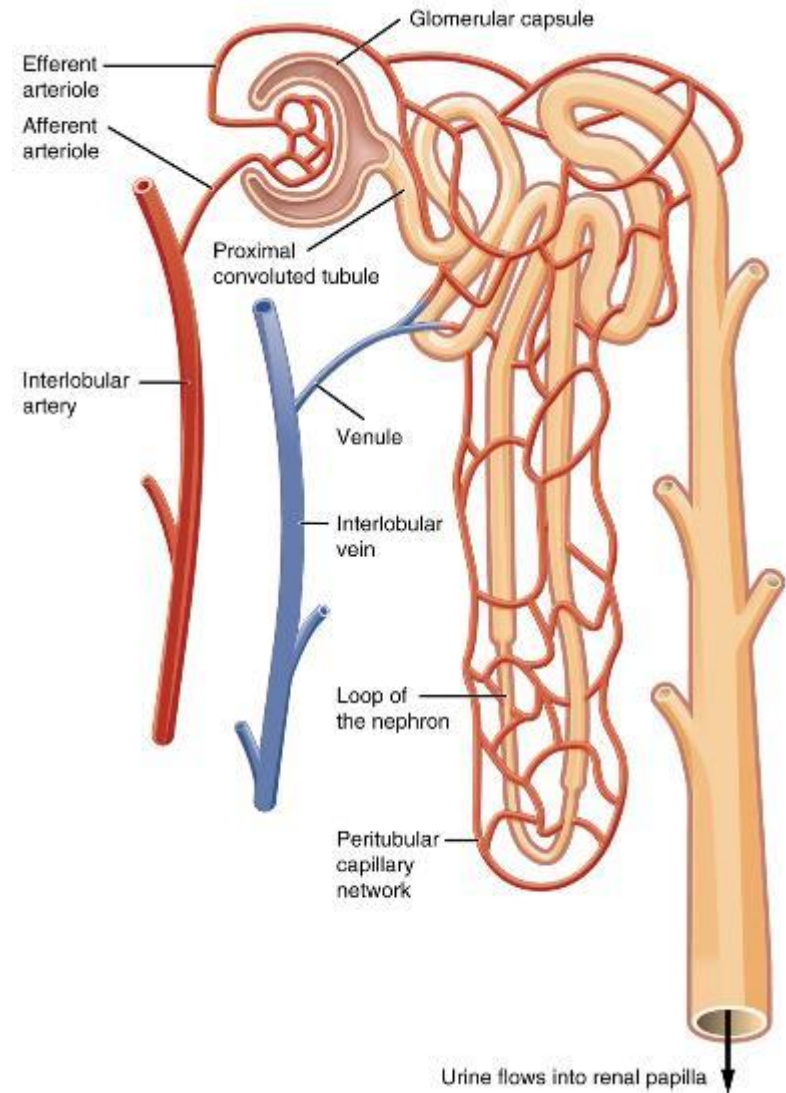
# FIGURE 25.10

## Blood Flow in the Nephron

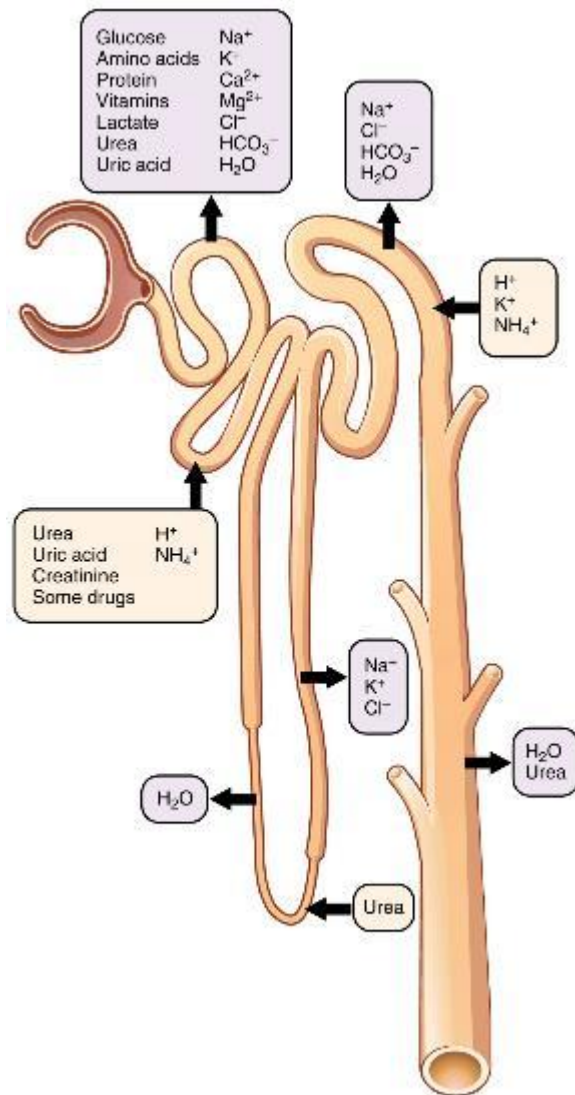
The two capillary beds are clearly shown in this figure. The efferent arteriole is the connecting vessel between the glomerulus and the peritubular capillaries and vasa recta.

After passing through the renal corpuscle, the capillaries form a second arteriole, the **efferent arteriole**.

These will next form a capillary network around the more distal portions of the nephron tubule, the **peritubular capillaries** and **vasa recta**, before returning to the venous system.



**FIGURE 25.17**



Locations of Secretion and Reabsorption in the Nephron

Nephron

Electrolytes  
Water  
Nutrients  
Wastes

## **Dear Class, please take care of your kidneys!**

- 1) Lots of water
- 2) Less energy drinks, caffeine (increase blood pressure)
- 3) Alcohol (dehydrating)
- 4) Smoking (elevate blood pressure)
- 5) Excess protein (darker urine)- One kidney
- 6) Too many pain-killers (drains blood producing cells)
- 7) Restrict Sodium consumption

**Restrict  $\text{Na}^+$**

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