The Urinary System

Chapter 17
Quick Overview of the Urinary System
Bladder Schistosomes

Normally, urine is sterile. Presence of blood may indicate an infection.
17.1 Introduction

- Cells produce waste that can become toxic if they accumulate

Functions
- the urinary system removes salts and nitrogenous wastes
- maintains normal concentration of water and electrolytes
- maintains pH, controls red blood cell production and blood pressure
Composition

- consists of a pair of kidneys which remove substances from the blood
- ureters which transport urine from the kidneys to the bladder
- urinary bladder stores urine
- urethra conveys urine to the outside of the body
17.2 Kidneys

- lie on either side of the vertebral column deep in the abdominal cavity
- positioned behind the parietal peritoneum (retroperitoneally)
- lateral side is convex, medial is concave, kidneys sit in a depression called the renal sinus
- Entrance is called the HILUM
-superior end of the kidney forms a funnel shaped sac - renal pelvis
-renal medulla = center of the kidney
-renal cortex = outer shell around the medulla; the cortex appears granulated due to the presence of nephrons
-renal arteries and veins supply blood to the kidneys

The nephron is the functional unit of the kidney
Myth or Fact?

1. Urinating on a jellyfish sting will help alleviate the pain.  ~Answer

2. It is safe to drink your own urine.

3. If someone is sleeping and you put their hand in warm water, they will pee their pants.  ~Answer

4. Holding your urine can cause a bladder infection.

5. There is a fish that will follow a urine stream and enter the urethra.  ~Answer
Renal Arteries & Veins

- Arteries attach to the abdominal aorta
- Veins attach to the inferior vena cava

Interlobar arteries pass between the renal pyramids
Afferent arterioles lead to the nephrons
Parts of the Urinary System - The NEPHRON
NEPHRONS - functional unit of the urinary system

Quick Analogy: A nephron is to the urinary system as the ______________ is to the nervous system

- Each kidney contains about 1 million nephrons
- Renal corpuscle: composed of a tangled cluster called a glomerulus which filters fluid

Pathway = glomerulus -> proximal tubule --> nephron loop (also called loop of Henle) --> distal tubule --> collecting duct --> ureter --> bladder
Also see
Kidney and Nephron Coloring
What blood vessel enters the glomerulus?
17.3 Urine Formation (section is abbreviated)

- glomerular filtration - urine formation begins, plasma is filtered
- tubular reabsorption - returns most of the fluid to the body
- tubular secretion - removes what is not needed; produces urine
Urine Composition

95 % Water

Contains urea and uric acid (characteristic smell)

Can contain trace amino acids
Urine may also contain other chemicals that can be detected.

Hormones present in a pregnant woman are detectable in urine.
17.4 Urine Elimination

- After urine forms in the nephrons, the ureters (starting with the renal pelvis) carry the urine away to the bladder.
- Bladder is an expandable structure that stores urine before it is eliminated from the body.
- Transitional epithelial cells change shape to allow for expansion and contraction.
Micturation = urination; as the bladder fills this reflex occurs though it is also under voluntary control.

Urethra = tube carries urine to the outside of the body.

Detrusor Muscle - attach to bladder and sphincter, control urination.
Disorders of the Urinary System

Many urinary problems can be solved by drinking enough water.

So how much fluid does the average, healthy adult living in a temperate climate need? The Institute of Medicine determined that an adequate intake (AI) for men is roughly 3 liters (about 13 cups) of total beverages a day. The AI for women is 2.2 liters (about 9 cups) of total beverages a day.
Kidney Stones

Extracorporeal shock wave lithotripsy (ESWL) is a procedure used to shatter simple stones in the kidney or upper urinary tract. Ultrasonic waves are passed through the body until they strike the dense stones, and make them smaller.
Cystitis = bacteria enters the bladder or kidneys (kidney infection); more common in women because the urethra is shorter

Commonly known as a "bladder infection"

UTI = urinary tract infection

Frequent need to urinate
Pain in the abdomen
Burning sensation during urination
Cloudy, bad-smelling urine
Blood in the urine
Leaking urine
Low back pain
Fever and chills
Nausea and poor appetite
Catheters

In medicine, a **catheter** is a tube that can be inserted into a body cavity, duct, or vessel.

The process of inserting a catheter is **catheterization**.
Overactive Bladder = sudden contractions of the bladder produce sensation of urgency, also more common in women

Incontinence - inability to control urination (or defecation)
When Kidneys Fail....

Dialysis may be used to clean the blood (hemodialysis)

4 hours, 3 times a week

Patients will eventually need a new kidney
Kidney Transplants

Modern Family Actress talks about kidney disease

Domino Kidney Transplants or Kidney Exchanges - when you aren't a match for a family member, you can participate in a kidney exchange.

![Diagram of Domino Paired Exchange]