Urinary System Functions

Def: Continuously cleanse blood & adjusts its composition through formation of urine

- Excrete nitrogenous wastes
  - Urea, uric acid & creatinine
- Regulate blood volume
- Regulate blood electrolytes & water balance
- Regulate blood pH
**Urinary System**

1. Kidneys produce urine.
2. Ureters transport urine.
3. Urinary bladder stores urine.
4. Urethra passes urine to outside.

**Female Urinary Tract**

- Kidney
- Ureter
- Rectum
- Bladder
- Pubic symphysis
- Vagina
- Urethra

**Male Urinary Tract**

- Kidney
- Ureter
- Rectum
- Bladder
- Prostate gland
- Pubic symphysis
- Penis
- Urethra
Blood Supply of Kidney
- renal cortex
- renal artery
- renal vein
- Renal pyramids
- Renal columns

Anatomy of Kidney and Lobe
- renal pyramid in renal medulla
- renal medulla
- Lobe
- collecting duct
- calyces
- ureter

Nephron Macroscopic Anatomy
-glomerulus
- proximal convoluted tubule
- distal convoluted tubule
- glomerular capsule
- efferent arteriole
- afferent arteriole
- artery
- vein
- loop of the nephron
- descending limb
- ascending limb
- peritubular capillaries
- Renal Cortex
- Renal Medulla
- collecting duct
Nephron

Functional unit of the kidney
  - urine production

Two main structures
  1. Renal corpuscle
     - Glomerulus & Bowman's capsule
  2. Renal tubule
     - PCT, Loop of Henle, DCT, and collecting duct

Renal corpuscle
  - nonselective passive filter

Urine Formation

Glomerular Filtration
  - Nonselective passive filter
    - From glomerulus to glomerular capsule
    - Blood plasma (not proteins) out to capsule
    - Includes:
      - Waste & excess ions
      - Useful things
        - Water, glucose, amino acids, and necessary ions
Tubular Reabsorption

Materials reabsorbed
- glucose
- water
- amino acids
- salts

Tubular Reabsorption

Reabsorbs of 99% of glomerular filtrate to BV
- Active and passive transport
- Proximal convoluted tubule (PCT)
  - Reabsorbs glucose, AA, and salts (ions)
- Collecting duct
  - Reabsorbs water and salts (ions)
  - Distal convoluted tubule (DCT)
**Tubular Secretion**

Reabsorption in reverse
- substances from blood to tubules
- Occurs along renal tubule & collecting duct
- Rids blood of (secretes):
  - Drugs, wastes, and ions
- Control of blood pH
  - Hydrogen ions out
    - Urine pH ~6.0

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**Juxtaglomerular Apparatus (JGA)**

- Modified smooth muscle cells of afferent arteriole
  - next to DCT
- Function:
  - Detects low blood pressure & blood volume
  - Releases renin (enzyme)
    1. Vasoconstriction
    2. Acts on adrenal cortex to release aldosterone
      - Increases BP and blood volume
Characteristics of Normal Urine

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>1-2 liters/day</td>
</tr>
<tr>
<td>Color</td>
<td>Yellow or amber</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Transparent</td>
</tr>
<tr>
<td>Odor</td>
<td>Mildly aromatic</td>
</tr>
<tr>
<td>pH</td>
<td>4.6 - 8.0 (Ave 6.0)</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.001 - 1.035</td>
</tr>
</tbody>
</table>
Urine (part 2)

- Sterile when formed
- Normal solutes
  - K⁺, Na⁺, urea, uric acid, creatinine, and bicarbonate ions
- Abnormal solutes
  - Glucose, RBC, WBC, bile, and plasma proteins

The End.