

Review 10

Breathing

- diaphragm, intercostal muscles of ribs, abdominal muscles
- control of rate of breathing
 - ∞ automatic, controlled by respiratory center in brain (part of autonomic nervous system)
 - ∞ primary system monitors CO₂ level (via pH) in blood; sensors are nerve endings both in brain and on the carotid artery (in the neck) = carotid body
 - ∞ back-up system monitors O₂ level in blood; sensors are nerve endings of carotid body
 - ∞ sensors communicate with respiratory center to effect changes in breathing rate; anticipation

Urinary System

Functions are:

1. Excretion via filtration of blood and removal of harmful substances from body
2. Maintenance of proper water balance in blood and body
3. Maintenance of proper chemical composition of blood
4. Secretion of enzymes and hormones
 - Renin—helps maintain proper blood pressure
 - Erythropoietin—stimulates production of red blood cells
 - Calcitriol (active form of Vit. D₃)—affects calcium absorption by gut and calcium levels in blood (moving into bone cells)

Overview—see diagram p 44 lecture notes

Kidney gross structure

Renal cortex, renal medulla, renal pelvis, nephrons, ureter

Nephron: gross structure

Blood supply

arteriole → capillary bed → arteriole → capillary bed → venule

Bowman's capsule → proximal tubule → loop of Henle → distal tubule → collecting duct

Nephron/kidney: how it functions

Saltiness much greater in medulla than cortex

- Filtration—glomerulus/Bowman's capsule
- Nutrient reabsorption—proximal tubule, distal tubule
- Salt & ion reabsorption (Na⁺, HCO₃⁻, Ca⁺⁺, Cl⁻, K⁺)—proximal tubule, ascending arm of loop of Henle, distal tubule
- Salt & ion discharge (H⁺, NH₃, K⁺, some drugs)—proximal and distal tubules

Review 10, con't

- **Water reabsorption—proximal tubule, descending arm of loop of Henle, distal tubule, collecting duct**
- **Salt movements into kidney tissue to maintain saltiness gradient**

Homeostatic control of osmotic pressure of blood and body fluids:

Water movement from distal tubule and collecting duct under control of ANTI-DIURETIC HORMONE (ADH)

- ◆ **Osmotic pressure of blood monitored by hypothalamus of brain**
- ◆ **Hypothalamus communicates with effectors (kidneys) via ADH**
- ◆ **If O.P. too high, more ADH released, water conserved and urine concentrated**
- ◆ **If O.P. too low, less ADH released, less water reabsorbed and urine dilute**

Causes of kidney failure

- **diabetes**
- **high blood pressure**
- **glomerulonephritis**
- **polycystic kidney disease**
- **scarring from kidney infections**
- **obstructions within the kidney**