

Animal Structure

Concepts of Animal Structure and Function

Body Systems:

- | | |
|---------------------|-------------------|
| 1. Digestive | 7. Reproductive |
| 2. Respiratory | 8. Nervous |
| 3. Cardiovascular | 9. Muscular |
| 4. Lymphatic/Immune | 10. Skeletal |
| 5. Excretory | 11. Integumentary |
| 6. Endocrine | |

Nutrition and Digestion

Nutrition = what nutrients an animal eats

Digestion = overall process of obtaining nutrition

Autotroph vs. Heterotroph

Animal Methods of Feeding

- animals are chemoheterotrophs

1. Carnivores
2. Herbivores
3. Omnivores

4. Suspension feeders (filter feeders)
5. Substrate feeders
6. Fluid feeders (blood suckers)
7. Bulk feeders
8. Scavengers
9. Decomposers

4 Stages of Food Processing

- 1) Ingestion
- 2) Digestion
- 3) Absorption
- 4) Elimination

Where Digestion Occurs

Incomplete digestive system

- a. Mouth
- b. Gastrovascular cavity

Complete digestive system (alimentary canal)

- a. Mouth
- b. Esophagus
- c. Stomach
- d. Intestine
- e. Anus

(May also have crop or gizzard)

HUMAN DIGESTION

Organs and Glands

Principle organs and parts:

- Mouth, oral cavity, tongue, pharynx, esophagus, stomach, small intestine, large intestine, rectum, anus

Principle glands:

- Salivary, pancreas, liver (+gallbladder)

Other Notes

Epiglottis, Peristalsis, and sphincters

- I. The Esophagus
 - a. Muscular contractions, epiglottis

- II. The Stomach
 - a. Muscular
 - b. Gastric juices and gastric glands
 - c. Hormone gastrin

- III. The Small Intestine
 - a. Nutrient absorption
 - b. Pancreas = digestive enzymes and alkali solutions
 - c. Liver and gallbladder = enzymes and bile (fat)
 - d. Villi and microvilli

- IV. The Large Intestine (“colon”)
 - a. 3 parts:
 - 1) Ascending colon
 - 2) Transverse colon
 - 3) Descending colon
 - b. Cecum and appendix
 - c. Water absorption

Healthful Diets and Other Notes

- 1) Fuel for power
- 2) Raw materials
- 3) Essential nutrients
- 4) Kilocalories and the BMR
- 5) Dieting
- 6) 9 essential amino acids
- 7) Vitamins and minerals
- 8) LDLs and HDLs

Respiration: The Exchange of Gases

Respiratory System = exchange of gases

Breathing Process

- 1) Gas exchange with environment
- 2) Transport of gases
- 3) Exchange of gases with tissues

Gas exchange must occur at moist surfaces!

- Body surfaces
- Gills
- Trachea
- Lungs

Breathing terms: inhalation + exhalation (ventilation)

HUMAN RESPIRATORY SYSTEM

1. Nasal cavity and mouth
2. Pharynx (joint tube for air and food)
3. Larynx (voice box, vocal cords)
4. Trachea
5. Bronchi
6. Bronchioles
7. Alveoli

Accessory parts:

- Diaphragm and Intercostal muscles
- Capillaries

Mechanics of Breathing:

Residual Air and Vital Capacity

Autonomic Control of Breathing

- Control centers
- Nerve signals, pH, carbon dioxide partial pressure
- Hyperventilation

Blood and Hemoglobin

- Diffusion
- Transports O₂ and CO₂
- Buffering capacity (carbonic acid)
- Gas exchange across the placenta

The Excretory System

Disposes of *Nitrogenous* wastes!!!

Parts:

1. Kidneys (2)
2. Ureters (2)
3. Urinary bladder
4. Urethra

The Kidney:

1. Cortex
2. Medulla
3. Nephrons

Functions: filtration, reabsorption, secretion, excretion

The Circulatory System

Major tissue = blood, accessory organs

Types of Circulatory Systems

1. Open circulatory system
2. Closed circulatory system

The Human (Closed) Circulatory System

- 1) Heart (pump)
- 2) Vessels
 - a. Arteries
 - b. Arterioles
 - c. Capillaries
 - d. Venules
 - e. Veins

Two Circulation Circuits

- 1) Systemic Circulation
- 2) Pulmonary Circulation

Structure of the Heart:

- Superior + inferior vena cava
- Right atrium + atrioventricular valve
- Right ventricle + semilunar valve
- Pulmonary arteries
- Pulmonary veins
- Left atrium + atrioventricular valve
- Left ventricle + semilunar valve
- Aorta

The blood pathway!

Blood Vessel Structure:

Artery:

- epithelium, smooth muscle, connective layer

Vein:

- epithelium, valves, smooth muscle, connective layer

Capillaries:

- epithelium one cell thick

The Cardiac Cycle

Diastole = relaxation

Systole = contraction

The Pacemaker and nerve nodes

Cardiac Output

Blood Pressure (systole/diastole)

Pulse Rate

Coronary arteries and heart attack

Blood distribution control

Structure and Function of Blood

- Plasma
- Red blood cells (erythrocytes)
- White blood cells (leukocytes)
- Platelets (thrombocytes)

The Immune System

The body's defense against disease.

Nonspecific Defenses

- skin
- mucous linings
- phagocytic cells (white blood cells)
- antimicrobial proteins

The Inflammatory Response

- histamine (signal)

The Lymphatic System

- 1) vessels + lymph nodes
- 2) white blood cells
- 3) thymus, tonsils, appendix, spleen and bone marrow

Specific Defenses: The Immune Response

- reactionary response
- specific to attacking organism
- ineffective against others
- antigens
- antibodies

Immunity = resistance to *specific* invaders

- A. active immunity
- B. passive immunity

Antigen recognition by cells

Antigen recognition by antibodies

Memory

- Primary immune response
- Secondary immune response

Immune Responses

A. Humoral immunity: plasma

- 1) B cells = produce antibodies
- 2) Memory
- 3) Antibodies mark invaders for elimination

B. Cell-mediated immunity

- 1) T cells = respond only to antigens on cell surface
 - a) Cytotoxic T cells = attack infected body cells
 - b) Helper T cells = stimulate B cells to produce antibodies
- 2) Self-recognition proteins

Allergies = overreactions to environmental antigens

Failure of the immune system:

- Autoimmune diseases = ex. Lupus
- Immunodeficiency diseases = ex. HIV/AIDS

The Endocrine System

- Chemical control = hormones
- Endocrine glands, some nervous tissue
- Carried in blood
- Types of chemicals:
 - 1) Neurotransmitters
 - 2) Prostaglandins
 - 3) Steroid hormones

4) Protein hormones