Organ Systems

Biology 2011

Nervous System

- Purpose: Coordinate the actions and functions of an organism. This is accomplished through electrochemical signals passed along neurons.
- Main Organs:
  - Brain: Receives sensory input and processes and coordinates appropriate responses.
  - Spinal Cord: Conducts sensory and motor information to and from the brain and to and from the effectors (tissues and organs)

Nervous System Cont'd.

- Neurons: Cell which carry the electrochemical signal to and from the brain or spinal cord to and from the effectors.

- Interactions with other Systems:
  - Controls all other systems
    - Autonomic – Involuntary
      - Breathing, Heartbeat, Gastrointestinal functions, etc.
    - Somatic – Voluntary
      - Walking, Talking, Reading, etc.

Nervous System Cont'd

- Fun Facts
  - Left side of Brain controls right side of body and vice-versa.
  - Neuron cells are some of the largest cells but do not undergo mitosis.
  - When you rub a bumped knee it can interrupt the pain signal to the brain

Skeletal System

- Purpose:
  - Support; Movement; Protection; Blood cell production; Storage (calcium, iron)
- Major Organs
  - Axial Skeleton: 80 bones of the vertebral column, rib cage, and skull. Moves the weight of the upper body to the hip joints.
  - Appendicular Skeleton:126 bones of the pectoral and pelvic girdles and the limbs.
  - Marrow: Found in interior of bones. Produces blood cells.

Skeletal System cont'd.

- Interactions with other systems:
  - The skeletal systems protects important organ systems in the chest and supports the muscular system. It also provides blood cells for the respiratory, circulatory, and immune systems.
  - It also is the source of calcium for electrochemical signaling and muscle movement.
- 3 fun facts about the skeletal system
  - There are two kinds of marrow – red and yellow.
  - The skeletal system accounts for 30-40% of body weight and half of this is water.
  - A newborn has about 300 bones in the body and by adult hood has about 206 due to fusion of some bones.

Muscular System

- Purpose:
  - To provide movement, strength, posture, balance, and heat for an organism.
- Major types of muscle
  - Smooth (non-striated) – involuntary control; found in blood vessels,GI tract, Urinary tract, Respiratiory tract, Reproductive tract, uterus, errector pili of skin, iris of eye.
  - Cardiac (striated) – involuntary control through the sinus node of the nervous system.
  - Skeletal (striated) – voluntary control of movement by somatic nervous system.

Muscular system cont'd.

- Interactions with other systems:
  - Smooth muscle allows movement of carbon dioxide, oxygen, blood, urine, wastes to move through systems of the body.
  - Cardiac muscle pumps blood throughout the body to deliver nutrients and take waste products away from all systems.
  - Skeletal muscle allows the skeletal system to move and assists in pumping blood away from extremities.
- 3 fun facts

  Muscle accounts for about 50% of a body's weight.

  Muscles can only pull, therefore must work in pairs.

  Busiest muscles are the eye muscles.

Immune System

- Purpose:
  - Protection of an organism by identifying and killing foreign substances and pathogens in the body.
- Major Organs:
  - Bone Marrow – Production of white blood cells for fighting infection and pathogens.
  - Thymus – Production of lymphocytes; T-cells – most active during childhood.
  - Spleen – Acts as a “immunologic conference center”, macrophages and B-cells bring pathogens here and are destroyed by antibodies; also responsible for destruction of old red blood cells.
  - Lymph nodes - Act as filters for particulates and pathogens. B-cells, T-cells, and macrophages destroy trapped matter.

Immune System cont'd.

- Interactions with other systems
  - Interaction is with other systems by keeping them healthy and free from infection and inflammation.

- 3 Fun Facts
  - The immune system is responsible for allergic reactions.
  - Prolonged stress reduces the ability of the immune system.
  - Laughter actually improves our immune system.

Endocrine System

- Purpose:
  - The endocrine system regulates other systems of the body through chemicals called hormones.
- Major Organs:
  - Hypothalamus-Pituitary- Adrenal Axis: controls and regulates digestion, body temp., stress, emotions, immune system.
  - Thyroid Gland: controls metabolism and sensitivity to other hormones.
  - Parathyroid Glands: controls amount of calcium in blood and bone.

Endocrine System cont'd.

  - Pancreas: Produces the hormones insulin and glucagon that control blood sugar level.
  - Pineal Body: Produces the hormone melatonin which controls sleep/wake patterns.
- Interactions with other systems
  - Interacts with many systems by control through chemical signaling by use of hormones. As opposed to the nervous system – the endocrine system is slow acting and usually sustained actions (days or weeks)
  - ***Exocrine system release through ducts not glands (salivary, sweat, stomach acid.

Excretory (Urinary) System

- Purpose:
  - Elimination of waste products of metabolism, liquid or gaseous waste; removal of uneccessary, excess, or dangerous chemicals.

- Major Organs:
  - Kidneys – Maintain homeostasis of osmotic, ions, and pH of the bodily fluids, excretion of toxic metabolic by-products and drug metabolism.
  - Ureter – ducts that move waste (urine) from the kidneys to the urinary bladder.
  - Urinary Bladder – Collects urine from the kidneys prior to urination.

Excretory (Urinary)System cont'd.

  - Uretha – duct that carries urine from the bladder to outside of the body for elimination.
  - **Lungs and Skins – through sweating and respiration some excretion is accomplished.
- Interactions with other systems:
  - By maintaining homeostasis of water, ions, pH, and elimination to toxic wastes allows all other systems to function optimally.
- 3 Fun Facts
  - Kidneys use a method of filtering similar to a lady cleaning out her purse.
  - Diluted urine can act as a fertilizer.
  - Concentrated urine can be used as a disinfectant for wounds.

Digestive System

- Purpose:
  - To break down and absorb nutrients from food and eliminate solid waste.
- Major Organs:
  - Mouth – Begins the mechanical and chemical breakdown of food.
  - Esophagus – Transfers the food to the stomach.
  - Liver & Gallblader - Produces bile to assist stomach in breaking down food. Gallbladder stores bile.
  - Stomach – Churns and continues breakdown of food with stomach acid.

Digestive System cont'd.

  - Small Intestine – Nutrients are absorbed and used to nourish. Villi in the small intestine increase the surface area for increased absorption.
  - Pancreas – Releases enzymes into small intestine to assist in digestion of nutrients.
  - Large Intestine (Colon) – Water content of waste is controlled here.
  - Rectum & Anus – Passage way for the elimination of solid waste from the body.
- Interactions with other systems:
  - Provides nutrients for the functioning of all other systems.

Digestive System cont’d.

- 3 Fun Facts
  - 1.5 liters of saliva is produced every day.
  - 90% of digestion and nutrient absorption takes place in the small intestine.
  - About 600 ml. of gas is produced every day in digestive tract.

Circulatory (cardiovascular) System

- Purpose:
  - To deliver nutrients, gases and chemical messengers to cells, tissues, and organ. To carry away waste products for elimination.
- Major Organs
  - Blood – carries necessary nutrients, gases, waste to their destination.
  - Heart – pumps blood to tissues and organs.
  - Aorta, arteries, arterioles – carry blood away from the heart to lungs for oxygenation and oxygenated blood away from the heart.

Circulatory (cardiovascular) cont'd.

  - Capillaries – exchange oxygenated blood and de-oxygenated blood at tissue and cellular level through increased surface area.
  - Veins – Carry de-oxygenated blood to the heart.
- Interactions with other systems:
  - All other systems are dependent on circulation of blood into and out of their tissues for oxygen, nutrients, elimination of wastes.
- 3 Fun Facts
  - 1 drop of blood contains 5 million RBCs and 12,000 WBCs
  - Heartbeat you hear is the sound of the valves opening and closing.
  - Your heart is about the size of your fist.

Respiratory System

- Purpose:
  - Gas exchange of oxygen and carbon dioxide.

- Major Organs:
  - Nasal cavity – warm and filter incoming air and eliminate carbon dioxide.
  - Trachea – Passageway for air in and out of the lungs
  - Bronchus, bronchioles – Passageways that decrease in size
  - Alveoli – terminal end of the bronchioles that have increased surface area and very thin to encourage gas exchange.
  - Diaphragm – Large muscle below the lung that through contraction and relaxation allows inhalation and exhalation.

Respiratory System cont'd.

- Interactions with other systems:
  - Provides the oxygen for all cells to use in cellular respiration.
  - Eliminates the carbon dioxide as a result of cellular respiration.

- 3 Fun Facts
  - Every minute we breath in about 6 liters of air.
  - Asthma is a result of bronchus and bronchiole constriction due to inflammation.
  - Total surface area of the alveoli is about equal to a tennis court.

Integumentary System

- Purpose:
  - First line of defense by providing a physical barrier between the outside and inside of the body.
  - Nails and Hair are part of the integumentary system.
  - Assists in excretion, temperature regulation, dehydration prevention, and location of sensory receptors.
- Major Organ:
  - The skin is divided into 2 layers
    - Epidermis – outer most layer
    - Dermis – middle layer
    - ***Sub-dermis is not true part of the skin but the inner most layer of connective tissue and fatty tissue.

Integumentary System

- Interactions with other systems:
  - Contributes to homeostasis of the organism through protection, excretion, and prevention of dehydration.

- 3 fun facts
  - The skin of amphibians is also part of their respiratory system.
  - You shed about 40 pounds of skin in your lifetime.
  - Skin is about 2 sq meters in area.

Reproductive System

- Purpose:
  - Continuation of the species.
- Major Organs:
  - Male
    - Penis – Passageway for sperm and eventual fertilization.
    - Urethra – Transfer of seminal fluid to and through the penis.
    - Testes – Produces the gamete (sperm)
    - Scrotum – Protection of testes and sperm
    - Epididymis – Storage of sperm
    - Vas deferens – Passageway for sperm to be carried to accessory glands.
    - Accessory Glands (prostate, seminal vesicles, bulbourethral) provide portions of seminal fluid.

Reproductive System cont'd.

- Female
  - Ovaries – Produces the gamete (ovum)
  - Fallopian tubes (oviducts) – Passageway for ovum into uterus
  - Uterus – Protection and nourishment of implanted fertilized ovum during gestation.
  - Vagina – Birth Canal

- Interactions with other systems:
  - The reproductive system is controlled by and interacts with the nervous and endocrine systems.

Reproductive System cont'd.

- 3 Fun Facts
  - Females are born with all the gametes they will have in their lifetime (400,000). They are immature and only about 400 will ever mature.
  - Males continue to produce new gametes throughout their lives. Can produce about 1,000 sperm per second.
  - The presence of the "Y" chromosome signals the developing embryo to form testes which then produce testosterone which makes the sexual organs differentiate.