

GENERAL BIOLOGY Lecture 31 - Circulation and Immunity

- I. Purpose and components of the circulatory system**
 - A. Cells survive by exchanging substances with the bloodstream**
 - 1. Relation to other systems - "a living & flowing connection"
 - 2. Blood - transport fluid
 - a) Carries raw materials to cells
 - b) Carries products and wastes from them
 - c) Helps maintain internal environment (pH, temperature, etc.)
 - B. Components of the circulatory system**
 - 1. Blood - composed of water (more than half of total volume), solutes, and specialized cells (red and white)
 - 2. Blood vessels - tubes in which blood is transported (arteries, capillaries, and veins)
 - 3. Heart - muscular pump used to drive blood flow
- II. Blood cells, plasma, blood vessels, and the heart**
 - A. Blood cells - originate in the bone marrow**
 - 1. Red blood cells (erythrocytes)
 - a) Function in oxygen transport
 - b) Most abundant cells of cellular portion
 - c) Lack nucleus and mitochondria
 - 2. White blood cells (leukocytes)
 - a) Function in day-to-day housekeeping & defense
 - b) Abundance is less than erythrocytes but can vary (bacterial infections can increase the leukocyte count)
 - c) Have nucleus and mitochondria
 - 3. Platelets - source of substances for clotting
 - 4. Plasma
 - a) Functions as a solvent and other roles
 - b) 50 to 60% of total blood volume
 - B. Blood vessels**
 - 1. Arteries - transport blood away from heart
 - a) Deoxygenated stuff to lungs (pulmonary circulation) & oxygenated stuff to body (systemic circulation)
 - b) Blood pressure measured at large arteries (systemic circulation)
 - 2. Capillaries - exchange between blood and cells occurs in capillary beds - capillaries "thread" throughout the body (diffusion of solutes occurs here)
 - 3. Veins - transport stuff back to the heart (they can adjust flow)
 - C. Heart - a living pump**
 - 1. Pulmonary pump (to lungs) and systemic pump (to body)
 - 2. Heart contractions generate blood pressure
 - 3. Heart has four chambers to facilitate pumping
 - 4. Heart is regulated by brain (medulla oblongata) and also has its own "cardiac pacemaker" (the heart can continue to beat even if nerves are cut!)
- III. Lymphatic system (Immunity)**
 - A. Functions: defense and housekeeping**
 - B. Supplementation to circulation - returns fluids to blood**
 - 1. Lymph - transport tubes and organs: lymph vessels, lymph nodes, spleen, and thymus (as well as bone marrow, tonsils, digestive, and respiratory tracts)
 - C. Nonspecific defense responses**
 - 1. Intact skin, ciliated mucus membranes of respiratory tract, stomach acid, microbes of the gut and vagina
 - D. Specific defense responses**
 - 1. Recognition between self and nonself (major histocompatibility complex [MHC] proteins - left alone to do what they want)
 - 2. Antigen - a foreign body that lacks the MHC protein
 - 3. Antibody - "tags" the antigen for destruction by phagocytes (types of white blood cells)