CHAPTER 1 REVIEW

21111002 - Aayush Joshi

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1 Basics of Anatomy and physiology

Anatomy is the science of structure and the relationships among structures. The word is derived from the Greek and means "to cut" or "cutting backwards" Cutting and separation of human organs or animal organs. It is easier to study anatomy in animals than humans. Model Species: Primates, Rodents, Livestock (Pigs) – Example: Cadaver dissection. It is the study of bodily functions—how the body parts work. The study of physiology is the basis for the development of new drugs and medical procedures. Structure and function of the body are closely related: Structure mirrors function. – Examples: 1) Bones of the skull are heavy and secure to protect brain function. 2)The thin air sacs of the lungs permit movement of gases from the lungs to the blood.

2 Levels of structural organisations

Life is characterized by a hierarchy of complexity consisting of 6 levels. 1). Chemical level • Atoms Smallest unit of matter • Molecules Composed of 2 or more atoms; H20 • Macromolecules Composed of large groups of molecules; DNA, protein, etc. 2) Cellular level • Organelles Composed of macromolecules; Mitochondria, cytoplasm, etc. • Cells Composed of organelles; Basic functional and structural units of an organism. 3). Tissue level • Tissues Groups of cells that work together to perform a similar function.; Ex. Smooth muscle tissue 4). Organ level • Organs Composed of two or more different types of tissues that have specific functions and recognizable shapes; Ex. Stomach 5). System level • Organ Systems Groups of related organs with a common function. Ex. Digestive system: all aspects of taking in and breaking down food. absorbing nutrients, and eliminating wastes. Includes mouth, esophagus, stomach, intestines, liver, gallbladder, etc. 6). Organismal level • Organism Collection of organ systems

3 Processes of life

1.) Metabolism: The sum of all the catabolic (breaking down) and anabolic (building up) chemical processes that occur in the body. 2.) Responsiveness:

The body's ability to detect and respond to internal and external changes. 3.) Movement: Any motion, including movement of tiny subcellular structures, or movement inside cells or organs. 4.) Growth: An increase in body size due to an increase in size of cells, number of cells, or both. 5.) Differentiation:The development of a cell from an unspecialized to specialized state. Differentiated cells have specialized structures and functions that differ from precursor cells. Stem cells give rise to cells that undergo differentiation. 6.) Reproduction: The formation of new cells (growth, repair, or replacement) or the production of a new individual.

4 Homeostasis

A condition of equilibrium (balance) in the body's internal environment. It is a dynamic condition meant to keep body functions in the narrow range compatible with maintaining life. Example: Blood glucose levels range between 70 110 mg of glucose/dL of blood. Body Fluids: Dilute, watery solutions containing dissolved chemicals inside or outside of the cell. Intracellular Fluid (ICF) is the fluid within cells, Extracellular Fluid (ECF) is the fluid outside cells, Interstitial fluid is ECF between cells and tissues.Some important body fluids: Blood Plasma is the ECF within blood vessels , Lymph is the ECF within lymphatic vessels.

5 Feedback systems

Three basic components: • Receptor – A body structure that monitors changes in a homeostatic controlled condition (body temperature) and sends input to the control center. Example: Specialized nerve endings in the skin and brain act as temperature receptors and can cause a nerve to fire in response to temperature changes. • Control center – Sets the range of values to be maintained usually this is done by neural tissue/brain. – Evaluates input received from receptors and generates an output command. Output involves nerve impulses, hormones, or other chemical agents. Example: Brain acts as a control center receiving nerve impulses from skin temperature receptors.• Effector – Receives output from the control center and produces a response or effect that changes the condition: Example: skeletal muscle or sweat.

5.1 Positive feedback loop :

Body senses a large divergence from homeostasis and initiates a self amplifying change. – Leads to change in the same direction. In contrast, negative feedback always reverses the direction of a sensed change.Normal way of producing rapid changes. – Examples: childbirth, blood clotting, protein digestion, and generation of nerve signals. Childbirth: · Fetal pressure on the cervix is detected by pressure receptors. · Nerve input is sent to the control center in the brain. · Oxytocin (output) is release from the brain into the blood. · Oxytocin causes effector uterine contractions which further push the baby against the cervix.

5.2 Negetive feedback loop :

Body senses a change and activates mechanisms to reverse the change.Thermoregulation - HOT – Receptors in skin or brain sense increase in blood temperature. Send neural input to brain. – Control center in brain sends neural output to effector organs. – Blood vessels in the skin dilate and sweat glands initiate sweating. Blood temperature should decrease. • Thermoregulation - COLD – Receptors in skin or brain sense decrease in blood temperature. Send neural input to brain. – Control center in brain sends output to effector organs. – Blood vessels in the skin constrict and skeletal muscles initiate shivering.Blood temperature should increase.