1

Tissues, Organs, and Systems

Setthakit Chitsanoor, D.V.M., Ph.D. (Pathobiology)





What is a cells ?

- Cell is derived from Latin word "cella", meaning "small room".
- Cell is the smallest unit of life that can replicate independently.
- Cell is the basic structural, functional, and biological unit of all known living organisms
- Cells are often called the "building blocks of life". The study of cells is called cell biology.



Cell theory

- 1. The cell is the smallest unit of life.
- 2. All organisms are composed one or more cells.
- 3. New cells arise from previously existing cells.
- Some organisms are unicellular such as Bacteria and Protists
- Some organisms are multicellular such as Fungi, Plants, and Animals
- Cells exhibit cell specialization. (Play role on specific jobs and look different from each other).



Tissues

In animal, a single cell can not work alone but required groups of cells work together.

" Groups of cells that are similar in structure that work together to perform a specific function are called Tissues."

- 4 major tissue types in animals
 - Epithelial tissue
 - Connective tissue
 - Muscle tissue
 - Nervous tissue



Epithelial tissue (Epithelium)

- Consists of epithelial cell Lines the body's surface, cavities, ducts, and tubes.
- This tissue provides a barrier between the external environment and the organ it covers.









Functions of epithelial tissue

- 1. Form the barrier between body (skin or other organ) and the external environment.
- 2. Epithelial tissues play roles in absorption of water and nutrients.
- 3. Epithelial tissues play roles in elimination of waste.
- 4. Epithelial tissues play roles in secreting enzymes and/or hormones in the form of glands.



Stratified squamous epithelium

Stratified cuboidal epithelium

Stratified columnar epithelium



f http://www.gettyimage.com/

Transitional epithelium





Tissue	Histology	Function	Location
Skeletal	Long cylindrical fiber, striated, many peripherally located nuclei	 Voluntary movement Produces heat Protects organs 	Attached to bones and around entrance point to body (e.g., mouth, anus)
Cardiac	Short, branched, striated, single central nucleus	Contracts to pump blood	Heart
Smooth	Short, spindle-shaped, no evident striation, single nucleus in each fiber	 Involuntary movement moves GI tract control of respiration moves secretions Regulates blood flow in arteries Etc. 	Walls of major organs and passageways

Muscle tissue

- Muscle tissue play roles in body and organ movement by contraction and relaxation
- Muscle tissue composes of muscle cells (myocytes) that contract when stimulated
- There are three major types of muscle tissue: 1. Skeletal or striated muscle

 - 2. Smooth or non-striated muscle
 - 3. Cardiac muscle



Nervous tissue

- the main tissue component the central nervous system (CNS) and the peripheral nervous system (PNS).
- Play roles in responds to stimuli in the environment by controls movement, reflexes, and receives sensory information.
- Nervous tissue is composed
 Neurons or nerve cells
 Neuroglia









Coordination of organ systems

- Communicate outside environment changes (detect external stimuli and coordinate the body's responses)
 - Nervous system
 - Sensory system
 - Endocrine systems
- Support and movement
 - Muscular system
 - Skeletal system
 - Nervous system

Homeostasis

- The term 'homeostasis' is derived from two Greek words; Homeo which means 'unchanging' and Stasis which means 'standing'
- In its simple form it means 'staying the same'
- It is an organism's internal environment = 'stays the same'

- Regulation and maintenance of the body's chemistry.
 - Digestive system
 - Circulatory system
 - Respiratory system
 - Excretory systems
- Defence
 - Integumentary
 - Immune
- Reproduction and development
 - Reproductive system.



Homeostasis

- Process that occurs in all living things.
- All organ systems work together to achieve homeostasis.
- Ability of an organism to maintain its internal environment, despite changes to its internal or external environment.

What things in your body need to be kept within a limit range?

- Body Temperature
- Blood pressure
- Blood pH
- O₂ and CO₂ concentration
- Osmoregulation-Water balance
- Blood glucose
- Etc.









Regulation of blood glucose

- Regulation of blood glucose (glucose homeostasis) is the process by which the levels of blood glucose are maintained by the body within a narrow range.
- Two important hormone from pancreas's Islets of Langerhans are involved in this process.
 - Insulin (secreted by beta cells)
 - Glucagon (secreted by alpha cells)



https://en.wikipedia.org/wiki/Pancreatic_islets



