

Unit 8: Biodiversity

Content Outline: Basic Anatomy and Physiology (8.8) – Part 1

I. **Anatomy** – This is the study of structure; **Physiology** – This is the study of function.

II. Hierarchy of multi-cellular organism's structure:

A. **Cells** – This is the *basic unit of life*.

B. **Tissues** – these are composed from cells with *common structure and function*. (There are 4 tissue types in most animals.)

1. **Epithelial Tissue** (This tissue forms *protective coverings* of structures, such as organs, cavities, and skin.)

a. They act as a *barrier* for various molecules. (This tissue relies heavily on the cell junctions to function.)

2. **Connective Tissue** (This tissue is for *binding together and supporting the other tissues* of the body.)

a. Types of connective tissue cells:

i. **Loose connective tissue** - This is the most abundant. (It basically acts as “filler material”.)

ii. **Adipose tissue** (Fat cells) - These are for: insulation, E storage, and padding.

iii. **Fibrous Connective tissue** – These are composed of dense collagenous fibers.

- **Ligaments** - For connecting *bone to bone*.

- **Tendons** - For connecting *bone with muscle*.

iv. **Cartilage** - This is a *flexible support* material.

- This is also the initial framework for making bone.

v. **Bone** (Osteo Tissues) This is made from cartilage that has undergone **ossification**.

(means “The process of making bone”).

– These cells build bone by depositing Calcium and Magnesium salts in cartilage.

vi. **Blood Tissue** - This tissue connects the *whole organism* transporting gases, nutrients, wastes.

- **Plasma** - This is the watery component containing dissolved substances.

- **Hematocrit** - This is the cellular component- RBC's, WBC's, and platelets.

- “**Erythro**” means “red”; “**Leuko**” means “white”; “**cyte**” means “cell”

3. **Nervous Tissue** - This tissue *senses stimuli and relay messages*.

a. The basic structure is called a **neuron**.

i. **Dendrites** – This part of the cell *receives stimulus* from the environment or another cell.

ii. **Body** – This part *collects and bundles* the stimuli into *one* message. (Contains the organelles.)

iii. **Axon** – This part takes the information away from body toward the brain/muscle/gland.

4. **Muscle Tissue** -This tissue provides a *pulling* force within the body.

a. Cells of this tissue are referred to as **muscle fibers** due to their long spindly shape.

b. These cells are mostly composed of **actin** and **myosin microfibrils**.

c. This tissue is the second largest consumer of energy in animals. (First is homeostasis.)

d. Three types of muscle tissue in animals:

i. **Skeletal** - This is striated muscle. (means “striped”)(It is voluntary, meaning *you control it*.)

ii. **Cardiac** - This is striated muscle. (It is involuntary, meaning the *brain controls it*; not you.)

iii. **Smooth** - This is unstriated muscle. (It is involuntary.) (It functions in **peristalsis** - *rhythmic* contraction of the digestive tract or in moving blood through blood vessels.)

C. **Organs** – This functional structure is a collection of *similar tissues working together*.

1. They are positioned in two different cavities:

a. **Thoracic Cavity** - This is above the diaphragm. It contains the heart and lungs and is protected by ribs.

b. **Abdominal Cavity** - This is below the diaphragm. It contains the digestive, urinary, and reproductive organs.

D. **Organ Systems** – These are composed of organs working together. (There are 11 systems in animals.)

E. **Organism** – This when all the organ systems are working together to create a multi-cellular organism.

(This is a great example of Emergent Properties.)

Part 2

- I. **Homeostasis** - Maintaining a steady internal state.
 - A. **Negative Feedback Loop** – This *stops a process already in motion and reverses the effect*.
 - B. **Positive Feedback Loop** - *Enhances* a process that is already in motion.
 - C. To constantly monitor all the chemical processes occurring within an organism every second of everyday it is alive, requires a *tremendous amount of energy*. Therefore this is the number one energy expenditure by animals. The amount of energy needed to stay alive will be related to the amount of food they eat.

- II. **Metabolism** (The sum of all the chemical reactions occurring within an organism.)
 - A. Heat Production vs. Food Intake vs. Activity
 1. **Endotherm** – These organisms generate their body heat from within by breaking down their food; therefore they need to eat more to keep their bodies warm; therefore they are more active anytime of the year.
 2. **Ectotherm** – These organisms obtain heat from the surrounding environment; therefore they need less food; therefore they are less active most of the time, especially when it is cold out.
 3. Metabolic Rate vs. body size
 - a. Small animals need more E to counter their large loss of body heat.
 - b. Large animals need less E as they lose less body heat.
 - c. Birds require massive amounts of E to counter the massive amount of body heat lost and needed to keep their giant breast muscles warm.

- III. **Thermoregulation** in Animals
 - A. **Regulator** (Organisms that *monitor* temperature and adjust in a changing environment. This *requires energy*.)
 - B. **Conformer** (Organisms that *match* their body temperature to the environmental temperature.) (Requires No energy.)
 1. These are incorrectly referred to as “cold” blooded animals.
 - D. Adaptations in animals to aid in thermoregulation:
 1. Insulation (hair, feathers, fat)

Please help students see the connection between the need to monitor homeostasis requiring more energy versus just matching the environment.