

Anatomy: is the study of the biological form an organism

Physiology: is the study of the biological functions of an organism performs

Evolutionary Convergence: Reflects different species' adaptation to a similar environmental challenge

Tissues in our body are "selective" as they choose what can enter the cell and what can't.

A Single-cell's surface area will determine how easily and readily it can exchange materials through the cell

2-D Cells will take a longer time exchanging materials in and out of the cells, hence for more cells and enzymes

- Multi-cellular organisms with a sac body plan have body walls that are only two cells thick facilitating diffusion of materials
- More complex organisms have highly folded internal surface for exchanging materials
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In Vertebrates, the space between cells filled with **interstitial fluid**, which allows for the movement of materials into and out of the cell

Epithelial Tissue: Covers the outside of the body and lines and the organs and cavities within the body

- The shape may be Cuboidal ( like dice ), Columnar (bricks on end), or Squamous (Floor tiles)

Connective Tissues: Mainly binds and supports other tissues; contains consist sparsely packed cells scattered throughout an extracellular matrix.

- Jelly-like, or solid foundation
- **Collagenous fibers** provide strength and flexibility  
*Elastic fibers* stretch and snap back to their original length  
*Reticular fibers* join connective tissue to adjacent tissues

**Must know all body systems]**

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1. **The 3 times of connective Tissues are :**

2. *Collagenous fibers provide strength and flexibility*

3. *Elastic fibers stretch and snap back to their original length*

4. *Reticular fibers join connective tissue to adjacent tissues*

- Connective tissue contains cells, including
- **Fibroblasts** that secrete the protein of extracellular fibers  
**Macrophages** that are involved in the immune system
- **Adipose tissue** stores fat for insulation and fuel  
**Blood** is composed of blood cells and cell fragments in blood plasma  
**Bone** is mineralized and forms the skeleton

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Muscle Tissue: Consisting of long cells called muscle fibers, which contract in response nerve signals.

- **Skeletal muscle** , or striated muscle, is responsible for voluntary movement
- **Smooth muscle** is responsible for involuntary body activities
- **Cardiac muscle** is responsible for contraction of the heart

**[Label 3 types of Muscles and their description] \*\***

Nervous Tissue: Senses stimuli and transmits signals throughout the animal

• Nervous tissue contains:

1. Neurons , or nerve cells, that transmit nerve impulses
2. Glial cells , or glia , that help nourish, insulate, and replenish neurons

### Coordination & Control

The endocrine system transmits chemical signals called **hormones** to receptive cells throughout the body via blood.

- Hormones are made up of fatty Acids
- Hormones are rarely slow acting, but can have long-lasting effects

The Endocrine system is referring to the collection of cells, glands, and tissues of an organism that secrete hormones directly into the bloodstream

- We are Regulators ; we must always maintain homeostasis (Comforters can change internal temperature accordance to external stimuli )

Feedback Loops in Homeostasis:

- Negative feedback in the body helps a variable to either a normal range or a set point. Negative feedback checks if there needs to be more or less of something in order to reach homeostasis regulation.

Alterations in Homeostasis:

- Set points and normal ranges can change with age or show cyclic variation.

Endothermic Vs. Ectothermic:

Endothermic	Generate heat through metabolism, burning fat (Mammals )
Ectothermic	Animals gain heat through an external Source

Balancing heat loss and gains:

### Heat regulation in mammals often involves the integumentary system: skin, hair, and nails

5 General Adaptation helps animals thermoregulate \*\*

1. Insulation
2. Circulatory adaptations (counter current exchange for certain animals & use of the Sun)
3. cooling by evaporation heat loss
4. behavioral réponse
5. adjusting metabolic heat production

Insulation:

1. Blood Regulation near the body surface
2. Many endotherms and some ectotherms can alter the amount of blood flowing between the body core and skin
3. Vasoconstriction : blood flow in the skin decreases and stays in the major organs
4. Vasodilation: Blood flow in skin increases, facilitating heat loss
5. Countercurrent exchange: Found in marine mammals and birds; heat exchanges transfer heat between fluids flowing in opposite direction
6. Ectotherms produce an "antifreeze" like substance preventing our blood to freeze

Cooling by Evaporation Heat Loss

1. Evaporation of water through sweat
2. Panting increases the cooling effect in birds and many mammals
3. Sweating and bathing moistens the skin, helping the animal to cool down.

Adjusting Metabolic Heat Production

- Some animals can regulate body temperature by adjusting their rate of metabolic heat production
- Heat production increases muscle activity
- Some Ectotherms can shiver to increase body temperature

Thermoregulation: Controlled by the part of the brain called Hypothalamus. The Hypothalamus triggers heat loss or heat generation mechanisms.

[Figure 40-16] [Chapter 14 Slide show ] \*\*

Bioenergetics: the overall flow and transformation of energy in an animal

- It also relates to how much food the animal needs depending on their size, activity and environment.

Biosynthesis: includes body growth and repair, synthesis of storage materials such as fat, and production of gametes.

[Figure 40-17]\*\*

Metabolic rate: is the amount of energy an animal uses in a unit of time

1. Basal metabolic rate : the metabolic rate of an endotherm at rest (Humans)
2. Standard metabolic rate: metabolic rate of an ectotherm at specific temperature

Ectotherms have much lower metabolic rates than endotherms, they must adapt to their environment, they can not regulate their metabolic rates and body temperatures.

Influences on Metabolism:

1. Size of the animal ( bigger the animal, the smaller the metabolic rate)
2. The higher metabolic rate of smaller animals lead to higher oxygen rate, breathing rate, etc. thus longer life span.

An animal's diet provides chemical energy, which is converted into ATP and powers processes in the body.

Animals needs a source of organic carbon and organic nitrogen in order to construct organic molecules.

- DNA has carbons, hydrogens and nitrogen

Essential Nutrients are required by cells and must be obtained through the foods we intake

4 Essentials nutrients :

1. Essential amino acids
2. essential fatty acids
3. Vitamins
4. Minerals

Animals require 20 amino acids and can synthesize about half from molecules in their diet

The Remaining amino acids, the essential amino acids, must be obtained from food in preassembled form.

Malnourished: Insufficient proteins

Most Plant proteins are incomplete in amino acid make up

Essential fatty acids are certain unsaturated fatty acids that must be obtained from the diet

Vitamins are grouped into 2 categories:

Fat Soluble & Water soluble

Undernourishment: is the result of a diet that consistently supplies less chemical energy than the body requires

Malnourished: the long term absence from the diet of one or more essential nutrients.

Ingestion: Act of eating

Suspension Feeders: which sift small food particles from the water (Fishes, Whales etc)

Substrate Feeders: animals that live in or on their food source