

## **Introduction to Anatomy and Physiology**

### I. Overview

A. Anatomy: the study of the structure of body parts and their relationship to one another.

1. Subdivisions:

a. gross anatomy (macroscopic): study of large body structures, visible to the naked eye.

- approaches: regional anatomy, systemic anatomy, or surface anatomy.

b. microscopic anatomy: study of structures too small to be seen without the aid of microscope.

- cytology, histology

c. "other" specialized branches -- pathological, radiographic anatomy.

2. Tools of study of anatomy:

- observation.

- manipulation.

- terminology.

B. Physiology: the study of the functioning of body's structural machinery; how parts of body work.

- has many subdivisions dealing with functioning of specific systems/structures; classically subdivided by system.

- physiology often focuses on events at cellular/molecular level since the functioning of the body depends on the operation of individual cells and chemical reactions occurring within them.

C. Complementation of structure and function: function a result of form, form dictated by functional needs?

### II. Hierarchy of structural organization.

- human body/biological systems exhibit many levels of structural complexity from molecules participating in cell reactions to organisms as entities.

A. Hierarchy:

1. chemical level: simplest level of structural hierarchy.

- atoms--molecules--organelles.

2. cellular level: basic structural and functional units of life.

3. tissue level: groups of similar cells with a common function; epithelium, connective tissue, muscle, nervous tissue.
4. organ level: an organ is a structure composed of at least two tissue types that performs a specific function for the body.
5. organ system level: organs that cooperate with one another to achieve a basic function and purpose.
6. organismal level: organ systems working together to achieve functions required for life.

B. Functional characteristics required for "life":

1. Maintenance of boundaries: internal environment distinct from external.
2. Movement: activities promoted by muscular system.
3. Responsiveness (irritability): the ability to sense changes in environment and react to them.
4. Digestion: the breakdown of ingested food into molecules that can be absorbed.
5. Excretion: removal of wastes from the body.
6. Reproduction: production of offspring.
7. Growth: increase in size of body part or the organism.

C. Survival needs of cells and organisms:

1. Nutrients: chemical substances required for energy and cell building.
2. Oxygen.
3. Water.
4. Appropriate body temperature.
5. Atmospheric pressure.

#### D. Homeostasis.

- with increasing complexity it is essential that basic functions for life are allowed to proceed as smoothly and as undisturbed as possible even in the face of ever-changing environment.

- homeostasis (def.): ability of the body to maintain relatively stable internal conditions despite ever-changing external environment; a state of dynamic equilibrium where internal conditions change within relatively narrow limits.

##### 1. Homeostatic control mechanisms: 3 major components.

a. Receptors: sensors.

b. Control center: integration.

c. Effectors: produces a response that affects the magnitude of the stimulus.

##### 2. Negative feedback mechanisms: output of system shuts off/reduces intensity of original stimulus.

- most homeostatic control mechanisms are negative feedback mechanisms.

##### 3. Positive feedback mechanisms: output of system enhances the original stimulus so that further output is accelerated.

#### III. Language of anatomy.

- anatomy has an accepted terminology that allows body structures to be located and identified precisely with a minimum number of words

##### A. Anatomical position and directional terms.

- need initial reference point, indicators of direction.

1. Anatomical position: anatomical reference point; the body erect, feet together, palms forward with thumbs away from the body; all directional terms refer to the body in anatomical position,

2. Directional terms: indicate direction relative to anatomical position; used to explain where a structure is located in relation to another.

##### B. Regional terms.

##### 1. Body is subdivided into two major areas:

a. axial part--head, neck and trunk.

b. appendicular part--limbs of the body.

2. Regional terms are used to designate specific areas within a major body division.

C. Body planes and sections.

- most frequently body planes are:

1. sagittal plane: vertical, divides the body into right and left portions
2. frontal plane: vertical, divides the body into anterior and posterior portions.
3. transverse plane: horizontal, divides the body into superior and inferior portions.

D. Body cavities and membranes.

1. Dorsal body cavity

- a. cranial cavity.
- b. vertebral cavity.

2. Ventral body cavity.

- a. thoracic cavity.
  - i. lateral pleural cavities (2).
  - ii. medial mediastinum: contains pericardial cavity.
- b. abdominopelvic cavity.
  - i. abdominal cavity.
  - ii. pelvic cavity.

3. Membranes on the ventral body cavity - serous membranes, serosae.

- walls of ventral body cavity and outer surfaces of organs it contains are lined with this thin double-layered membrane.
- a. parietal serosa: part of membrane lining cavity walls.
  - b. visceral serosa: part of membrane lining organ in cavity.

4. Other body cavities.

- oral and digestive cavities; nasal cavities; orbital cavities; middle ear cavities; and synovial cavities.

E. Abdominopelvic regions and quadrants.

1. Abdominopelvic regions:

- created by two transverse and two parasagittal planes: umbilical region, epigastric region, hypogastric region, right and left iliac regions, right and left lumbar regions, and right and left hypochondriac regions.

2. Abdominopelvic quadrants:

- a more simplified subdivision of this cavity uses one transverse and one medial sagittal plane.