

### **Branches of Anatomy**

GROSS ANATOMY refers to macroscopic study of the whole body...things that can be seen with the naked eye. Within Gross anatomy are REGIONAL ANATOMY which studies the anatomy of body parts (the head, the leg, etc), SYSTEMIC ANATOMY which studies body systems, and SURFACE ANATOMY which studies what is underneath the surface.

MICROSCOPIC ANATOMY refers to the study of anatomy using a microscope. CYTOLOGY is the study of cells and HISTOLOGY is the study of tissues (tissues are groups of cells).

DEVELOPMENTAL ANATOMY studies where things come from, how they develop. This area includes EMBRYOLOGY (the study of embryonic development)

SPECIALIZED ANATOMY areas include PATHOLOGICAL which is the study of disease, RADIOGRAPHIC which studies how anatomy relates to the radiographic techniques, and SURGICAL ANATOMY.

### **Physiology**

Physiology is studied based on organ system subdivisions, though it is important to note that organ systems do not operate independently of one another—they overlap.

Physiology is based on three things:

- 1) Cellular function
- 2) Molecular activity
- 3) Laws of physics

The overarching concept behind physiology is THE PRINCIPLE OF COMPLEMENTARITY OF STRUCTURE AND FUNCTION. This simply means that function follows form...in other words, what a structure can do depends on its design. For example, a Volkswagen is not going to win the Indy 500, because it was not designed to do so. A bicycle is not going to fly, because it was not designed with wings.

### **Levels of organization**

Living organisms are organized from smaller structures to larger structures.

Smallest level	Chemical	Atoms Molecules (atoms build molecules)
Next level	Cellular	Organelles Cells (organelles are part of cells)
Next level	Tissues	groups of cells together
Next level	Organ	Various tissues work together to form organ

Next level	Organ system	11 in the human body
Highest level	Organism	All the organ systems working together

### **Maintenance of Life**

In order to maintain life, an organism must 1) **maintain boundaries** and remain separate from the environment, i.e. skin or cell membrane; 2) be capable of **movement**, which can be internal and external; 3) utilize **responsiveness**, which is the sensing of and response to changes in the environment. This stimuli can be internal and external such as feeling cold or having a thought; 4) be capable of **digestion**, the breakdown of complex foodstuffs into the smallest building block molecules; 5) have a **metabolism**, which encompasses all the chemical process in the body. Catabolism is the breakdown of complex molecules into smaller particles which anabolism is the building of molecules. Cellular respiration, another component of metabolism, is an organism's ability to use oxygen to convert nutrients to ATP; 6) be capable of **excretion**, the removal of wastes from the body. Defecation eliminates unabsorbed food (that never really entered the body!) and urination voids metabolic wastes. Another form of excretion is expiration, which is the rids the body of carbon dioxide via exhalation; 7) undergo **reproduction** at both the cellular and organismal level; and 8) be capable of **growth**, which is usually an increase in the number of cells (though the size of the cells can increase slightly). Growth occurs when anabolic processes dominate over catabolic processes.

### **Survival Needs**

Nutrients:	CHO, protein, lipids, minerals, vitamins
Oxygen:	Required for oxidation of nutrients into usable energy
Water:	Body is 60-80% water - the most abundant substance in the body
Appropriate Temp:	Life is driven by enzyme-catalase reactions. Protein enzymes lose their shape when not at the correct temperature and they fail to function.
Appropriate Pressure:	Ventilation drives mechanical respiration. Think of Mt. Everest or SCUBA diving.

### **Homeostasis AKA "Staying the Same"**

Homeostasis is the ability of the body to maintain a stable set of internal conditions, such as temperature. It is also referred to as dynamic equilibrium because it doesn't adhere to one strict notion of "normal", yet keeps the body constantly moving toward "normal", within a close range. For example, the body's temperature is not always 98.6, it may fluctuate a bit in either direction throughout the day.

## **Mechanisms of Homeostasis**

The RECEPTOR provides data. It recognizes the stimulus or change in the environment and reports the value, for example...the temperature is 99.2

The CONTROL CENTER decides what to do with this information. An example of a control center is the hypothalamus. It compares the receptor input against the body's set point and decides what adjustments to make (if any).

The EFFECTOR carries out the plan. It is the means of altering organism's function according to control center output.

## **2 Types of Feedback in Homeostasis**

In NEGATIVE FEEDBACK the effector's response opposes or negates the movement of original stimulus. If the original stimulus is saying that it is too cold, then the effector's response will negate the cold. It works to return organism to equilibrium and is the most common type of feedback.

In POSITIVE FEEDBACK the effector's response enhances the original stimulus. In this case, the organism temporarily moved further from equilibrium. One example is childbirth, where contractions get progressively stronger until the baby is born. This type of feedback occurs infrequently. It initiates a set of self-perpetuating events and also includes an event to break the cycle.

## **The Language of Anatomy**

Anatomical position refers to standard body position...face forward, feet forward, arms at sides with palms turned forward.

Directional terms describe the relationships of anatomical structures.

Superior / Inferior = Above / Below

Ex: The head is superior to the chest  
The umbilical region is inferior to the neck

Anterior / Posterior = Front / Back (also Ventral / Dorsal)

Ex: The heart is anterior to the spine  
The heart is posterior to the breast bone

Medial / Lateral = Toward midline / Toward side

Ex: The heart is medial to the arm  
The arms are lateral to the heart

Superficial / Deep = Toward surface / Away from surface (inward)

Ex: The epidermis is superficial to the skeleton  
The lungs are deep to the skin

Proximal / Distal = Closer to midline or point of region / Farther away

Ex: The elbow is proximal to the wrist  
The wrist is distal to the shoulder

### **Regional Terms**

Regional terms designate specific areas of the body, such as the nasal region, and occipital region.

### **Body Cavities**

There are two major cavities in the body. They contain the internal organs and are subdivided into smaller cavities.

Two main cavities are the Dorsal Body Cavity and the Ventral Body Cavity.

1. Dorsal Body Cavity

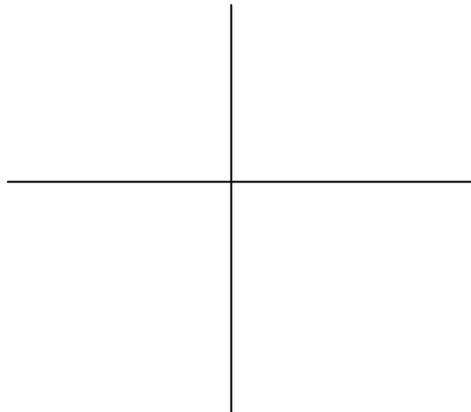
- A. Cranial Cavity
- B. Spinal Cavity

2. Ventral Body Cavity

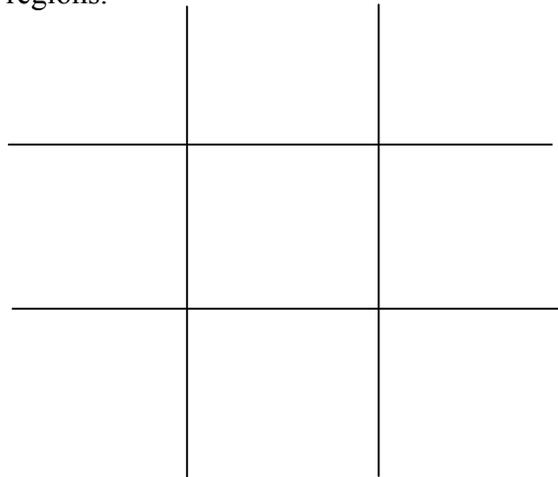
- A. Upper Thoracic Cavity
  - a) Two Pleural Cavities (lungs in each)
  - b) Mediastinum
    - 1) Pericardial Cavity (includes heart)
- B. Abdominopelvic Cavity
  - a) Abdominal Cavity
  - b) Pelvic Cavity

### **Abdominopelvic Regions**

In general terms, the abdominopelvic region can be divided into four regions, which form a + at the belly button.



In more detail, the area is divided into nine regions.



Marieb, E. N. (2006). *Essentials of human anatomy & physiology* (8th ed.). San Francisco: Pearson/Benjamin Cummings.

Martini, F., & Ober, W. C. (2006). *Fundamentals of anatomy & physiology* (7th ed.). San Francisco, CA: Pearson Benjamin Cummings.