

Chapter 1

An Introduction to the Human Body

- Anatomy
 - science of structure
 - relationships revealed by dissection (cutting apart)
 - imaging techniques
- Physiology
 - science of body functions
 - normal adult physiology studied in this text
 - some genetic variations described

Levels of Organization

- Chemical
- Cellular
- Tissue
- Organs
- System Level
- Organismic Level

Levels of Structural Organization

- Chemical Level
 - atomic and molecular level
- Cellular level
 - smallest living unit of the body
- Tissue level
 - group of cells and the materials surrounding them that work together on one task
 - 4 basic tissue types
 - epithelium, muscle, connective tissue, and nerve
- Organ level
 - grouping of 2 or more tissue types into a recognizable structure with a specific function.
- Organ system
 - collection of related organs with a common function
 - sometimes an organ is part of more than one system
- Organismic level
 - one living individual.

Interaction of Organ Systems

- All major body systems will be examined
- Interaction of different systems of the body
 - skin produces vitamin D needed for calcium absorption and bone growth
 - bone marrow produces cells which help the skin resist infection.

Life Processes

- Metabolism = sum of all chemical processes
 - breakdown of large molecules into small
 - building new structural components (proteins)
 - providing chemical energy for cells
- Responsiveness
 - detect & respond to changes in internal or external environment
 - some typical responses
 - muscle contraction, electrical signals, hormone or glandular secretion
- Movement at any structural level
 - the body, an organ, a cell or cell component
- Growth
 - increase in number or size of cells or the material found between cells
- Differentiation
 - specialization of cells for a specific function
 - stem cells give rise to cells that specialize
- Reproduction
 - formation of new cells or new individuals

Homeostasis

- Maintaining the internal environment within physiological limits
- Example
 - blood glucose level is kept within narrow range 70-110/100ml
- Delineation of fluid compartments
 - intracellular fluid (ICF) = within cells
 - extracellular fluid (ECF) = outside cells
 - intercellular fluid = tissue fluid = interstitial fluid
 - plasma = fluid portion of blood
- Composition of fluids change as substances move between compartments
 - nutrients, oxygen, ions and wastes move in both directions across capillary walls

Control of Homeostasis

- Homeostasis is continually being disrupted by
 - external stimuli or
 - intense heat, cold, and lack of oxygen
 - internal stimuli
 - psychological stresses
 - exercise
- Disruptions are usually mild & temporary
- If homeostasis is not maintained, death may result

Components of Feedback Loop

- Receptor
 - monitors a controlled condition
- Control center
 - determines next action
- Effector
 - receives directions from the control center
 - produces a response that changes the controlled condition

Negative & Positive Feedback Loops

- Negative feedback loop
 - original stimulus reversed
 - most feedback systems in the body are negative
 - used for conditions that need frequent adjustment
 - body temperature, blood sugar levels, blood pressure
- Positive feedback loop
 - original stimulus intensified
 - seen during normal childbirth

Homeostasis of Blood Pressure

- Pressure receptors in walls of certain arteries detect an increase in BP
 - blood Pressure = force of blood on walls of vessels
- Brain receives input and signals heart and blood vessels
- Heart rate slows and arterioles dilate (increase in diameter)
- BP returns to normal

Positive Feedback during Childbirth

- Stretch receptors in walls of uterus send signals to the brain
- Brain releases hormone (oxytocin) into bloodstream
- Uterine smooth muscle contracts more forcefully
- More stretch, more hormone, more contraction etc.
- Cycle ends with birth of the baby & decrease in stretch

Basic Anatomical Terminology

- Anatomical position
- Regions of the body
- Anatomical planes, sections and directional terms

Anatomical Position

- Standardized position from which to describe directional terms
 - **standing upright**
 - **facing the observer, head level**
 - **eyes facing forward**
 - **feet flat on the floor**
 - **arms at the sides**
 - **palms turned forward**
- Prone position = lying face down
- Supine position = lying face up

Common Regional Names

- Clinical terminology based on a Greek or Latin root word.

Planes and Sections

- A plane is an imaginary flat surface that passes through the body.
- A section is one of the 2 surfaces (pieces) that results when the body is cut by a plane passing through it.

Sagittal Plane

- Sagittal plane
 - **divides the body or an organ into left and right sides**
- Midsagittal plane
 - **produces equal halves**
- Parasagittal plane
 - **produces unequal halves**

Other Planes and Sections

- Frontal or coronal plane
 - **divides the body or an organ into front (anterior) and back (posterior) portions**
- Transverse(cross-sectional) or horizontal plane
 - **divides the body or an organ into upper (superior) or lower (inferior) portions**
- Oblique plane
 - **some combination of 2 other planes**

Planes and Sections of the Brain (3-D anatomical relationships revealed)

- Horizontal Plane
- Frontal Plane
- Midsagittal Plane

Major Directional Terms

- See Definitions page 14

Superior or Inferior

- Superior
 - **towards the head**
 - **The eyes are superior to the mouth.**
- Inferior
 - **away from the head**
 - **The stomach is inferior to the heart.**

Dorsal or Ventral

- Dorsal or Posterior
 - **at the back of the body**
 - **The brain is posterior to the forehead.**
- Ventral or Anterior
 - **at the front of the body**
 - **The sternum is anterior to the heart.**

Medial or Lateral

- Medial
 - **nearer to the midline of the body**
 - **The heart lies medial to the lungs.**
- Lateral
 - **farther from the midline of the body**
 - **The thumb is on the lateral side of the hand.**

Proximal or Distal

- Proximal
 - nearer to the attachment of the limb to the trunk
 - The knee is proximal to the ankle.
- Distal
 - farther from the attachment of the limb to the trunk
 - The wrist is distal to the elbow.

Dorsal Body Cavity

- Near dorsal surface of body
- 2 subdivisions
 - cranial cavity
 - holds the brain
 - formed by skull
 - vertebral or spinal canal
 - contains the spinal cord
 - formed by vertebral column
- Meninges line dorsal body cavity

Ventral Body Cavity

- Near ventral surface of body
- 2 subdivisions
 - thoracic cavity above diaphragm
 - abdominopelvic cavity below diaphragm
- Diaphragm = large, dome-shaped muscle
- Organs called viscera
- Organs covered with serous membrane

Abdominopelvic Cavity

- Inferior portion of ventral body cavity below diaphragm
- Encircled by abdominal wall, bones & muscles of pelvis

Thoracic Cavity

- Encircled by ribs, sternum, vertebral column and muscle
- Divided into 2 pleural cavities by mediastinum
- Mediastinum contains all thoracic organs except lungs

Mediastinum

- Midline wall of tissue that contains heart and great vessels, esophagus, trachea and thymus.

Serous Membranes

- Thin slippery membrane lines body cavities not open to the outside
 - parietal layer lines walls of cavities
 - visceral layer covers viscera within the cavities
- Serous fluid reduces friction

Pleural & Pericardial Cavities

- Visceral pleura clings to surface of lungs --- Parietal pleura lines chest wall
- Visceral pericardium covers heart --- Parietal pericardium lines pericardial sac

Peritoneum

- Visceral peritoneum --- serous membrane that covers the abdominal viscera
- Parietal peritoneum --- serous membrane that lines the abdominal wall

Abdominopelvic Regions & Quadrants

- Describe locations of organs or source of pain
- Tic-tac-toe grid or intersecting lines through navel

Abdominopelvic Regions

- Umbilical
- Epigastric
- Hypogastric
- Right and left iliac or inguinal
- Right and left lumbar
- Right and left hypochondriac