INTRODUCTION TO BASIC HUMAN ANATOMY

LESSON 1 Lecture Notes

DEFINITIONS

Anatomy is the study of the structure of the body. Often, you may be more interested in functions of the body. Functions include digestion, respiration, circulation, and reproduction. Physiology is the study of the functions of the body.

The body is a chemical and physical machine. As such, it is subject to certain laws. These are sometimes called natural laws. Each part of the body is engineered to do a particular job. These jobs are functions. For each job or body function, there is a particular structure engineered to do it.

In the laboratory, anatomy is studied by dissection (SECT = cut, DIS = apart).

BODY TYPES

No two human beings are built exactly alike, but we can group individuals into three major categories. These groups represent basic body shapes.

MORPH = body, body form

ECTO = all energy is outgoing

ENDO = all energy is stored inside

MESO = between, in the middle

ECTOMORPH = slim individual

ENDOMORPH = broad individual

MESOMORPH = body type between the two others, "muscular" type

Ectomorphs, slim persons, are more susceptible to lung infections. Endomorphs are more susceptible to heart disease.

NOTE ON TERMINOLOGY

Each profession and each science has its own language. Lawyers have legal terminology. Physicians and other medical professions and occupations have medical terminology, and educators have objectives, domains, and curricula.

To work in a legal field, you should know the meaning of quid pro quo. To work in a medical field, you should know the meanings of terms such as proximal, distal, sagittal, femur, humerus, thorax, and cerebellum.

KINDS OF ANATOMICAL STUDIES

Microscopic anatomy is the study of structures that cannot be seen with the unaided eye. You need a microscope.

Gross anatomy by systems is the study of organ systems, such as the respiratory system or the digestive system.

Gross anatomy by regions considers anatomy in terms of regions such as the trunk, upper member, or lower member.

Neuroanatomy studies the nervous system.

Functional anatomy is the study of relationships between functions and structures.

ORGANIZATION OF THE HUMAN BODY

The human body is organized into cells, tissues, organs, organ systems, and the total organism.

Cells are the smallest living unit of body construction.

A **tissue** is a grouping of like cells working together. Examples are muscle tissue and nervous tissue.

An **organ** is a structure composed of several different tissues performing a particular function. Examples include the lungs and the heart.

Organ systems are groups of organs which together perform an overall function. Examples are the respiratory system and the digestive system.

The total organism is the individual human being. You are a total organism.

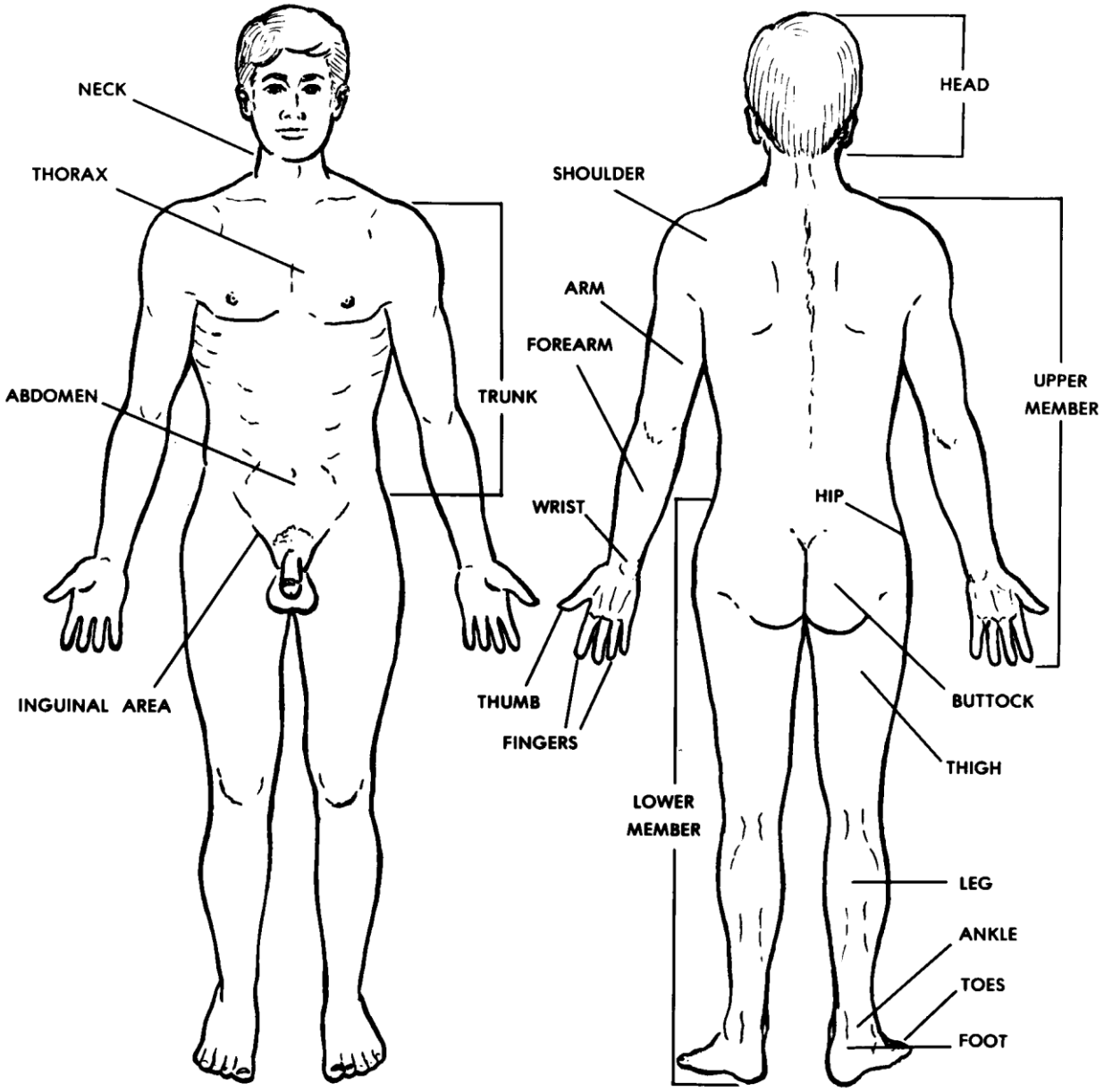


Figure 1-1. Regions of the human body.

REGIONS OF THE HUMAN BODY

The human body is a single, total composite. Everything works together. Each part acts in association with ALL other parts. Yet, it is also a series of regions. Each region is responsible for certain body activities. These regions are:

Back and Trunk. The torso includes the back and trunk. The trunk includes the thorax (chest) and abdomen. At the lower end of the trunk is the pelvis. The perineum is the portion of the body forming the floor of the pelvis. The lungs, the heart, and the digestive system are found in the trunk.

Head and Neck. The brain, eyes, ears, mouth, pharynx, and larynx are found in this region.

Members. Each upper member includes a shoulder, arm, forearm, wrist, and hand. Each lower member includes a hip, thigh, leg, ankle, and foot.

ANATOMICAL TERMINOLOGY

As I mentioned earlier, you must know the language of a particular field to be successful in it. Each field has specific names for specific structures and functions. Unless you know the names and their meanings, you will have trouble saying what you mean. You will have trouble understanding what others are saying. You will not be able to communicate well.

What is a scientific term? It is a word that names or gives special information about a structure or process. Some scientific terms have two or three different parts. These parts are known as a PREFIX, a ROOT (or base), and a SUFFIX. An example is the word subcutaneous.

SUBCUTANEOUS means below the skin.

SUB means below. SUB is the prefix.

CUTIS means skin. CUTIS is the root.

A second example is the word myocardium.

MYOCARDIUM means the muscular wall of the heart.

MYO means muscle. MYO is a prefix.

CARDIUM means heart. CARDIUM is the root.

A third example is the word tonsillitis.

TONSIL is the root

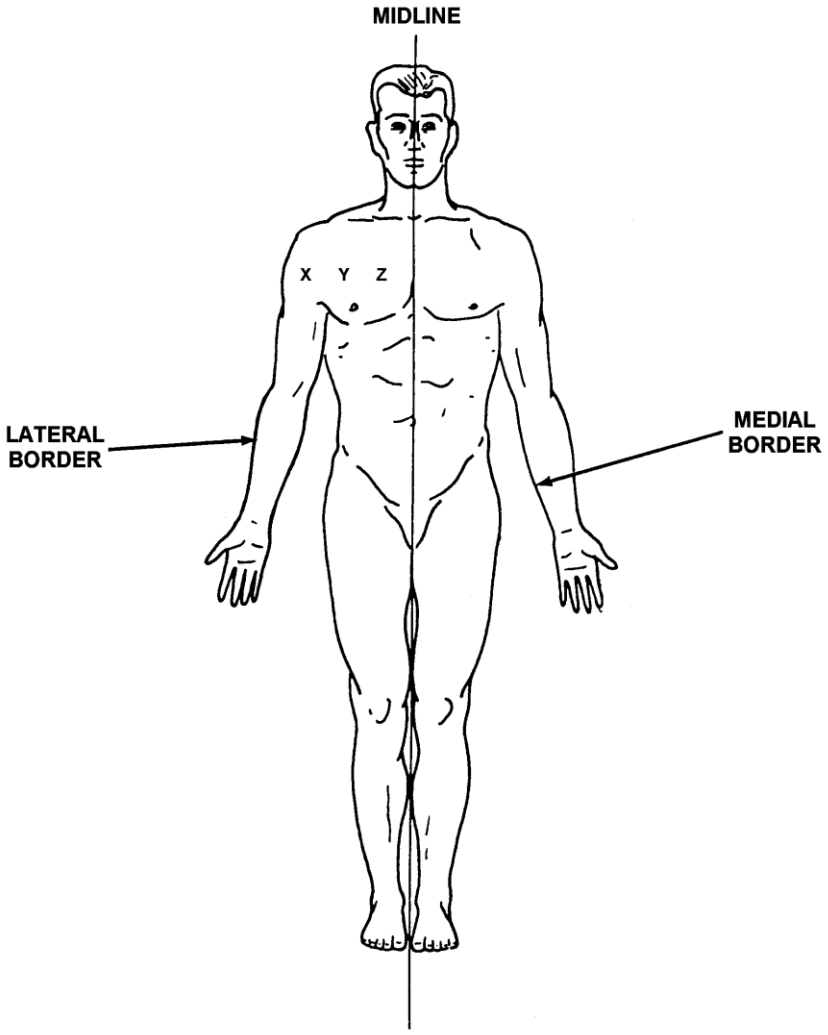
ITIS is the suffix and means inflammation.

So TONSILLITIS means an inflammation of the tonsils

THE ANATOMICAL POSITION

The anatomical position is an artificial posture of the human body (see figure 1-2). This position is used as a standard reference throughout the medical profession.

We always speak of the parts of the body as if the body were in the anatomical position. This is true regardless of what position the body is actually in. In the anatomical position, the body stands erect, with heels together. Upper members are along the sides, with the palms of the hands facing forward. The head faces forward.



X is lateral to Y and Z; Y is medial to X and lateral to Z
In the example shown, the body is in the normal anatomical position.

PLANES OF THE BODY

See figures 1-3A through 1-3C for the imaginary planes used to describe the body.

Sagittal planes are vertical planes that pass through the body from front to back. The median or midsagittal plane is the vertical plane that divides the body into right and left halves.

Horizontal (transverse) planes are parallel to the floor. They are perpendicular to both the sagittal and frontal planes.

Frontal (coronal) planes are vertical planes which pass through the body from side to side. They are perpendicular to the sagittal plane.

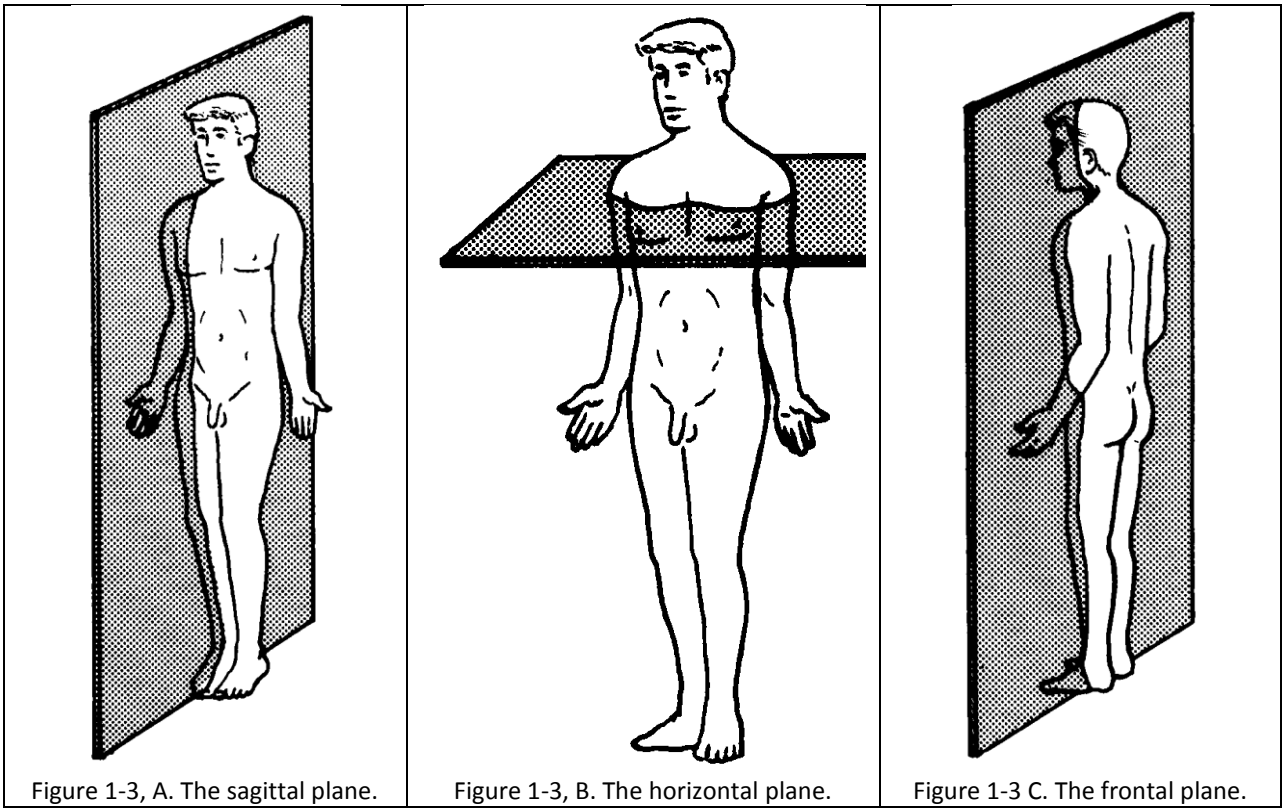


Figure 1-3, A. The sagittal plane.

Figure 1-3, B. The horizontal plane.

Figure 1-3 C. The frontal plane.

DIRECTIONS

Superior means above. **Inferior** means below.

Anterior refers to the front of the body. A commonly-used substitute word is **Ventral**.

Posterior refers to the back of the body. A commonly-used substitute word is **Dorsal.**

Medial means toward or nearer the midline of the body.

Lateral means away from the midline or toward the side of the body.

Superficial means closer to the surface of the body.

Deep means toward the center of the body or body part.

Proximal and distal are terms applied specifically to the limbs. **Proximal** means nearer to the shoulder joint or the hip joint. **Distal** means further away from the shoulder joint or the hip joint. Sometimes proximal and distal are used to identify the "beginning" and "end" of the GI tract--that portion closer to the stomach being **proximal** while that further away being **distal**.

NAMES

Names are chosen to describe the structure or process as much as possible. An international nomenclature was adopted for anatomy in Paris in 1955. It does not use the names of people for structures. (The single exception is the Achilles tendon at the back of the foot and ankle.)

Names are chosen to identify structures properly. Names identify structures according to shape, size, color, function, and/or location. Some examples are:

TRAPEZIUS MUSCLE
TRAPEZIUS = trapezoid shaped, like a rectangle with uneven sides.

ADDUCTOR MAGNUS MUSCLE
AD = toward
DUCT = to carry (function)
MAGNUS = very large (size)

ERYTHROCYTE
ERYTHRO = red (color)
CYTE = cell

CELL INTRODUCTION

A cell is the microscopic unit of body organization. The "typical animal cell" is illustrated in figure 1-4. A typical animal cell includes a cell membrane, a nucleus, a nuclear membrane, cytoplasm, ribosomes, endoplasmic reticulum, mitochondria, Golgi apparatus, centrioles, and lysosomes, and I'll talk a little about each of them.

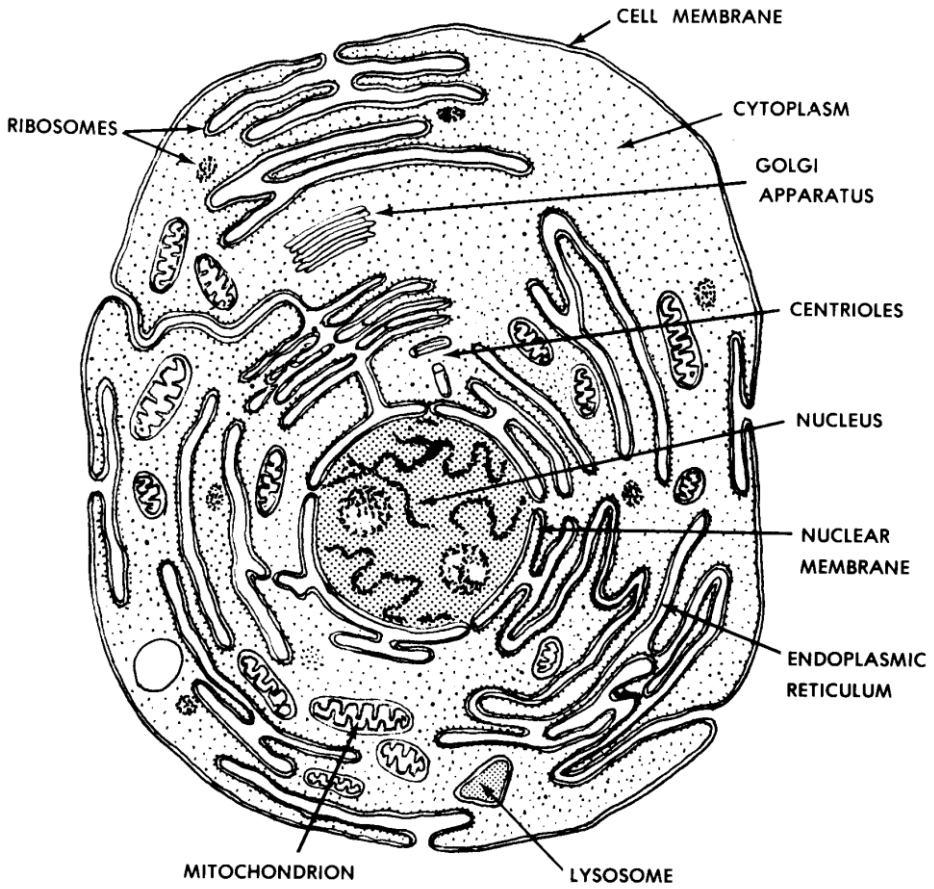


Figure 1-4. A "typical" animal cell (as seen in an electron microscope).

MAJOR COMPONENTS OF A "TYPICAL" ANIMAL CELL

Nucleus. The nucleus plays a central role in the cell. Information is stored in the nucleus and distributed to guide the life processes of the cell. This information is in a chemical form called nucleic acids. Two types of structures found in the nucleus are chromosomes and nucleoli. Chromosomes can be seen clearly only during cell divisions. Chromosomes are composed of both nucleic acid and protein. Chromosomes contain genes. Genes are the basic units of heredity which are passed from parents to their children. Genes guide the activities of each individual cell.

Cell Membrane. The cell membrane surrounds and separates the cell from its environment. The cell membrane allows certain materials to pass through it as they enter or leave the cell.

Cytoplasm. The semifluid found inside the cell, but outside the nucleus, is called the cytoplasm.

Mitochondria (Plural). Mitochondria are the "powerhouses" of the cell. The mitochondria provide the energy wherever it is needed for carrying on the cellular functions.

Endoplasmic Reticulum. The endoplasmic reticulum is a network of membranes, cavities, and canals. The endoplasmic reticulum helps in the transfer of materials from one part of the cell to the other.

Ribosomes. Ribosomes are "protein factories" in the cell. They are composed mainly of nucleic acids which help make proteins according to instructions provided by the genes.

Centrioles. Centrioles help in the process of cell division.

Lysosomes. Lysosomes are membrane bound spheres which contain enzymes that can digest intracellular structures or bacteria.

CELL MULTIPLICATION (MITOSIS)

Individual cells have fairly specific life spans. Some types of cells have longer life spans than others. During the processes of growth and repair, new cells are being formed. The usual process of cell multiplication is called **mitosis**. There are two important factors to consider:

- From one cell, we get two new cells.
- The genes of the new cells are identical (for all practical purposes) to the genes of the original cell.

HYPERTROPHY/HYPERPLASIA

Hypertrophy and **hyperplasia** are two ways by which the cell mass of the body increases.

With **HYPERTROPHY**, there is an increase in the **size** of the individual cells. No new cells are formed. An example is the enlargement of muscles due to exercise by the increased diameter of the individual striated muscle fibers.

With **HYPERPLASIA**, there is an increase in the total **number** of cells. An example of abnormal hyperplasia is cancer.

ATROPHY is seen when there is a loss of cellular mass.
