

Basic Human Anatomy

Lesson 2: Tissues of the Body

Welcome to Lesson 2 of the Basic Human Anatomy Course. Today, we'll be studying the Basic Tissues of the Body.

I have 5 goals for you in this lesson:

1. Be able to Define Tissue
2. Identify the four major types of tissues
3. Define
 - a. Epithelial tissue
 - b. Connective tissue
 - c. Muscle tissue
 - d. Nervous tissue
4. Name the tissue, after being given a of:
 - a. Epithelial tissue
 - b. Matrix
 - c. Fibrous connective tissue
 - d. Cartilage connective tissue
 - e. Bone connective tissue
 - f. Fat connective tissue
 - g. Smooth muscle tissue
 - h. Striated muscle tissue
 - i. Cardiac muscle tissue
 - j. Nervous tissue, neuron, or glia.
5. Name four major types of connective tissue (CT)
 - a. Name the characteristic cells of fibrous CT, cartilage CT, and bone CT
 - b. Describe the matrix of fibrous CT, cartilage CT, and fat CT.

DEFINITION

A tissue is a grouping of like cells working together.

TYPES OF TISSUES

There are several major types of tissues. The most common types are epithelial, connective, muscle, and nervous tissues. Later, this lesson will discuss each type.

TISSUES AND ORGANS

a. Tissues make up organs. An organ is a structure performing a particular function. An organ is composed of several different tissues. Examples of organs are the lungs and the heart.

b. In some cases, a term may be used to describe both a type of tissue and a kind of organ. For example, we speak of bone tissue and of bones. We speak of muscle tissue and of muscles.

DEFINITION OF EPITHELIAL TISSUES

Epithelial tissue is tissue that covers surfaces and lines cavities. Here, it may protect, absorb, and/or secrete. Epithelial tissue covers the outer surface of the body. It lines the intestines, the lungs, and other hollow organs.

TYPES OF EPITHELIAL CELLS (BY SHAPE)

Figure 2-1 illustrates the basic types of epithelial cells by shape. The three basic shapes are squamous (flat), cuboidal (cubes), and columnar (columns).

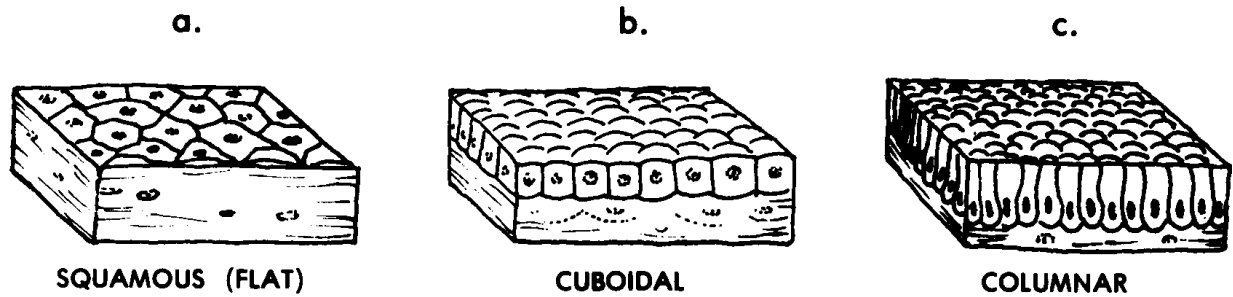


Figure 2-1. Epithelial cells.

TYPES OF EPITHELIAL TISSUES

- a. **Layers.** In epithelial tissues, the cells are in single or multiple layers. If there is only one layer, the tissue is called a simple epithelium. If there is more than one layer, the tissue is called a stratified epithelium. See figure 2-2.

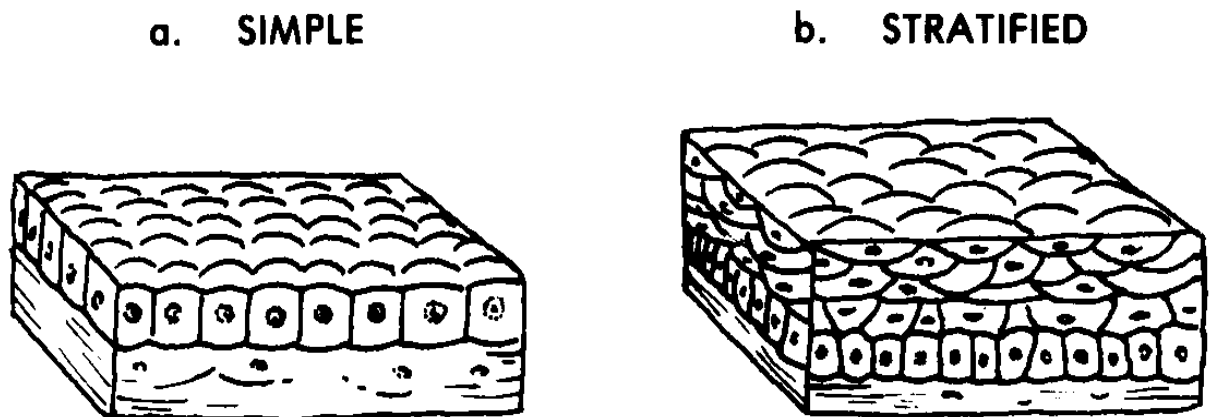


Figure 2-2. Types of epithelial tissues.

b. **Naming.** Epithelial tissues are named by the number of layers and the type of cell in its outermost layer. For example, if there are several layers and if the outermost layer consists of squamous (flat) cells, then the tissue is called a stratified squamous epithelium.

c. **Examples of Epithelial Tissues.**

(1) A simple squamous epithelium called endothelium lines the heart and blood vessels.

(2) As serous membranes, simple squamous epithelial tissue lines the cavities of the abdomen (peritoneal lining) and the chest (pleural lining). Serous membranes are membranes which secrete a lubricating fluid.

(3) Epithelial tissue forms the secretory part of glands and also parts of the various sense organs.

d. **Functions.** According to its location, epithelial tissue has different functions. As the skin, epithelial tissue protects the tissues beneath. In the small intestines, the epithelial tissue absorbs. In the lungs, epithelial tissue is a membrane through which the gases pass easily. In the glands, epithelial tissue secretes.

DEFINITION OF CONNECTIVE TISSUES

a. Connective tissue is tissue that supports other tissues, holds tissues together, or fills spaces.

b. Among and outside the cells of the connective tissues, there is a material called matrix. The matrix is manufactured by the connective tissue cells. Each type of connective tissue has its own particular type of matrix.

TYPES OF CONNECTIVE TISSUE

There are several major types of connective tissue (CT). These include fibrous CT (FCT), cartilage CT, bone CT, and fat CT. Blood is sometimes considered an additional type of CT.

FIBROUS CONNECTIVE TISSUE (FCT)

a. **Fibroblasts.** The characteristic cells of FCT are fibroblasts. Fibroblasts are able to form elongated fibers.

b. **Matrix.** These fibers make up the matrix of FCT.

c. **Fibers.** The fibers are either white or yellow.

(1) White fibers are made from a protein called collagen. White fibers tend to have a fixed length. White fibers are not very easily stretched.

(2) Yellow fibers are made from a protein called elastin. Yellow fibers are elastic. They can be stretched and then they can snap back (like a rubber band).

d. **Types of FCT.** The types of FCT are recognized by the arrangement of their fibers. These types include:

(1) Loose areolar FCT. Loose areolar FCT has an open irregular arrangement of its fibers.

AREOLAR = airy

Loose areolar FCT is found widely throughout the body. An example is the superficial fascia (subcutaneous layer). The superficial fascia is the connective tissue which lies beneath the skin. Loose areolar FCT is the filling substance around most organs and tissues of the body.

(2) Dense FCT. The fibers of dense FCT are closely packed and parallel. There are no significant spaces between the fibers. Examples of dense FCT are ligaments and tendons. A ligament is a band of dense FCT that holds the bones together at a joint. A tendon attaches a muscle to a bone.

CARTILAGE CONNECTIVE TISSUE

a. **Cartilage Cells.** Cartilage cells are also called chondroblasts. Cartilage cells are clustered in microscopic pockets within the cartilage matrix. The cartilage cells produce the material of the matrix.

b. **Matrix.** The matrix produced by the cartilage cells appears homogeneous (the same throughout). The matrix also appears amorphous (shapeless).

c. Types of Cartilage CT.

(1) Hyaline cartilage CT. Hyaline cartilage CT appears homogeneous and clear.

HYALINE = clear

This type of cartilage helps to cover bone surfaces at joints. Hyaline cartilage is found as incomplete rings which keep the trachea (windpipe) open.

(2) Fibrous cartilage CT. Fibrous cartilage CT includes dense masses of fibers (of FCT). It is more rigid than hyaline cartilage. The auricle of the external ear is stiffened with fibrous cartilage.

(3) Calcified cartilage CT. Calcified cartilage CT is cartilage that has been stiffened by the addition of calcium salts. This is not the same as bone tissue. An

example is the cartilages of the larynx (the voice box) which become calcified with age.

BONE CONNECTIVE TISSUE

a. **Osteoblasts/Osteoclasts.** Osteoblasts are cells that make and repair bone. Osteoclasts are cells which tear down and remove bone. Bone is continually being remodeled as a person lives. Remodeling is in direct response to the stresses placed on the bone.

b. **Types of Bone Tissues.** There are two major types of bone tissue. One is compact bone CT, which is dense. The other is cancellous bone CT, which is spongy. Compact bone CT forms the hard outer layers of bones as organs. Cancellous bone CT forms the inner, lighter portion of bones.

FAT CONNECTIVE TISSUE

a. **Fat Cells.** A large fraction of the volume of a fat cell is occupied by a droplet of fat. This droplet has its own membrane, in addition to the outer membrane of the cell. The remaining components of the fat cell, including the nucleus, are found in an outer layer of cytoplasm surrounding the droplet of fat.

b. **Matrix.** Fat connective tissue has a matrix of lipid (oil or fat). There may be yellow fat CT or brown fat CT.

c. **Functions.** Fat CT acts as a packing material among the organs, nerves, and vessels. Fat CT also helps to insulate the body from both heat and cold. Some fat CT serves as a high-energy storage area.

BLOOD "CONNECTIVE TISSUE"

Some experts consider blood to be a type of connective tissue. Blood will be discussed in lesson 9.

DEFINITION OF MUSCLE TISSUES

There are muscle tissues and there are organs called muscles. Muscles are made up of muscle tissues. Muscle tissues and the muscles they make up are specialized to contract. Because of their ability to shorten (contract), muscles are able to produce motion.

TYPES OF MUSCLE TISSUES

See figure 2-3 for the three types of muscle tissue.

a. **Skeletal Muscle Tissue.** The cells (muscle fibers) of skeletal muscle tissue are long and cylindrical and have numerous nuclei. The arrangement of the cellular contents is very specific and results in a striated appearance when viewed with the microscope. This type of muscle tissue is found mainly in the skeletal muscles.

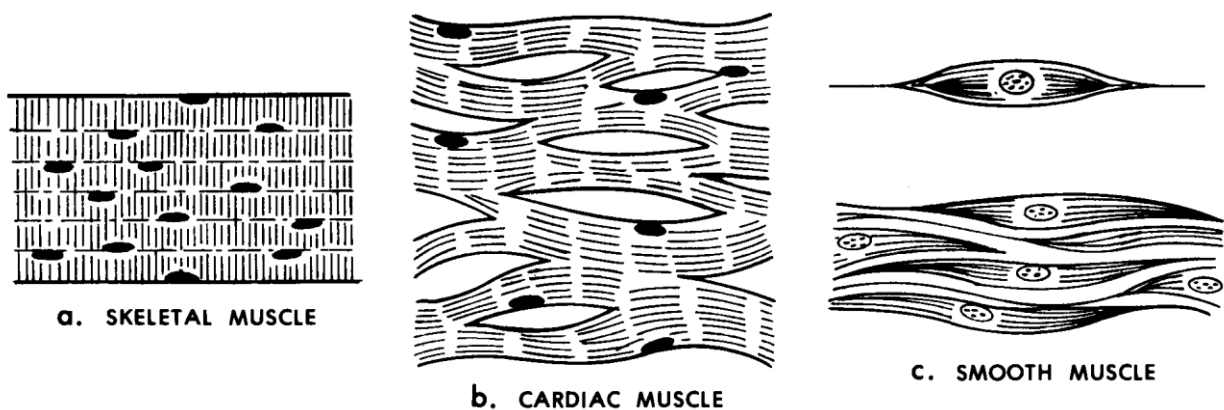


Figure 2-3. Types of muscle tissue.

b. **Cardiac Muscle Tissue.** The cells (muscle fibers) of cardiac muscle tissue are short, branched, contain one nucleus, and are striated. This tissue makes up the myocardium (wall) of the heart.

c. **Smooth Muscle Tissue.** The cells (muscle fibers) of smooth muscle tissue are spindle-shaped, contain one nucleus, and are not striated. Smooth muscle tissue is generally found in the walls of hollow organs such as the organs of the digestive and respiratory systems, the blood vessels, the ureters, urinary bladder, urethra, and reproductive ducts.

DEFINITION OF NERVOUS TISSUE

Nervous tissue is a collection of cells that respond to stimuli and transmit information.

NERVOUS TISSUE CELLS

a. A neuron (figure 2-4), or nerve cell, is the cell of the nervous tissue that actually picks up and transmits a signal from one part of the body to another. A synapse (figure 2-5) is the point at which a signal passes from one neuron to the next.

b. The neuroglia (also known as glia) is made up of the supporting cells of the nervous system (glial cells).

c. The nervous tissues will be discussed in a later lesson.

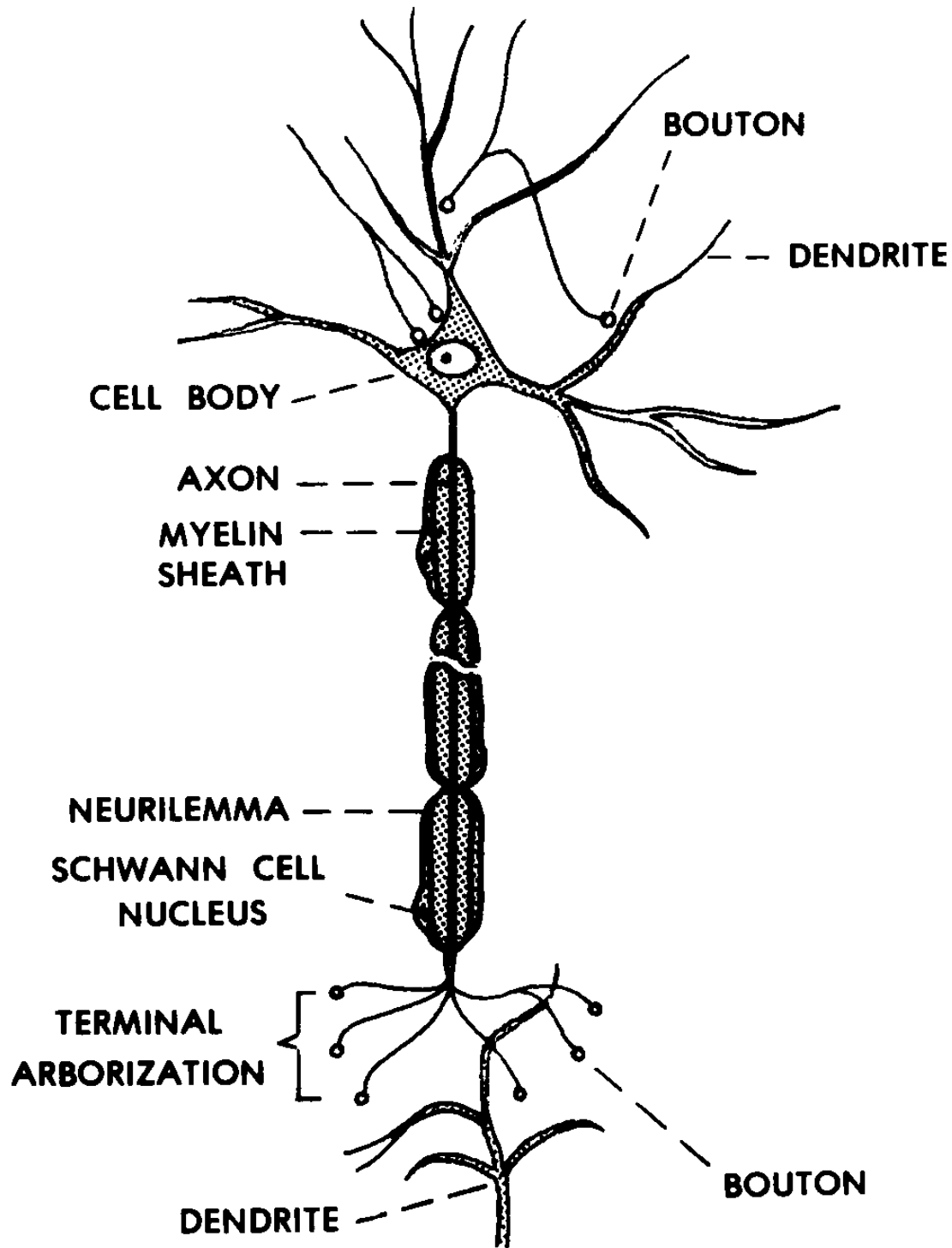


Figure 2-4. A neuron.

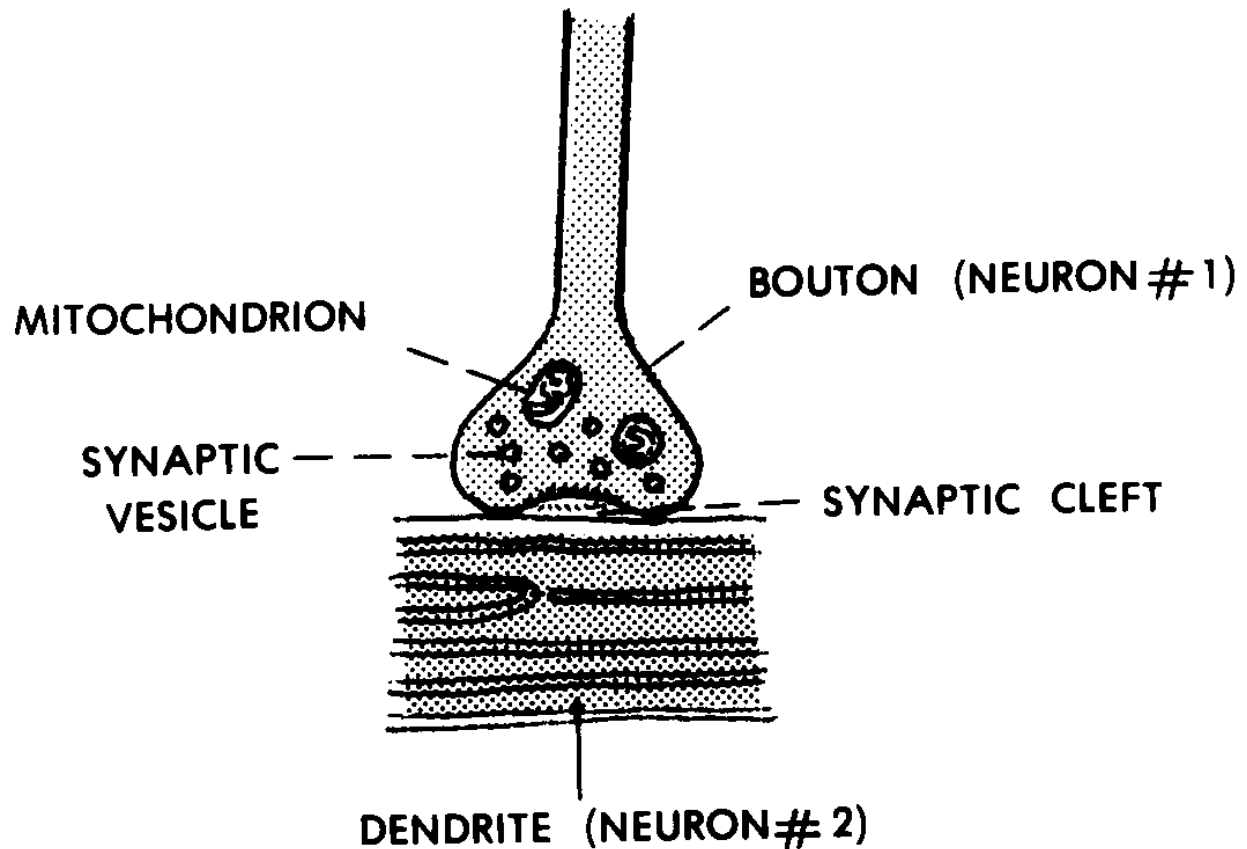


Figure 2-5. A synapse.

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