

Connective Tissue

A type of tissue found in animals whose main function is to bind, support, and anchor the body. Connective tissue (CT) is one of the four main classes of tissues. Although it is the most abundant and widely distributed of the primary tissues, the amount of connective tissue in a particular organ varies. Like to the timber framing of a house, the connective tissue provides structure and support throughout the body

- Connective tissue is the most abundant and widely distributed of the primary tissues.
- Connective tissue has three main components: cells, fibers, and ground substance. Together the ground substance and fibers make up the extracellular matrix (**extracellular matrix**: Cells of the connective tissue are suspended in a non-cellular matrix that provides structural and biochemical support to the surrounding cells)
- Connective tissue is classified into two subtypes: soft and specialized connective tissue.
- Major functions of connective tissue include: 1) binding and supporting, 2) protecting, 3) insulating, 4) storing reserve fuel, and 5) transporting substances within the body.
- Connective tissues can have various levels of vascularity. Cartilage is avascular, while dense connective tissue is poorly vascularized. Others, such as bone, are richly supplied with blood vessels.

Connective tissue is divided into four main categories:

1. Connective proper
2. Cartilage
3. Bone
4. Blood

Connective tissue proper has two subclasses: loose and dense. Loose connective tissue is divided into 1) areolar, 2) adipose, 3) reticular.

Dense connective tissue is divided into 1) dense regular, 2) dense irregular, 3) elastic.

- The lymphatic system is a part of the circulatory system, comprising a network of conduits called lymphatic vessels that carry a clear fluid called lymph unidirectionally towards the heart.
- Blood is considered a specialized form of connective tissue. In vertebrates, it is composed of blood cells suspended in a liquid called blood plasma.
- The primary tissue of bone, osseous tissue, is a relatively hard and lightweight composite material, formed mostly of calcium phosphate in the chemical arrangement termed calcium hydroxylapatite.
- Adipose tissue or body fat is loose connective tissue composed of adipocytes.
- Cartilage is a flexible connective tissue found in many areas in the bodies of humans and other animals, including the joints between bones, the rib cage, the ear, the nose, the elbow, the knee, the ankle, the bronchial tubes, and the intervertebral discs.
- In humans, adipose tissue is located beneath the skin (subcutaneous fat), around internal organs (visceral fat), in bone marrow (yellow bone marrow), and in breast tissue.

Types of Muscle

Skeletal Muscle

When you think of a muscle, most people generally think of a skeletal muscle. The biceps, triceps, and quadriceps are all common names for muscles that body builders tend to focus on. In fact, these general muscles are often composed of many small muscles that attach to different places to give a joint its full range of motion. Skeletal muscle is a striated muscle. This means that each muscle fiber has striations, or linear marks, which can be seen when this muscle is put under a microscope. The striations correspond to the sarcomeres present in striated muscles, which are highly organized bundles of muscle cells which can contract quickly in concert.

Skeletal muscle is controlled via the somatic nervous system, also known as the voluntary nervous system. Point your finger to the ceiling. This is your somatic nervous system in action, controlling your skeletal muscles.

Cardiac Muscle

Cardiac muscle, while similar to skeletal muscle in some ways, is connected to the autonomous nervous system. This system controls vital organs such as the heart and lungs and allows us to not have to focus on pumping our heart each time it needs to beat. While there is a certain amount of conscience control we have over the autonomous nervous system, it will always kick in when we are unconscious. For instance, you can hold your breath if you like but you do not have to remember to breathe all the time. Cardiac muscle surround the chambers of the heart and is used to pump blood through the body.

Cardiac muscle is similar to skeletal muscle in that it is striated. Unlike skeletal muscle, cardiac muscle fibers are arranged in a branching pattern instead of a linear pattern. Both skeletal muscle and cardiac muscle need to contract quickly and often, which is why the striations can be seen.

Smooth Muscle

Unlike skeletal and cardiac muscle, smooth muscle is not striated. This is because the individual muscle cells are not perfectly aligned into sarcomeres. Instead, they are displaced throughout the fibers. This gives smooth muscle the ability to contract for longer, although the contraction happens more slowly. Consider the muscle that contracts the sphincter on your bladder. This muscle may need to stay clamped shut for hours at a time and only gets a minute of relief when you go to the bathroom. Many other smooth muscles operate in the same manner.

Like cardiac muscle, smooth muscle is mostly controlled by the autonomous nervous system. The many muscles that line your digestive tract work together to move food through the digestive system. Muscles attach to your hair follicles that all your hairs to stand up when it's cold. Smooth muscle is almost everywhere in your body and aids in everything from circulation to digestion.

Metabolism

Metabolism is the set of life-sustaining chemical reactions in organisms. The three main purposes of metabolism are: the conversion of food to energy to run cellular processes; the conversion of food/fuel to building blocks for proteins, lipids, nucleic acids, and some carbohydrates; and the elimination of metabolic wastes. These enzyme-catalyzed reactions allow organisms to grow and reproduce, maintain their structures, and respond to their environments. (The word metabolism can also refer to the sum of all chemical reactions that occur in living organisms, including digestion and the transport of substances into and between different cells, in which case the above described set of reactions within the cells is called intermediary metabolism or intermediate metabolism).

Metabolic reactions may be categorized as *catabolic* – the *breaking down* of compounds (for example, the breaking down of glucose to pyruvate by cellular respiration); or *anabolic* – the *building up* (synthesis) of compounds (such as proteins, carbohydrates, lipids, and nucleic acids). Usually, catabolism releases energy, and anabolism consumes energy.

The metabolic system of a particular organism determines which substances it will find nutritious and which poisonous.