

Physiology of skeletal muscle

Each skeletal muscle is an organ that consists of various integrated tissues. These tissues include the skeletal muscle fibers, blood vessels, nerve fibers, and connective tissue. Each skeletal muscle has three layers of connective tissue (called myisia) that enclose it, provide structure to the muscle. Each muscle is wrapped in a sheath of dense, irregular connective tissue called the **epimysium**, which allows a muscle to contract and move powerfully while maintaining its structural integrity. The epimysium also separates muscle from other tissues and organs in the area, allowing the muscle to move independently.

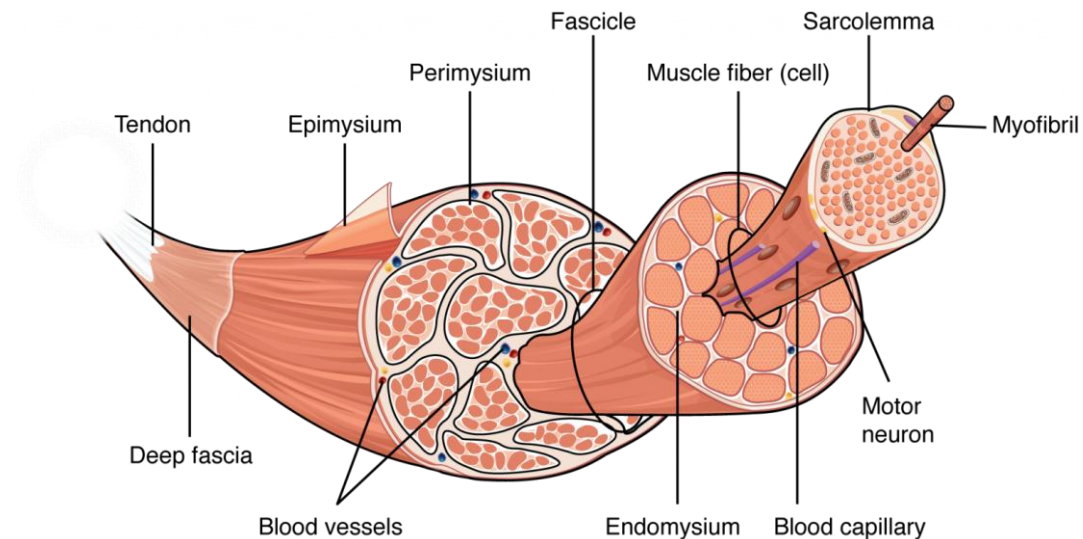


Figure :The Three Connective Tissue Layers

Bundles of muscle fibers, called fascicles, are covered by the perimysium. Muscle fibers are covered by the endomysium.

Inside each skeletal muscle, muscle fibers are organized into bundles, called **fascicles**, surrounded by a middle layer of connective tissue called the **perimysium**. it allows the nervous system to trigger a specific movement of a muscle by activating a subset of muscle fibers within a fascicle of the muscle. Inside each fascicle, each muscle fiber is encased in a thin connective tissue layer of collagen and reticular fibers called the **endomysium**.

Skeletal Muscle Fibers

Because skeletal muscle cells are long and cylindrical, they are commonly referred to as muscle fibers (or myofibers). Skeletal muscle fibers can be quite large compared to other cells, with diameters up to $100\ \mu\text{m}$ and lengths up to 30 cm. Having many nuclei allows for production of the large amounts of proteins and enzymes needed for maintaining normal function of these large protein dense cells. In addition to nuclei, skeletal muscle fibers also contain cellular organelles found in other cells, such as mitochondria and endoplasmic reticulum. However, some of these structures are specialized in muscle fibers. The specialized smooth endoplasmic reticulum, called the **sarcoplasmic reticulum (SR)**, stores, releases, and retrieves calcium ions (Ca^{++}).

The plasma membrane of muscle fibers is called the **sarcolemma** and the cytoplasm is referred to as **sarcoplasm**. Within a muscle fiber, proteins are organized into organelles called **myofibrils** that run the length of the cell and contain sarcomeres connected in series. The **sarcomere** is the smallest functional unit of a skeletal muscle fiber and is a highly organized arrangement of contractile, regulatory, and structural proteins. It is the shortening of these individual sarcomeres that lead to the contraction of individual skeletal muscle fibers (and ultimately the whole muscle)

actin

protein that makes up most of the thin myofilaments in a sarcomere muscle fiber

action potential

change in voltage of a cell membrane in response to a stimulus that results in transmission of an electrical signal; unique to neurons and muscle fibers

depolarize

to reduce the voltage difference between the inside and outside of a cell's plasma membrane (the sarcolemma for a muscle fiber), making the inside less negative than at rest