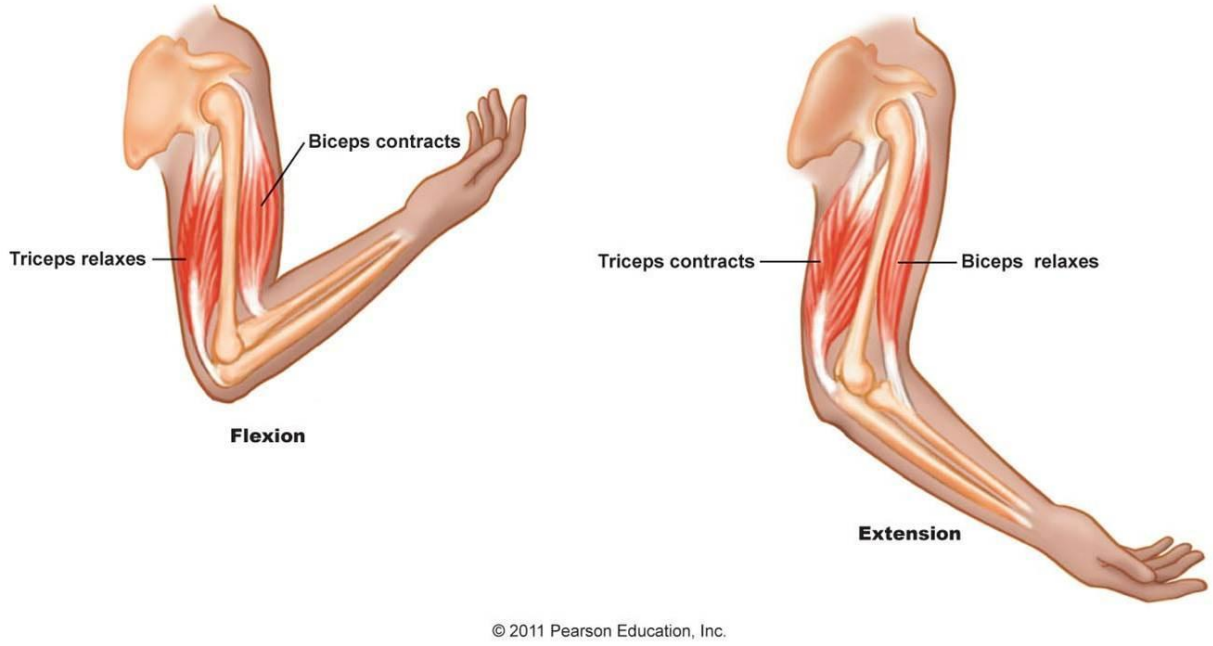
Skeletal Muscle Tissue

Skeletal muscle tissue is a type of striated muscle, meaning clear bands can be seen in it under a microscope. This can be seen in image (a) below. These tiny light and dark bands are *sarcomeres*, highly organized bundles of actin, myosin, and associated proteins. These organized bundles allow striated muscle to contract quickly and release quickly. Muscle tissue is attached to the bones through *tendons*, which are highly elastic portions of connective tissue. Many muscles may seem to control a single appendage, but in reality each one only controls one small aspect of movement. Skeletal muscle tissue can be controlled voluntarily, by the *somatic nervous system*. The other types of muscle are controlled mainly by the involuntary or *autonomous nervous system*.

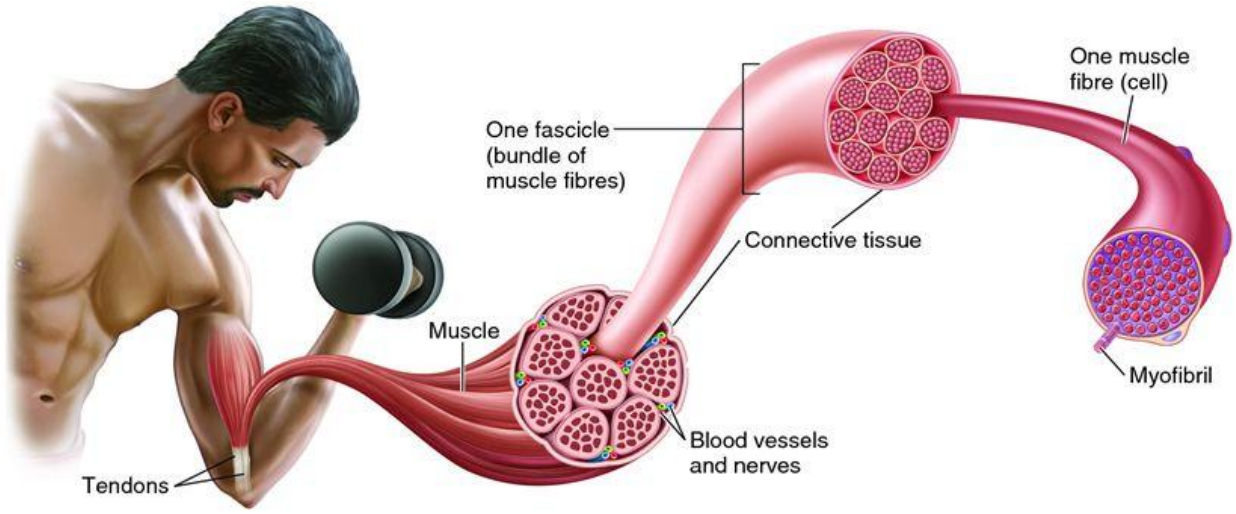
The muscle system is responsible for movement of the human body, posture, movement of substances inside the body andfor the generation of body heat. There are approximately 700 known and named muscles and on top of that, muscle tissue is also found inside of the heart, digestive organs, and blood vessels.

Skeletal muscle is a voluntary muscle, which means that we can actively control its function. It’s attached to the bone and forms a distinct organ of muscle tissue, blood vessels, tendons, and nerves that covers our bones and allows movement.

Skeletal muscles often exist in pairs, whereby one muscle is the primary mover and the other acts as an antagonist. For example when you bend your arm, your biceps contracts whilst your triceps is relaxed. When your arm returns to the extended position it is the triceps that contracts and the biceps relaxes.

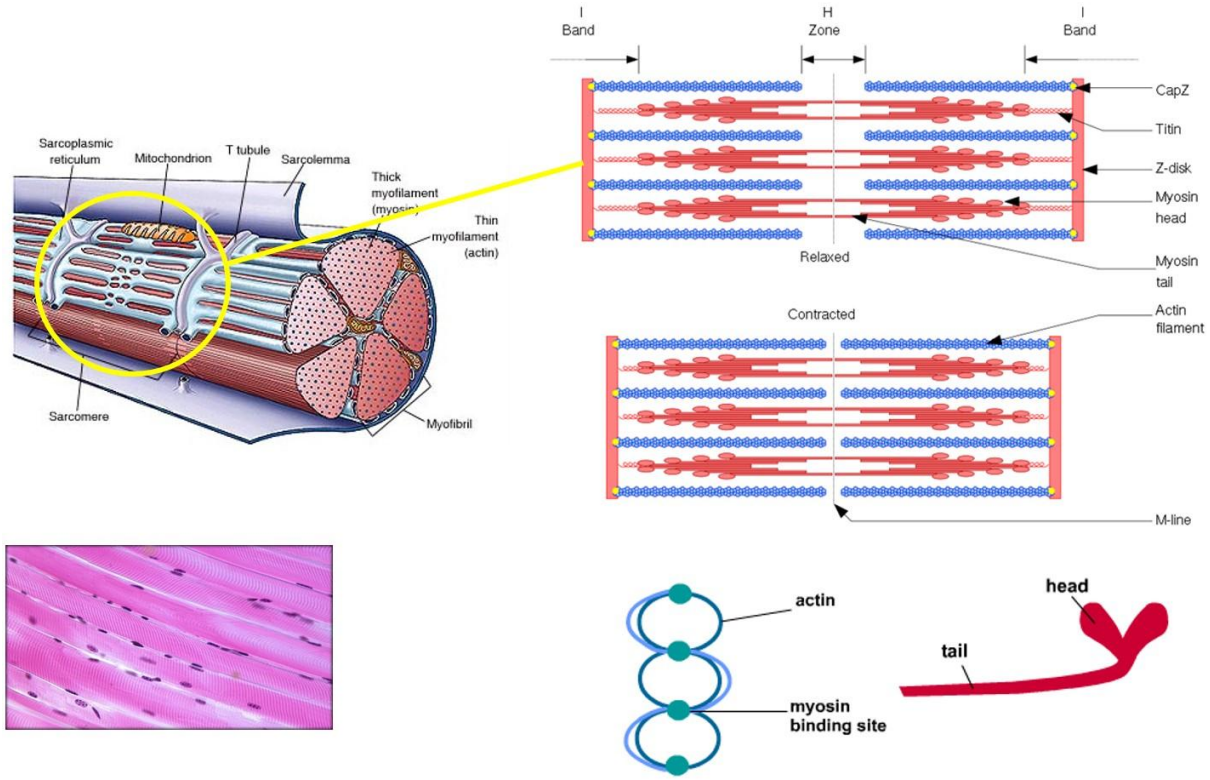


Skeletal muscle is a fascinating tissue with a complex structure. It consists of elongated multinuclear cells called the myocytes (or myofibers). The muscle cells can be anything from 1 mm to 30 cm in length. The longest muscle cell in our bodies can be found in the sartorius muscle and is 30 cm (nearly 12 inches!) long.



From biology-forums.com

The individual muscle cells appear striated under the microscope (see image below). This is due to the highly organsied structure of the muscle fibers where actin and myosin myofilaments are stacked and overlapped in regular repeating arrays to form sarcomeres. Actin and myosin filaments slide against each other and are responsible for the muscle contraction.

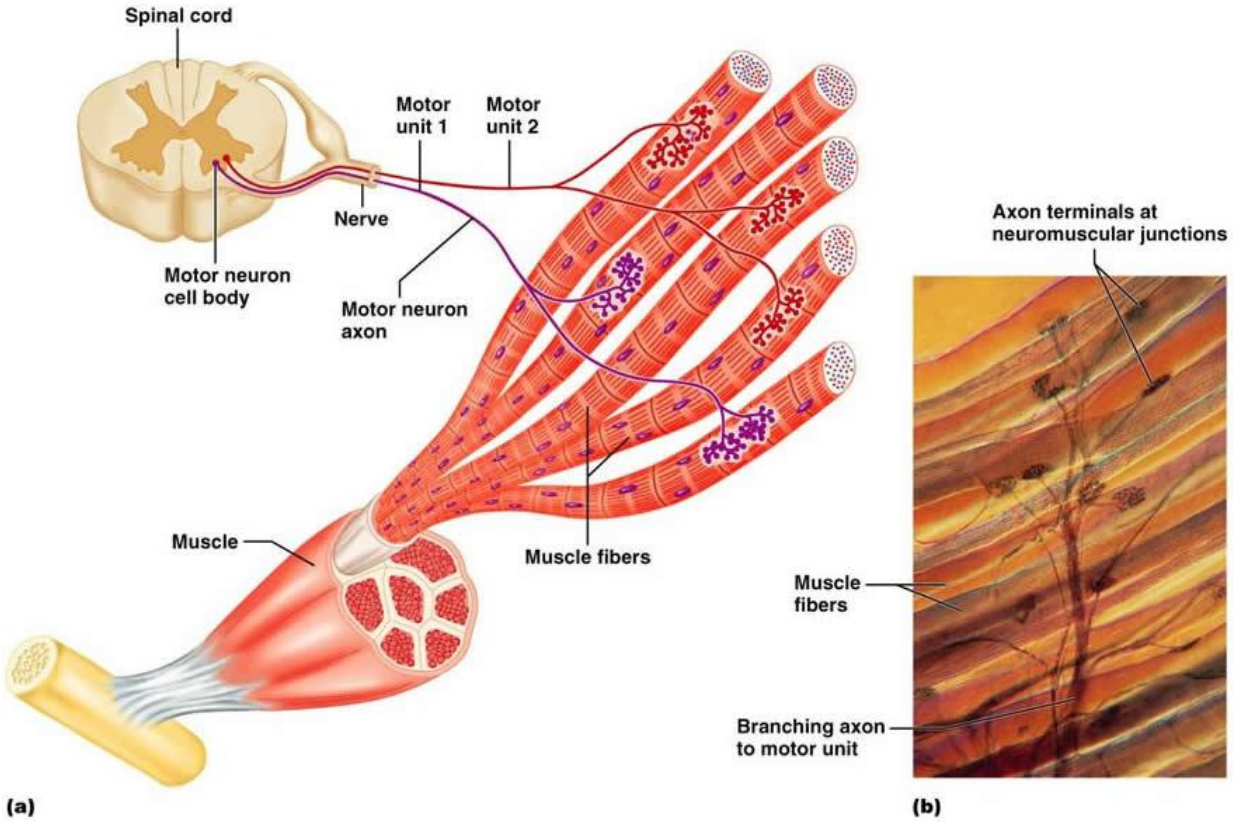


To see how the muscle contracts and works, have a look at the video here.

The energy for muscle function comes from intracellular organelles called the mitochondria. Mitochondria are the powerhouses of every cell in our bodies and responsible for delivering energy that the cells need to function.

Muscles are ennervated by motor neurons. A motor neuron and the muscle fibers ennervated by it form a motor unit. Size of motor units varies in the body, depending on the function of the muscle. Fine movements (eyes) have fewer muscle fibers per neuron to allow for fine movement. Muscles that require a lot of

strength have many muscle fibers per unit. The body can control strength by deciding how many motor units it activates for a given function.



Cardiac Muscle Tissue

While the striations in skeletal muscle tissue are even and parallel, complex and branching striations are seen in cardiac muscle tissue. Cardiac muscle can be seen in image (c) below. While the striations are hard to see in this image, the branching nature of the cells is easy to pick out. The branching is caused by the connection of cardiac muscle cells to one another. The cells are connected via *intercalated discs*. These junctures help cardiac muscle to contract as one and provide a rapid and coordinated contraction to move blood.

Characteristics of Cardiac Muscle

Cardiac muscle is characterized by striped muscle fibers, connected together by intercolated disks, where the membranes are specialized to allow electrical signals to pass easily. Like smooth muscles, cardiac muscles can remain in contraction for a sustained period. Like skeletal muscles, cardiac muscles also contract quickly. The formation of contractile proteins in cardiac muscle cells also allows for stronger contractions when the fibers are stretched, which makes the heart pump more efficiently.

Smooth Muscle Tissue

Unlike cardiac and skeletal muscle tissue, smooth muscle tissue has no striations. The fibers of myosin and actin in smooth muscle fiber is not nearly as organized as in the other types of muscle tissue. In smooth muscle, the contractions are not quick and rapid but rather smooth and continuous. Smooth muscle is found surrounding many organs, blood vessels, and other vessels used for transporting fluids. The smooth muscle can contract to apply a force on organ. This can be used to move blood or food throughout their respective systems. Smooth muscle is recognizable from its lack of striations and unbranching nature in image (b) below.