The **muscular system** is an [organ system](http://en.wikipedia.org/wiki/Organ_(anatomy)) consisting of [skeletal](http://en.wikipedia.org/wiki/Skeletal_muscle), [smooth](http://en.wikipedia.org/wiki/Smooth_muscle) and [cardiac](http://en.wikipedia.org/wiki/Cardiac_muscle) [muscles](http://en.wikipedia.org/wiki/Muscle). It permits movement of the body, maintains posture, and circulates blood throughout the body. The muscular system in [vertebrates](http://en.wikipedia.org/wiki/Vertebrate) is controlled through the [nervous system](http://en.wikipedia.org/wiki/Nervous_system), although some muscles (such as the [cardiac muscle](http://en.wikipedia.org/wiki/Cardiac_muscle)) can be completely autonomous. Together with the [skeletal system](http://en.wikipedia.org/wiki/Skeletal_system) it forms the [musculoskeletal system](http://en.wikipedia.org/wiki/Musculoskeletal_system), which is responsible for movement of the [human body](http://en.wikipedia.org/wiki/Human_body).

**Muscles:**

There are three distinct types of muscles: skeletal muscles, cardiac or heart muscles, and smooth (non-striated) muscles. Muscles provide strength, balance, posture, movement and heat for the body to keep warm.

Upon stimulation by an [action potential](http://en.wikipedia.org/wiki/Action_potential), skeletal muscles perform a coordinated contraction by shortening each sarcomere. The best proposed model for understanding contraction is the [sliding filament model](http://en.wikipedia.org/wiki/Sliding_filament_model) of muscle contraction. Actin and myosin fibers overlap in a contractile motion towards each other. Myosin filaments have club-shaped heads that project toward the actin filaments.

Larger structures along the myosin filament called [myosin heads](http://en.wikipedia.org/wiki/Myosin) are used to provide attachment points on binding sites for the actin filaments. The myosin heads move in a coordinated style, they swivel toward the center of the sarcomere, detach and then reattach to the nearest active site of the actin filament. This is called a rachet type drive system. This process consumes large amounts of[adenosine triphosphate](http://en.wikipedia.org/wiki/Adenosine_triphosphate) (ATP).

Energy for this comes from **ATP**, the energy source of the cell. ATP binds to the cross bridges between myosin heads and actin filaments. The release of energy powers the swiveling of the myosin head. Muscles store little ATP and so must continuously recycle the discharged [adenosine diphosphate](http://en.wikipedia.org/wiki/Adenosine_diphosphate) molecule (ADP) into ATP rapidly. Muscle tissue also contains a stored supply of a fast acting recharge chemical, [creatine phosphate](http://en.wikipedia.org/wiki/Creatine_phosphate" \o "Creatine phosphate) which can assist initially producing the rapid regeneration of ADP into ATP.

[Calcium ions](http://en.wikipedia.org/wiki/Calcium_ions) are required for each cycle of the sarcomere. Calcium is released from the [sarcoplasmic reticulum](http://en.wikipedia.org/wiki/Sarcoplasmic_reticulum" \o "Sarcoplasmic reticulum) into the [sarcomere](http://en.wikipedia.org/wiki/Sarcomere" \o "Sarcomere)when a muscle is stimulated to contract. This calcium uncovers the actin binding sites. When the muscle no longer needs to contract, the calcium ions are pumped from the sarcomere and back into storage in the [sarcoplasmic reticulum](http://en.wikipedia.org/wiki/Sarcoplasmic_reticulum" \o "Sarcoplasmic reticulum).

**Cardiac muscle**

Heart muscles are distinct from skeletal muscles because the [muscle fibers](http://en.wikipedia.org/wiki/Muscle_fibers) are laterally connected to each other. Furthermore, just as with smooth muscles, they are not controlling themselves. Heart muscles are controlled by the [sinus node](http://en.wikipedia.org/wiki/Sinus_node) influenced by the [autonomic nervous system](http://en.wikipedia.org/wiki/Autonomic_nervous_system).

**Smooth muscle**

Smooth muscles are controlled directly by the [autonomic nervous system](http://en.wikipedia.org/wiki/Autonomic_nervous_system) and are involuntary, meaning that they are incapable of being moved by conscious thought. Functions such as heart beat and lungs (which are capable of being willingly controlled, be it to a limited extent) are involuntary muscles but are not smooth muscles.

**Skeletal muscle**

There are approximately 639 skeletal muscles in the human body.

**Control of muscle contraction**

[Neuromuscular junctions](http://en.wikipedia.org/wiki/Neuromuscular_junctions) are the focal point where a [motor neuron](http://en.wikipedia.org/wiki/Motor_neuron) attaches to a muscle. Acetylcholine, (a [neurotransmitter](http://en.wikipedia.org/wiki/Neurotransmitter) used in skeletal muscle contraction) is released from the axon terminal of the nerve cell when an action potential reaches the microscopic junction, called a [synapse](http://en.wikipedia.org/wiki/Synapse). A group of chemical messengers cross the synapse and stimulate the formation of electrical changes, which are produced in the muscle cell when the acetylcholine binds to receptors on its surface. Calcium is released from its storage area in the cell's sarcoplasmic reticulum. An impulse from a nerve cell causes calcium release and brings about a single, short [muscle contraction](http://en.wikipedia.org/wiki/Muscle_contraction) called a [muscle twitch](http://en.wikipedia.org/wiki/Muscle_twitch). If there is a problem at the neuromuscular junction, a very prolonged contraction may occur, [tetanus](http://en.wikipedia.org/wiki/Tetanus). Also, a loss of function at the junction can produce [paralysis](http://en.wikipedia.org/wiki/Paralysis).

Skeletal muscles are organized into hundreds of [motor units](http://en.wikipedia.org/wiki/Motor_unit), each of which involves a motor neuron, attached by a series of thin finger-like structures called [axon terminals](http://en.wikipedia.org/wiki/Chemical_synapse#Anatomy_and_physiology). These attach to and control discrete bundles of muscle fibers. A coordinated and fine tuned response to a specific circumstance will involve controlling the precise number of motor units used. While individual muscle units contract as a unit, the entire muscle can contract on a predetermined basis due to the structure of the motor unit. Motor unit coordination, balance, and control frequently come under the direction of the [cerebellum](http://en.wikipedia.org/wiki/Cerebellum) of the brain. This allows for complex muscular coordination with little conscious effort, such as when one drives a car without thinking about the process.