

Classification of Muscles

- DEPENDING UPON STRIATIONS
- DEPENDING UPON CONTROL
- DEPENDING UPON SITUATION

Human body has more than 600 muscles. Muscles perform many useful functions and help us in doing everything in day-to-day life. Muscles are classified by three different methods, based on different factors:

- I. Depending upon the presence or absence of striations
- II. Depending upon the control
- III. Depending upon the situation.

■ DEPENDING UPON STRIATIONS

Depending upon the presence or absence of cross striations, the muscles are divided into two groups:

1. Striated muscle
2. Non-striated muscle.

1. *Striated Muscle*

Striated muscle is the muscle which has a large number of cross-striations (transverse lines). Skeletal muscle and cardiac muscle belong to this category.

2. *Non-striated Muscle*

Muscle which does not have cross-striations is called non-striated muscle. It is also called plain muscle or smooth muscle. It is found in the wall of the visceral organs.

■ DEPENDING UPON CONTROL

Depending upon control, the muscles are classified into two types:

1. Voluntary muscle
2. Involuntary muscle.

1. *Voluntary Muscle*

Voluntary muscle is the muscle that is controlled by the will. Skeletal muscles are the voluntary muscles. These muscles are innervated by somatic nerves.

2. *Involuntary Muscle*

Muscle that cannot be controlled by the will is called involuntary muscle. Cardiac muscle and smooth muscle are involuntary muscles. These muscles are innervated by autonomic nerves.

■ DEPENDING UPON SITUATION

Depending upon situation, the muscles are classified into three types:

1. Skeletal muscle
2. Cardiac muscle
3. Smooth muscle.

Features of these muscles are given in Table 28.1.

1. *Skeletal Muscle*

Skeletal muscle is situated in association with bones forming the skeletal system. The skeletal muscles form 40% to 50% of body mass and are voluntary and striated. These muscles are supplied by somatic nerves.

TABLE 28.1: Features of skeletal, cardiac and smooth muscle fibers

Features	Skeletal muscle	Cardiac muscle	Smooth muscle
Location	In association with bones	In the heart	In the visceral organs
Shape	Cylindrical and unbranched	Branched	Spindle-shaped, unbranched
Length	1 cm to 4 cm	80 μ to 100 μ	50 μ to 200 μ
Diameter	10 μ to 100 μ	15 μ to 20 μ	2 μ to 5 μ
Number of nucleus	More than one	One	One
Cross-striations	Present	Present	Absent
Myofibrils	Present	Present	Absent
Sarcomere	Present	Present	Absent
Troponin	Present	Present	Absent
Sarcotubular system	Well developed	Well developed	Poorly developed
'T' tubules	Long and thin	Short and broad	Absent
Depolarization	Upon stimulation	Spontaneous	Spontaneous
Fatigue	Possible	Not possible	Not possible
Summation	Possible	Not possible	Possible
Tetanus	Possible	Not possible	Possible
Resting membrane potential	Stable	Stable	Unstable
For trigger of contraction, calcium binds with	Troponin	Troponin	Calmodulin
Source of calcium	Sarcoplasmic reticulum	Sarcoplasmic reticulum	Extracellular
Speed of contraction	Fast	Intermediate	Slow
Neuromuscular junction	Well defined	Not well defined	Not well defined
Action	Voluntary action	Involuntary action	Involuntary action
Control	Only neurogenic	Myogenic	Neurogenic and myogenic
Nerve supply	Somatic nerves	Autonomic nerves	Autonomic nerves

Fibers of the skeletal muscles are arranged in parallel. In most of the skeletal muscles, muscle fibers are attached to tendons on either end. Skeletal muscles are anchored to the bones by the tendons.

2. Cardiac Muscle

Cardiac muscle forms the musculature of the heart. These muscles are striated and involuntary. Cardiac muscles are supplied by autonomic nerve fibers.

3. Smooth Muscle

Smooth muscle is situated in association with viscera. It is also called visceral muscle. It is different from skeletal and cardiac muscles because of the absence of cross-striations, hence the name smooth muscle. Smooth muscle is supplied by autonomic nerve fibers. Smooth muscles form the main contractile units of wall of the various visceral organs.