

Types of Muscle Tissue

Skeletal	Cardiac	Smooth
multinucleate	one	one
striated	nucleus	nucleus
	striated	nonstriated
voluntary	involuntary	involuntary
attached to bones to cause movement	heart (myocardium)	GI, Uterus, Blood vessels

Skeletal Muscle Cells

- long cells (fibers) that contain repeating striations called bands
- bands composed of filaments of actin and myosin
- voluntarily controlled by motor neurons:
 1. descending motor tracts
 2. ventral root
 3. spinal nerve
 4. neuromuscular junction synapses with muscle fiber

Innervation of Muscle Cell

motor neurons	stimulate muscle cells
excitable cells	can change membrane potential
acetylcholine	released from neuron and tells muscles to contract
Neuromuscular junction (synapse)	axon terminal of motor neuron interacts with muscle

Smooth Muscle Cells

- contain filaments of actin and myosin
- gap junctions allow movement between neighboring cells
- displays rhythmicity (peristalsis and segmentation)
- tetanic contraction
- multi-unit: more varicosities
- single unit: more gap junctions

Gross Anatomy of Skeletal Muscle

- A muscle is a bundle of fascicles
- Fascicles are bundles of muscle fibers (cells)
- muscle fiber (cell) serves as the unit of contraction
- Epimysium covers entire muscle
- Perimysium wrap around fascicle
- Endomysium encloses a single muscle fiber (cell)
- one nerve and one artery generally serve each muscle

Sliding Filament Theory

Action potential in neuron	motor neuron is activated an AP passes down axon	AP arrives at axon terminal
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Sliding Filament Theory (cont)

Calcium channels in neuron	voltage change induces opening of Ca channels	calcium induces docking of neurotransmitter-filled vesicles at plasma membrane
Acetylcholine released	Ach diffuses across cleft	Ach binds to its receptors
Muscle cell response	GP induces depolarization and MANY Ca channels open	T-tubules carry impulse deep into muscle fiber
power stroke and contraction	Calcium binds to troponin-- myosin binds to actin and uses ATP to generate a powerstroke	Muscle fibers shift at each sarcomere

Cardiac Muscle Cells

- connected by desmosomes and gap junctions
- contain filaments of actin and myosin that shorten to contract
- functional syncytium: all-or-none
- does not undergo tetanic contraction



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Not published yet.

Last updated 6th November, 2022.

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Microscopic Anatomy of Skeletal Muscle

Sarcoplasm: contains glycosomes and myoglobin
cytoplasm of muscle cell

Sarcolemma: deep to endomysium
specialized plasma membrane

T-tubules extensions of plasma membrane(sarcolemma), permit action potentials to penetrate,

Sarcoplasmic reticulum-(modified ER) calcium storage and release site

Myofibrils Fibers that aid in muscle contraction they are made of lots of sarcomeres(contractile units)

sarcomere contain thick(myosin) and thin(actin) filaments. the reason skeletal muscles are striated. slide along one another

Troponin and Tropomyosin proteins that prevent actin from binding myosin by blocking myosin binding sites

Myofibril structure

Dark A band actin and myosin filaments

Light I band actin filaments

H-zone area of A band with only myosin. shortens when muscle contraction occurs

M-line attachment point for myosin

Z-line attachment point for actin

Sliding Filament Theory Filaments in sarcomere do not shorten, they slide past one another



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