Intro

Cardiac Muscle	found only in the heart and shares characteristics of both skeletal and smooth muscles

Basic Vocabulary

Sarcoplasmic Reticulum	modified endoplasmic reticulum composed of a fine network of interconnected tubules into which Ca^{++} is actively transported and stored
T-Tubules	invagination of the plasma membrane at each sarcomere
Foot Proteins	proteins that span the gap between the lateral sacs and the transverse tubules and mediate a change in permeability to Ca^{++} by the lateral sacs; also known as ryanodine receptors because they are locked open by the plant chemical ryanodin
Lateral Sacs	enlared regions of the sarcoplasmic reticulum that come into close contact with the transverse tubules
Dihydropyridine Receptors	receptor proteins in the transverse tubule membrane that come into contact with the foot proteins; voltage dependent and gate the change in permeability of the foot proteins to Ca^{++}

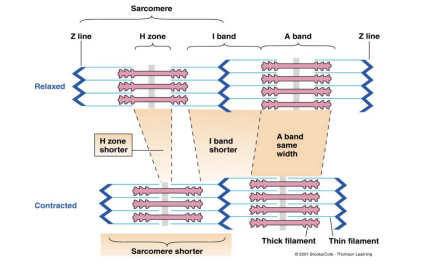
Thin Filament

Actin	globular cytoskeletal protein linked to form two long chains arranged in a double helical strands
Tropomyosin	pairs of threadlike filamentous proteins that lie alongside the grooves formed by the actin helix
Troponin	protein complex composed of three subunits, one that binds to actin, one that binds to tropomyosin, and one that binds to Ca^{++}; multiple copies of this complex are bound to the strands of actin and tropomyosin

Striated and Unstriated Muscles

Striated Muscles	*Skeletal and Cardiac Muscles*	Visually has striped lines across the muscle
Unstriated Muscles	*Smooth Muscles*	Has no striped lines

Sarcomere Nomenclature



Excitation-Contraction Coupling

1. ACh released by axon of motor neurons binds to receptors on the motor end plate

2. Action potential generated in response to binding of ACh and subsequent end plate potential is propagated across surface of membrane and down T-Tubule of muscle cell

Excitation-Contraction Coupling (cont)

3. Action potential triggers Ca^{++} release from the sarcoplasmic reticulum

4. Ca^{++} ions released from lateral sacs bind to troponin on actin filaments; tropomyosin physically moved aside to uncover cross--bridge binding sites on actin

5. Myosin cross bridges attach to actin and bend, pulling actin filaments towards the center of the sarcomere; powered by energy provided by ATP

6. Ca^{++} actively taken up by sarcoplasmic reticulum when there is no longer local action potentials

7. With Ca^{++} no longer bound to troponin, tropomyosin slips back to its blocking position over the binding sites on actin; contraction ends; actin slides back to original resting position

Thick Filament

Myosin	cytoskeletal protein composed of two interwoven subunits, eqch with a long tail and a globular head region
Actin Binding Site	specialized region of the myosin head capable of binding to actin
Myosin ATPase	specialized region of the myosin head capable of ATP hydrolysis

Voluntary and Involuntary Muscles

Voluntary Muscles	*Skeletal Muscles*
Involuntary Muscles	*Cardiac and Smooth Muscles*

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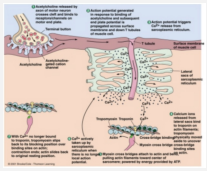
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Sarcomere Vocabulary

Sarcomere	functional unit of a muscle
Z-Line	defines boundary of sarcomere; site where thin filaments attach
A-Band	made up of thick filaments along with portions of thin filaments that overlap
H-Zone	lighter area within middle of A-band where thin filaments do not reach
M-Line	extends vertically down middle of A-band within center of H-zone
I-Band	consists of remaining portion of thin filaments that do not project into A-band

Excitation-Contraction Coupling



Intercalated Discs

specialized cell-to-cell junctions found in cardiac muscle tissue

contains desmosomes (maintaining the structural integrity and mechanical stability of the heart)

also contains gap junctions (allows electrical signals (action potentials) to pass directly between cells)

located at the ends of the cardiac muscle cells which form a zigzag connection between them

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