

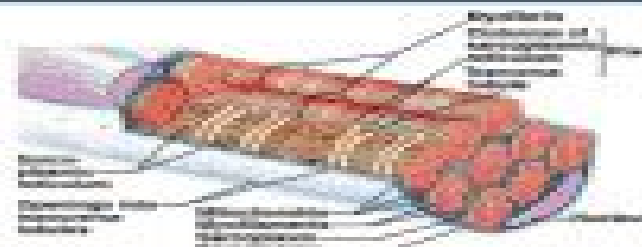
Muscle Contraction

H&SP! Medical Anatomy & Physiology 09b
Lab Activity

Background

Muscle Cell Structure

Muscle cells are specialized to contract. An individual muscle is actually a bundle of hundreds to thousands of long cylindrical muscle fibers or cells. The cell membrane of muscle cells is called the sarcolemma, the cytoplasm is the sarcoplasm, and the endoplasmic reticulum is modified into the sarcoplasmic reticulum (SR). Channels from the sarcolemma into the sarcoplasm and SR are called transverse (T) tubules. The T tubules allow for electrical impulses from motor neurons to be channeled directly to the SR, causing it to release calcium ions and initiate a contraction. Muscle cells are made up of bundles of myofibrils that contain the contracting units, called sarcomeres, made up of two main proteins - myosin and actin.



Myofibrils (bundles of sarcomeres) within a muscle fiber. © 2007 L. J. P. Coen



The Motor Unit

Motor neurons connect to skeletal muscles to control movement. Each motor neuron actually controls a group of muscle cells called a motor unit. All of the cells in the motor unit will be stimulated by the motor neuron at the same time. Movements that need fine motor skills, like writing with a pencil, have only a few muscle cells for each motor unit, which allows for precision. Larger movements, like picking up a bag, have many muscle cells for each motor unit.

Muscle Contraction

A muscle contraction is a complicated cycle and can differ according to the type of contraction and the type of muscle tissue. The following chart describes and diagrams the steps of a muscle contraction according to the sliding filament theory.

Steps of a Muscle Contraction

1	The brain or spinal cord sends an impulse to the muscle.	<p>A diagram of a neuromuscular junction. It shows a cross-section of a motor neuron (labeled 'Motor neuron') with its axon terminal (labeled 'Axon terminal') releasing neurotransmitters (labeled 'Neurotransmitter') into the synaptic cleft (labeled 'Synaptic cleft') to reach the sarcolemma of a muscle fiber (labeled 'Sarcolemma').</p>
2	The impulse travels down the motor neuron and reaches a neuromuscular junction where it releases acetylcholine, which triggers the impulse in the muscle.	
3	The impulse travels through the plasma membrane (sarcolemma) and down T tubules surrounding the myofibrils.	<p>A diagram of a muscle fiber showing the path of an electrical impulse. The impulse starts at the sarcolemma (labeled 'Sarcolemma') and travels down the transverse tubule (labeled 'Transverse tubule') which surrounds the myofibril (labeled 'Myofibril').</p>
4	As the impulse passes through the T tubules, it causes the sarcoplasmic reticulum (SR) surrounding the T tubule to release calcium ions (Ca^{2+}) into the sarcoplasm, eventually reaching the sarcomere.	

Answer Key For For Muscle Activity

Mary Rhiner



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are able to perceive whatever common neural features underlie sentience in those animals that possess it *General Physiology of Muscles and Nerves* Isidor Rosenthal, 1881 **Human Biology** Sylvia S. Mader, 1997-07 **Human Biology and Health** Michael J. Padilla, 2002 **English Mechanic and Mirror of Science**, 1873 **Cambridge IGCSE™ Physical Education Student's Book (Collins Cambridge IGCSE™)** Leon Fraser, 2021-06-07 Collins Cambridge IGCSE PE is the only published course to offer comprehensive coverage of the Cambridge IGCSE PE syllabus Consisting of a clear colourful Student Book a supportive Teacher's Guide and a digital component for reinforcement of key syllabus topics the course enables students to deepen their understanding and build confidence **Calcium in Muscle Activation** Johann Caspar Rüegg, 1988 **English Mechanic and Mirror of Science and Art**, 1873 **Study Guide for Introductory Psychology** Morris K. Holland, 1981 **Ganong's Physiology Examination and Board Review** Kim E. Barrett, Susan M. Barman, Scott Boitano, Jane F. Reckelhoff, 2017-09-01 The review students need to excel on their medical physiology course exams and the USMLE This powerful new review follows the format of the acclaimed Katzung Trevor's Pharmacology Examination Board Review It delivers a concise overview of essential high yield topics and fundamental concepts followed by USMLE style Q A The chapter based approach facilitates use with course notes or larger texts Presented in full color the book includes numerous flow charts illustrations and tables that summarize must know information Ganong's Medical Physiology Examination Board Review succinctly covers all key physiology principles and includes clinical correlations to clarify the connection between physiology and clinical medicine The book includes two comprehensive 100 question examinations followed by the correct answer and rationales Learning aids included bolded key terms skill builder questions that prompt readers to review previous material and end of chapter checklists Essential for USMLE Step 1 review An excellent course book for physiology Companion website offers interactive customizable qBank Learning and Physiological Responses to Various Word-picture Combinations Henry A. Bern, 1958 Student Guidebook Peter S. Fernald, Lloyd Dodge Fernald, 1972

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