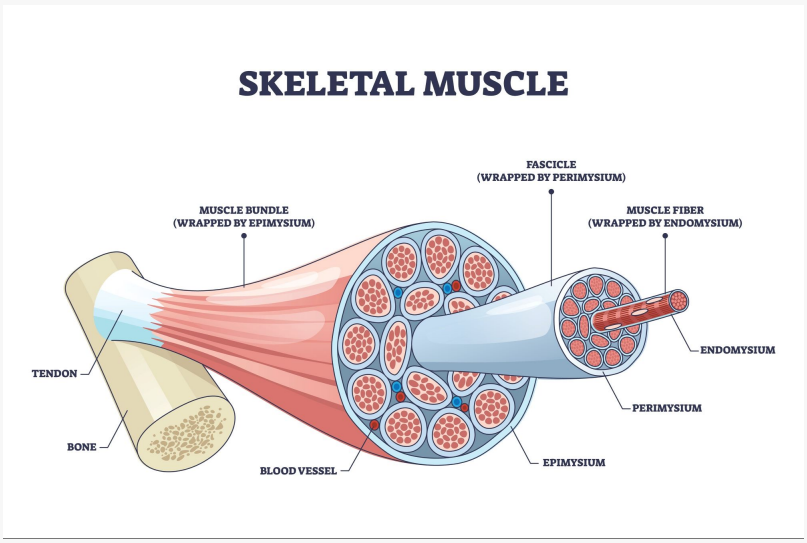
The Brookbush Institute Enhances Physiology Education with an Update to the Course 'Muscle Cell Structure and Function'

Learn about muscle cell structure, muscle cell traits, sliding filament theory, excitation-contraction coupling, motor units, and so much more.



Layers of connective tissue - https://brookbushinstitute.com/courses/muscle-cell-structure-function

NEW YORK, NY, UNITED STATES, November 5, 2024 /EINPresswire.com/ -- From the Course: Muscle Cell Structure and Function
- Additional Study Aids: Motor Unit

MUSCLE CELLS (Definition):
- Muscle cells, also known as myocytes, are specialized cells designed for contraction and force production.

Skeletal Muscle Cells: These cells are long, cylindrical, and have a striated (or striped) appearance due to their highly organized structure into functional units known as sarcomere. Additionally, these cells are multi-nucleated to increase the rate of protein synthesis and growth. Further, these cells have the highest number of mitochondria per cell in the human body to aid in energy production. However, the most important difference between skeletal muscle cells and other muscle cell types is that they can be voluntarily recruited. That is, skeletal muscle is the only type of muscle that can be consciously activated via the intent to move.

- "Muscle Fibers" versus "Myofibrils:" Note that skeletal muscle cells are also known as "muscle fibers" because of their long fiber-like shape (0.001 - 0.01 cm thick but 2 - 12 cm long). However, "myofibrils" are an organelle within a muscle cell (muscle fiber). Myofibrils are strands of repeating sarcomeres that run parallel to one another and are bundled into muscle fibers by the sarcolemma and endomysium - a thin layer of areolar (loose) connective tissue.

COURSE INTRODUCTION
This course covers the structure and function of skeletal muscle cells. The human body consists of four main types of cells: epithelial cells (e.g., skin), nerve cells (e.g., sciatic nerve), connective tissue cells (e.g., tendons), and muscle cells (e.g., biceps brachii). Muscle tissue is classified into

> Education from Brookbush Institute is thorough and easy to digest. I have filled in so many gaps from my initial licensure with this platform. I am so grateful for this platform."
>
> *Sherstin Hatch, Movement Professional*

three distinct types: smooth muscle tissue, cardiac muscle tissue, and skeletal muscle tissue. Skeletal muscle cells are unique due to their highly organized structure, their ability to generate force through contraction, and their ability to be voluntarily controlled.

Muscle contraction results from an interaction between two proteins, actin and myosin, which are collectively known as "contractile filaments." These contractile filaments are organized parallel to one another in the smallest functional unit of a muscle cell, known as a sarcomere. When a motor nerve is stimulated, it signals to all of the sarcomeres in all of the innervated muscle cells (a motor unit) to contract. This is known as excitation-contraction coupling. Contraction occurs when myosin (a "motor protein") changes in shape and pulls actin toward the center of the sarcomere, sliding the filaments passed one another. This process of contraction is known as the sliding filament theory.

This course covers all of these amazing processes and more in greater detail, with practical applications throughout. See an example of "practical applications" below.

Practical Application of Understanding Excitation-Contraction Coupling

All-or-none Principle: Because an action potential is all-or-none, and the stimulus from a nerve propagates across the entire sarcolemma, a muscle fiber has to contract completely or not at all (all-or-none principle). You cannot contract half a muscle fiber (or muscle). This should have dispelled the myths about targeting your "distal bicep brachii," "medial pectoralis major ," or "lower gluteus maximus ," etc.

Application in Physical Rehabilitation: Several injuries and pathologies may disrupt normal excitation-contraction coupling. For example, radiculopathies (e.g., sciatica) can cause intense muscle pain, as these nerve irritations often result in irregular but intense bursts of action potentials that result in muscle spasms. Additionally, some pathologies directly affect the excitation-contraction coupling. Myasthenia gravis is an autoimmune disorder in which antibodies attack the acetylcholine receptors at the neuromuscular junction, reducing the ability of muscles to respond to neural signals.

Application in Human Performance: Discussions about ions, calcium, and ATP might remind you of sports supplements. Although ingesting calcium alone may not significantly impact performance (unless correcting a deficiency), and ATP cannot be directly ingested to increase muscle stores, two common supplements can enhance performance by affecting excitation-contraction coupling. While calcium itself may not provide a performance boost, consuming sodium and potassium, along with smaller amounts of the other electrolytes, can improve

performance during exercise lasting longer than an hour. These electrolytes, found in sports drinks like Gatorade, play a key role in maintaining muscle and nerve function during the rapid depletion of electrolytes during intense physical activity. Additionally, creatine phosphate (CP) supplements increase CP stores in muscles, which helps regenerate ATP from ADP. Even though ATP cannot be ingested directly, increasing CP stores through supplementation supports energy production during intense physical activity.

THIS COURSE COVERS
- Muscle cell traits
- Muscle cell structure
- Excitation-contraction coupling
- Sliding filament theory
- Motor unit recruitment
- Connective tissue layers
- Muscle fiber arrangement (Pennation Angle).

THE FOLLOWING STUDY AIDS ARE INCLUDED
- AI Tutor
- Course Summary Webinar
- Study Guide
- Text and Illustrations
- Audio Voice-over
- Practical Applications
- Practice Exam
- 3 Credit Final Exam
- Additional Courses:
- Muscle Fiber Types
- Muscle Fiber Dysfunction and Trigger Points

Brent Brookbush
Brookbush Institute
Support@BrookbushInstitute.com
Visit us on social media:
Facebook
X
LinkedIn
Instagram
YouTube
TikTok
Other

---

try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.