

Muscle Overview

- The majority of the muscle in the body is skeletal muscle since it is attached to the skeleton.
- Main function is to provide movement
- Main Types:
 - Cardiac and Smooth (Involuntary)
- Function: transport materials within the body
- Skeletal (Voluntary)
- Main features:
 - Appear striped (striated)
 - Contain multiple nuclei (multinucleate)
- Functions:
 - Gives body contour and shape
 - Allow movement
 - Ability to manipulate environment

The Cells of Skeletal Muscle

- Muscles are composed of long, cylindrical cells called fibers
- Muscle cells are arranged into myofibrils
 - Long, filamentous organelles
 - Give skeletal muscle its striated appearance
- Myofibrils are composed of thread-like myofilaments
 - Contain 2 types of contractile proteins
 - ~ Actin or Myosin
 - Slide past one another to produce muscle shortening or contraction
- Sarcomeres: actual contractile units of muscle which extend from the middle of one I band (its z disc) to the middle of the next along the length of the myofibrils
- Cross section where thick and thin filaments of sarcomeres overlap show thick filaments surrounded by 6 thin filaments; each thin filament is enclosed by 3 thick filaments

Types of Muscles

- Agonists are primarily responsible for producing movement
- Antagonists oppose or reverse a movement, provides resistance
 - When one is active, the other is relaxed
- Synergists aid antagonists by reducing undesired movement (stabilize)
- Fixators are specialized synergists, immobilize and allow you to "pose"

Muscles of the Head

- Mentalis
 - O: mandible below incisors
 - I: Skin of chin
 - Action: Protrudes lower lip; wrinkles chin

Muscles of the Head

- Zygomaticus
 - O: zygomatic bone
 - I: corners of mouth
 - Action: smiling

Muscles of the Head

- Epicranianus
- Orbicularis oculi
- Corrugator supercilii
- Levator labii superioris
- Zygomaticus (major and minor)
- Risorius
- Depressor labii inferioris
- Depressor anguli oris
- Orbicularis oris
- Mentalis
- Buccinator
- Masseter
- Temporalis
- Medial pterygoid
- Lateral pterygoid

The Neuromuscular Junction

- Skeletal muscle cells are stimulated by motor neurons via nerve impulses
- Neuromuscular junctions are found between nerve fibers (axon) and muscle cells
- A single neuron may stimulate many muscle cells
- A motor unit is composed of the muscle cells and stimulating neuron
- Synaptic cleft is the gap separating the neuron and muscle fiber

Organization of Skeletal Muscle Cells into Muscles

- Endomysium: thin areolar connective tissue surrounding each fiber
- Perimysium: collagenic membrane sheathing bundles of fibers
- Fascicle: bundle of muscle fibers
- Epimysium: dense overcoat of connective tissue around entire muscle
- Deep Fascia: connective tissue that bind muscles into functional groups
- Tendons: connect muscle to bone (strong, cordlike)
- Aponeuroses: connect muscle to muscle or bone (flat, sheet-like)

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The Neuromuscular Junction

In axon terminal:
neurotransmitter signals muscle
Acetylcholine (ACh)
leaves axon terminal, goes to synaptic cleft,
binds to receptors on sarcolemma

Muscles of the Head

Masseter
O: zygomatic arch
I: angle & ramus of mandible
Action: elevate mandible

Origins and Insertions

A muscle's origin is it's fixed attachment
A muscles insertion is it's movable attachment
For example: the Triceps
Origin: Humerus
Insertion: Ulna

The Cells of Skeletal Muscle

- At each junction of A and I bands, the sarcolemma indents into the muscle cell, forming a transverse tubule (T tubule).
- These tubules run deep into the muscle cell between the terminal cisternae, of the smooth ER, called the sarcoplasmic reticulum.
- Regions where the SR terminal cisternae abut a T tubule on each side are called triads.

Muscles of the Head

Orbicularis oculi
Sphincter muscle of eyelid
O: frontal & maxillary bones
I: tissue of eyelid
Action: closes eye

Muscles of the Head

Risorius
O: Fascia of masseter muscle
I: Skin at angle of mouth
Action: Draws corner of lip laterally

The Cells of Skeletal Muscle

- The sarcolemma is the covering of each muscle fiber
- The sarcoplasm is the cytoplasm of a muscle fiber
- The sarcosomes are mitochondria of muscle tissue
- The sarcoplasmic reticulum is the endoplasmic reticulum of a muscle tissue
- A sarcomere is the contractile unit of a muscle

Muscles of the Head

Temporalis
O: temporal fossa
I: coronoid process of mandible
Action: elevate and retract mandible

Muscles of the Head

Temporalis
O: temporal fossa
I: coronoid process of mandible
Action: elevate and retract mandible

Muscles of the Head

Buccinator
O: molar region of maxilla & mandible
I: Orbicularis oris
Action: Draws corners of the mouth

Muscles of the Head

O: zygomatic bone and infraorbital margin of maxilla
I: skin and muscle of upper lip and boarder of nostril
Action: opens lip; raises and furrows upper lip

The Cells of Skeletal Muscle

- Myofilaments:
- contractile proteins
- actin- thin
- myosin- thick
- I band: only actin

The Cells of Skeletal Muscle (cont)

- A band: actin and myosin
- H-zone: only myosin (between actin). Only thick filaments

Naming Muscles

Muscles are named by:
Direction of muscle fibers (in reference to an imaginary line)
- rectus (straight) - transverse (at a right angle)
- oblique (irregular)
Relative size of muscle
- maximus (largest) - longus (long)
- minimus (smallest) - brevis (short)
Location of muscle, or bone its associated with
Number of origins
- bi (2) -tri (3) - quad (4)
Location of origin or insertion
Shape of muscle
- orbit (circular) - del (triangular)
Action of muscle
- adductor (bring closer) - extensor (move away)

Anatomy of a Skeletal Muscle

- Thick Filaments: composed of myosin
- Thin Filaments: composed of actin
- A Bands: dark bands, both actin and myosin (thick). Thick and thin overlap at outer edges
- I Bands: light bands, only actin (thin). Contains thin only
- H Zone: portion of A Band where thick and thin do not overlap
- Z Line: bisect I Bands, compose one sarcomere
- T Tubule: indent of sarcolemma at junction of A and I bands

The Neuromuscular Junction

lots ACh released → sarcolemma channels
open → K⁺ and Na⁺ flow across membrane
→ action potential → muscle contraction

Organization of Skeletal Muscle Cells into Muscles

Tendons provide durability and conserve space
Are rough collagenic connective tissue that span rough bony prominences; this would destroy more delicate muscle tissue
Are small so more tendons can pass over a joint than muscle tissue
Connective Tissue Wrappings
Support and bind muscle fibers
Provide strength to the total muscle
Provide a route for the entry and exit of nerves and blood vessels
The larger the muscle, the more connective tissue



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Page 3 of 3.

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