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

Epicranius
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

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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 then 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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