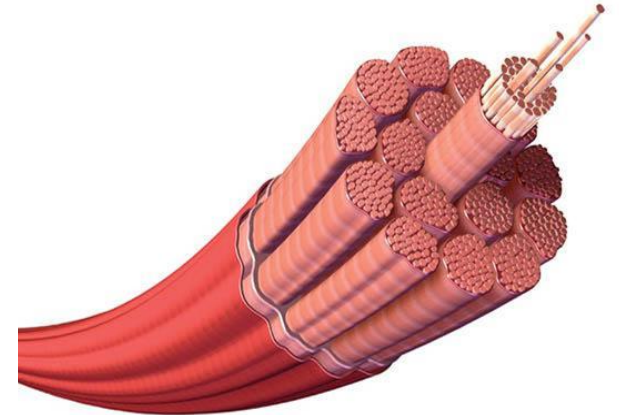
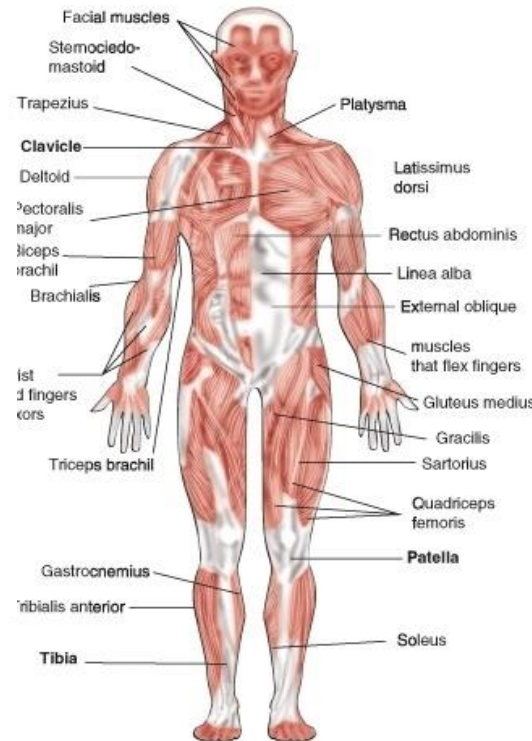


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# Muscular System Intro

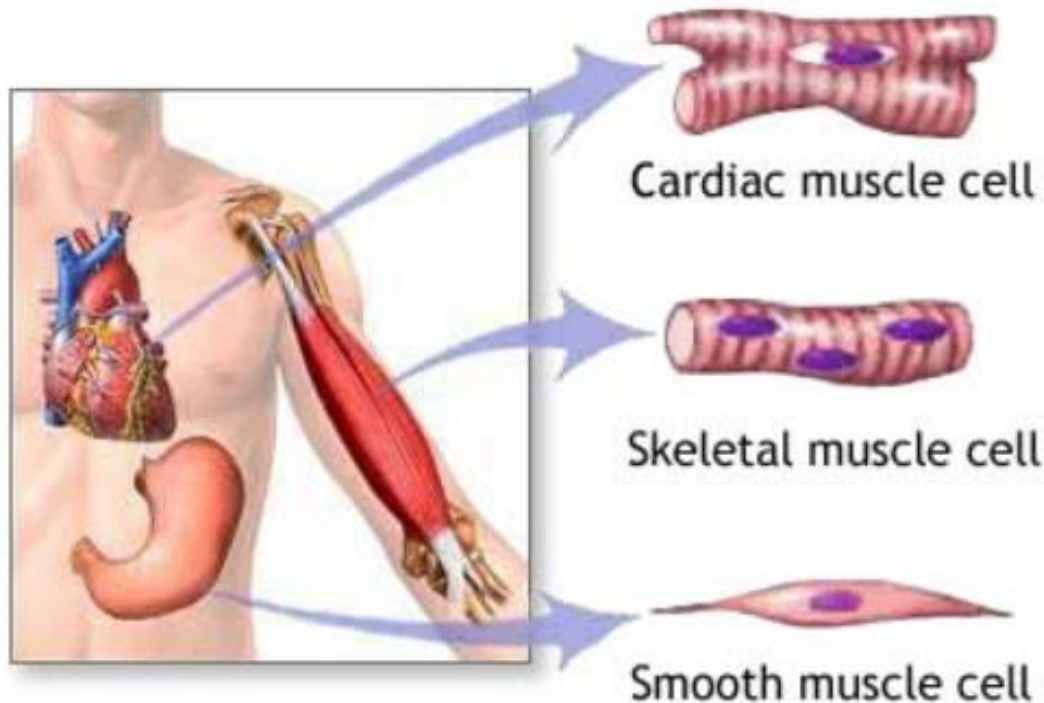
EQ: Compare and contrast the muscle bundle/organization with a nerve bundle/organization.



# Types of Muscle

Function is to produce movement

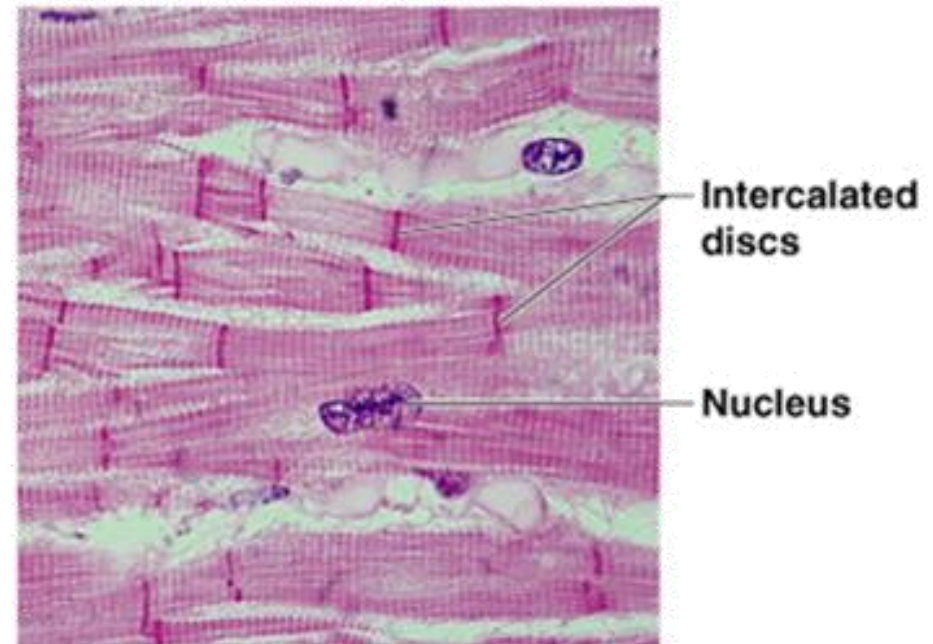
- Cardiac - heart
- Skeletal – striated & voluntary
- Smooth – involuntary



*The word “**striated**” means striped. Skeletal muscle appears striped under a microscope.*

# Types of Muscle

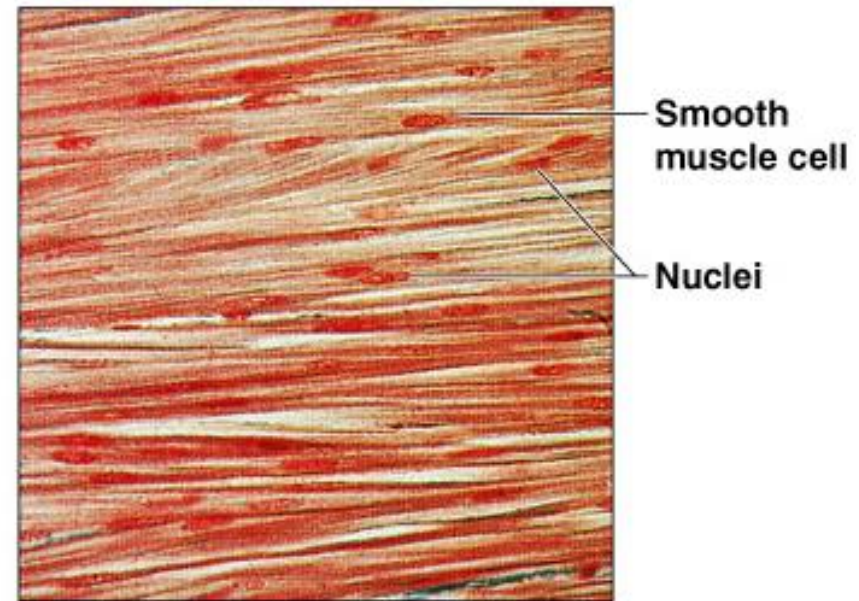
- Cardiac muscle
  - Found only in the heart
  - Function is to pump blood (involuntary)
  - Cells attached to other cardiac muscle cells at intercalated disks
  - Cells are striated
  - One nucleus per cell



**Photomicrograph: Cardiac muscle (800x).**

# Types of Muscle

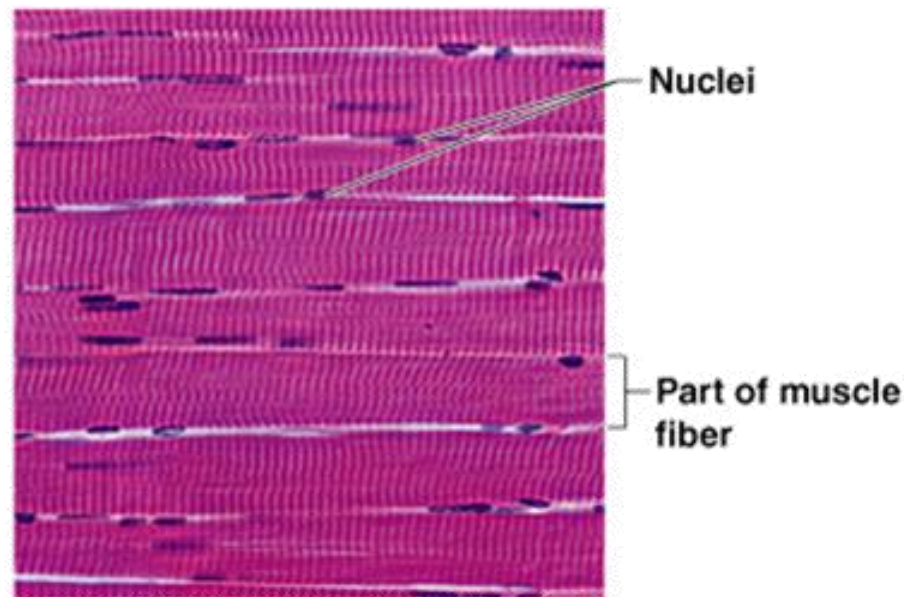
- Smooth muscle
  - Involuntary muscle
  - Surrounds hollow organs
  - Attached to other smooth muscle cells
  - No visible striations
  - One nucleus per cell



**Photomicrograph:** Sheet of smooth muscle (approx. 600x).

# Types of Muscle

- **Skeletal muscle**
  - Can be controlled voluntarily
  - Cells attach to connective tissue
  - Cells are striated
  - Cells have more than one nucleus



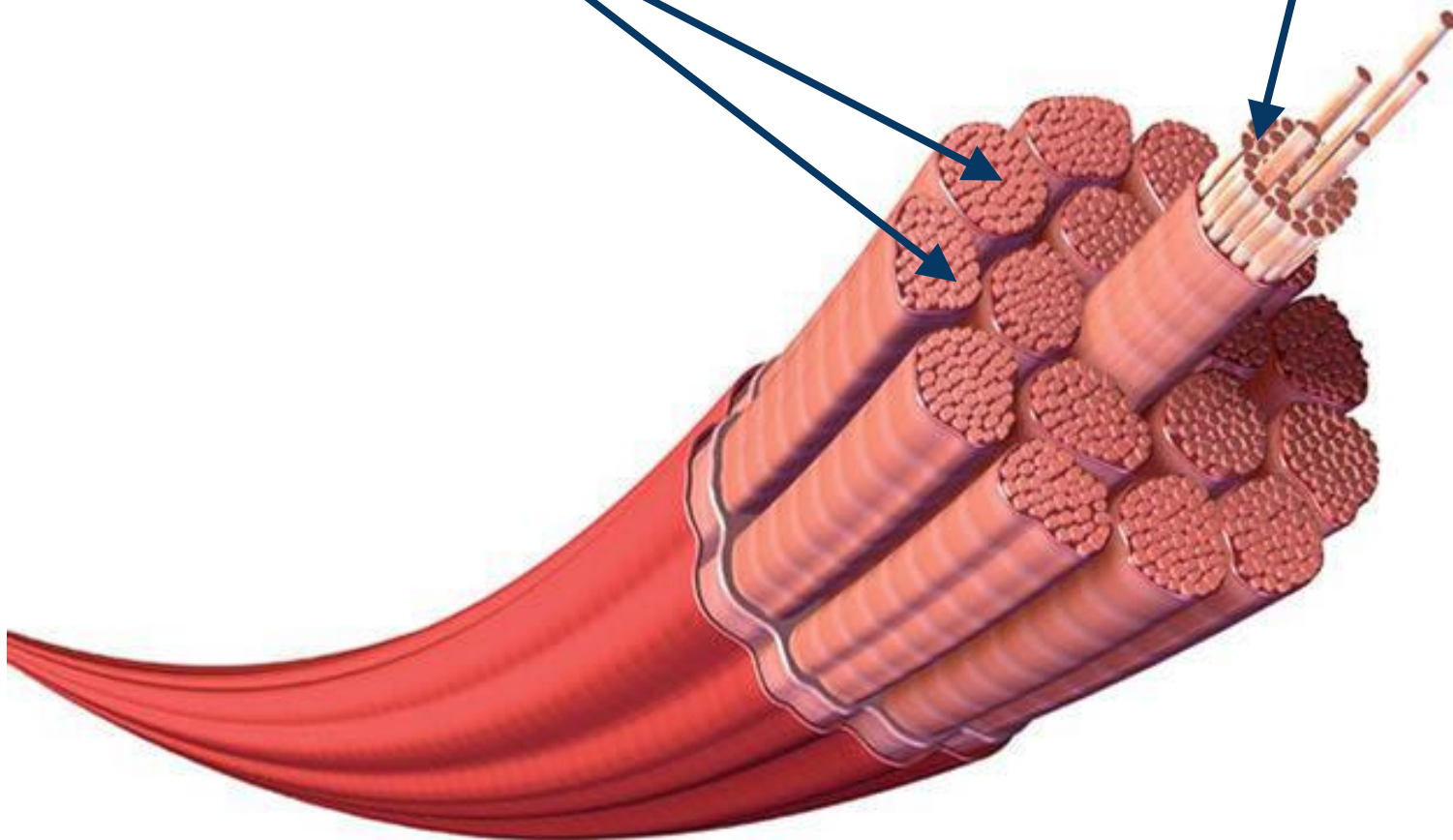
**Photomicrograph:** Skeletal muscle (approx. 300x).

# The Big Picture

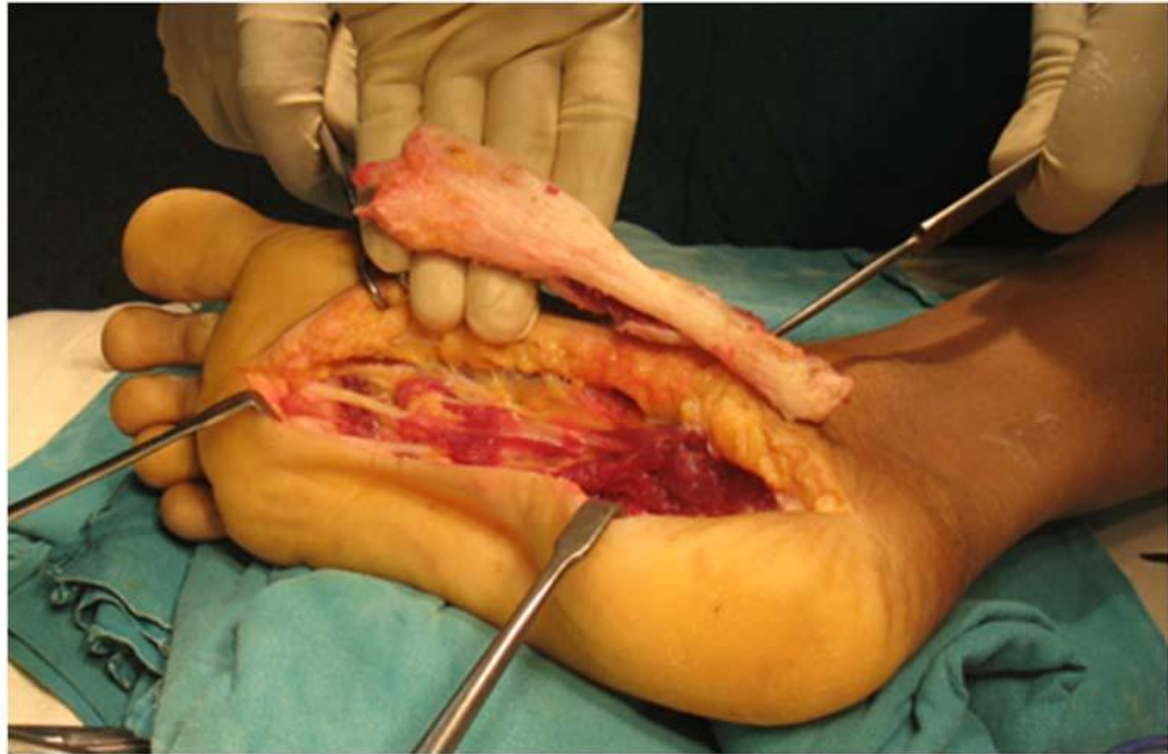
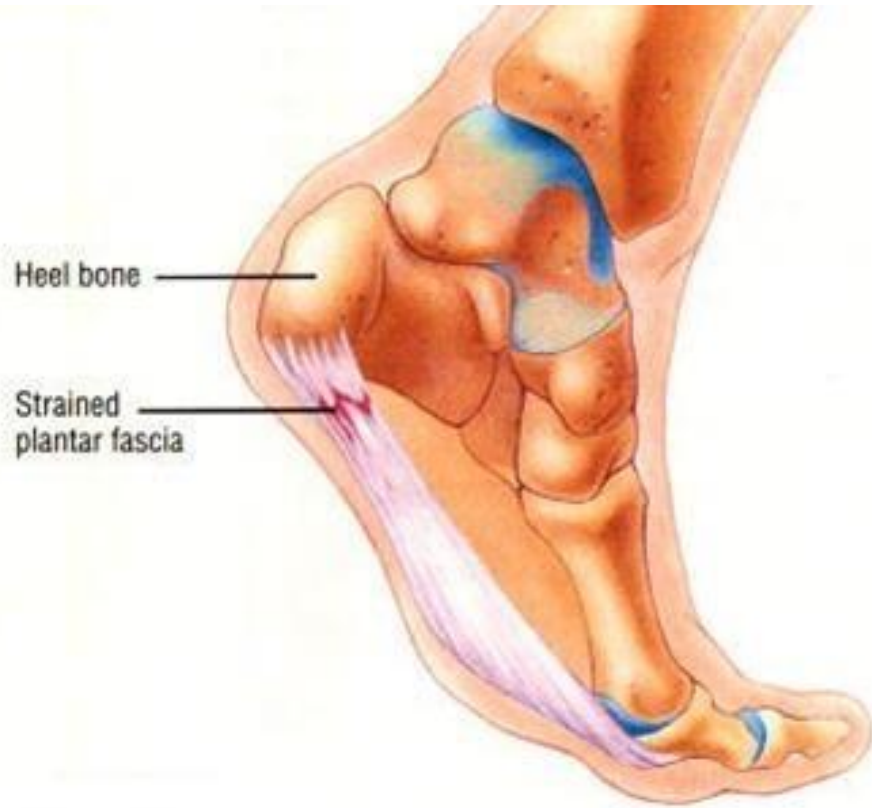
- You have over 600 muscles
- Muscles can do only one thing; contract
- Muscles are either contracted or relaxed
- A muscle, like your triceps, is actually a **muscle trunk**.
- The muscle trunk is divided into **muscle fascicles**, which are divided into **muscle fibers or cells**.
- The cells are further divided into **myofibrils**
- Myofibrils are divided into **actin & myosin filaments**

# Muscles and Muscle Fiber Structure

Muscles are composed of many **FIBERS** that are arranged in bundles called **FASCICLES**



Individual muscles are separated by **FASCIA**, which also forms **tendons**



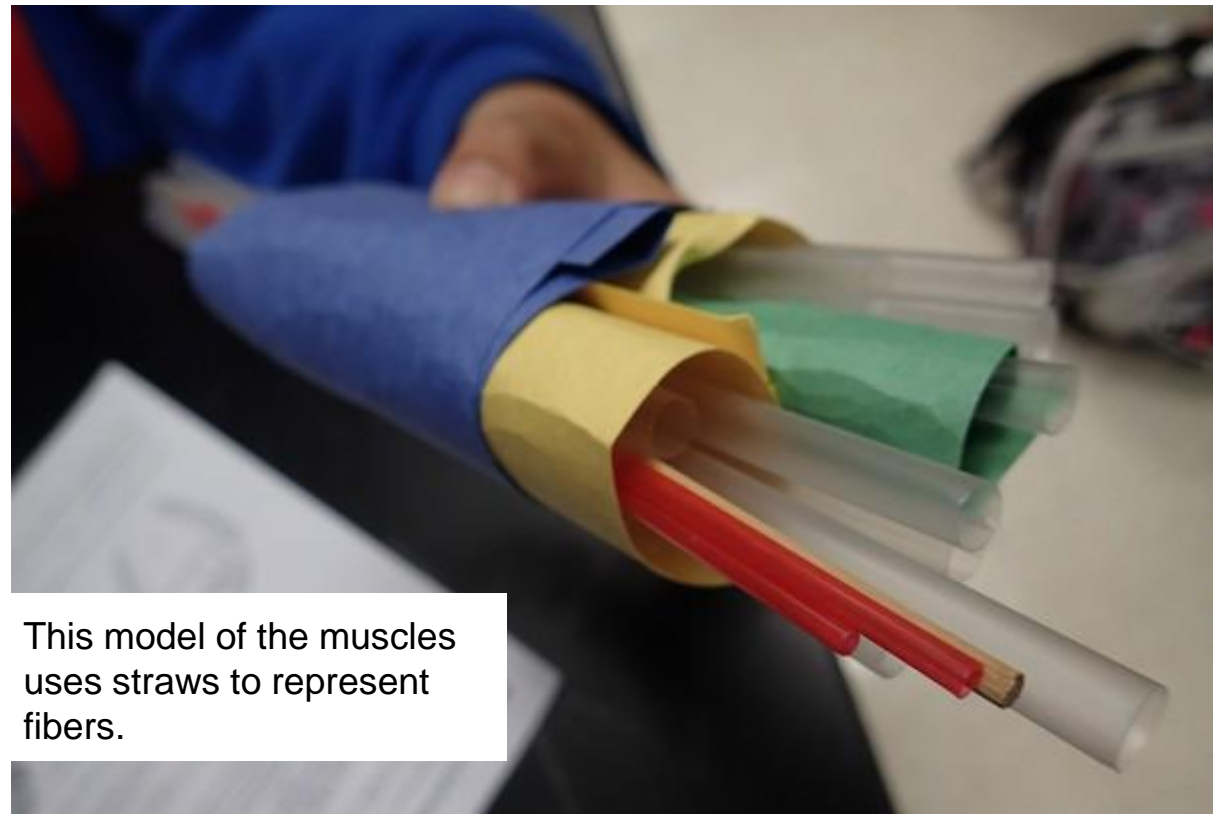


# Connective Tissue Around Muscles

**EPIMYSIUM** = outermost layer, surrounds entire muscle. – Blue on Model

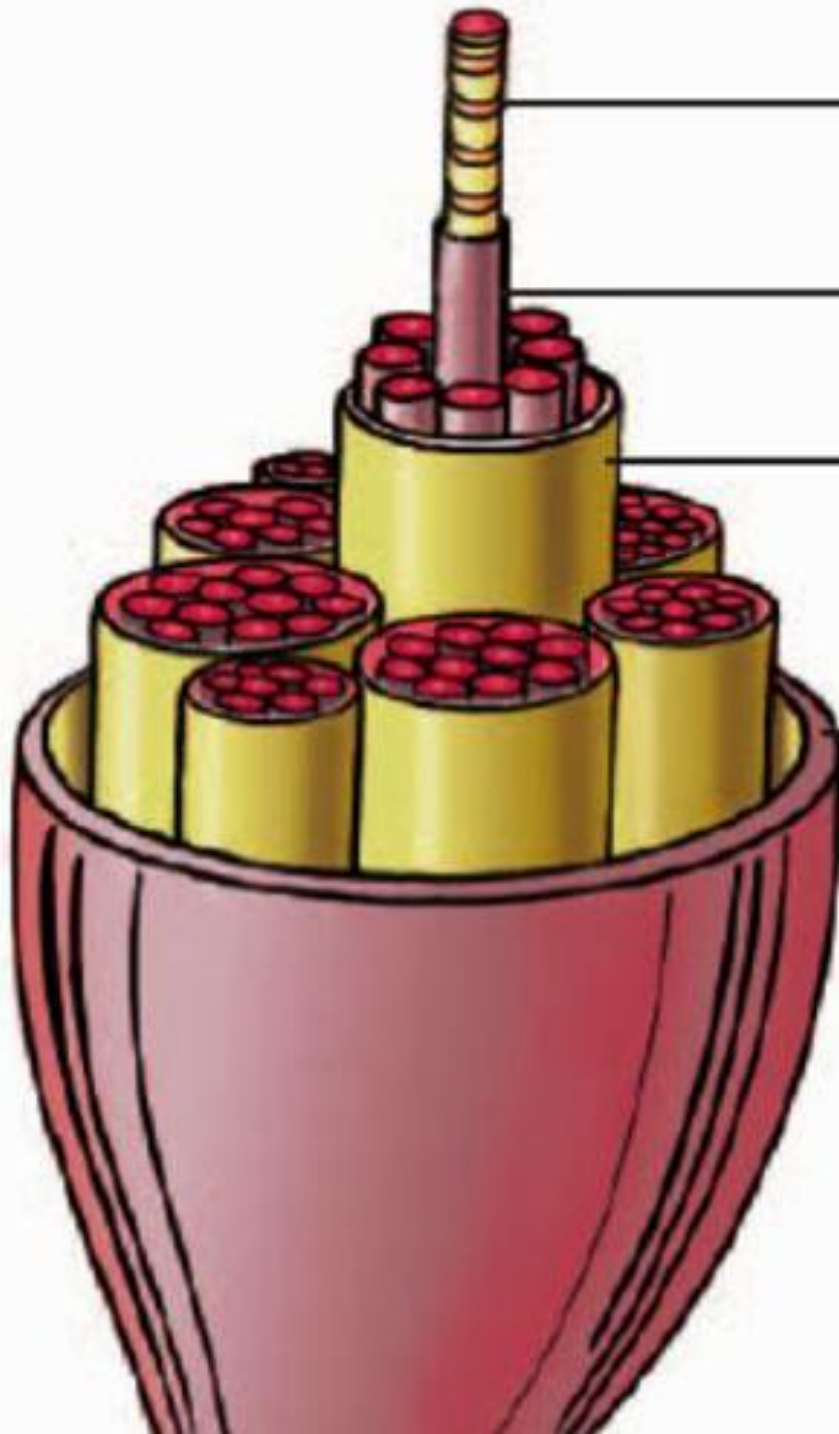
**PERIMYSIUM** = separates and surrounds fascicles (bundles of muscle fibers) – Yellow on Model

**ENDOMYSIUM**  
= surrounds each individual muscle fiber – Green on Model



This model of the muscles uses straws to represent fibers.

## Connective tissue hierarchy



Muscle cell or muscle fibre

Endomysium: connective tissue around a muscle cell

Perimysium: connective tissue around a bundle of muscle fibres

Epimysium: connective tissue around a muscle

# Muscle Cells

**Sarcolemma:** muscle fiber membrane

**Sarcoplasm:** inner material surrounding fibers (like cytoplasm)

**Myofibrils:** individual muscle fibers, made of myofilaments

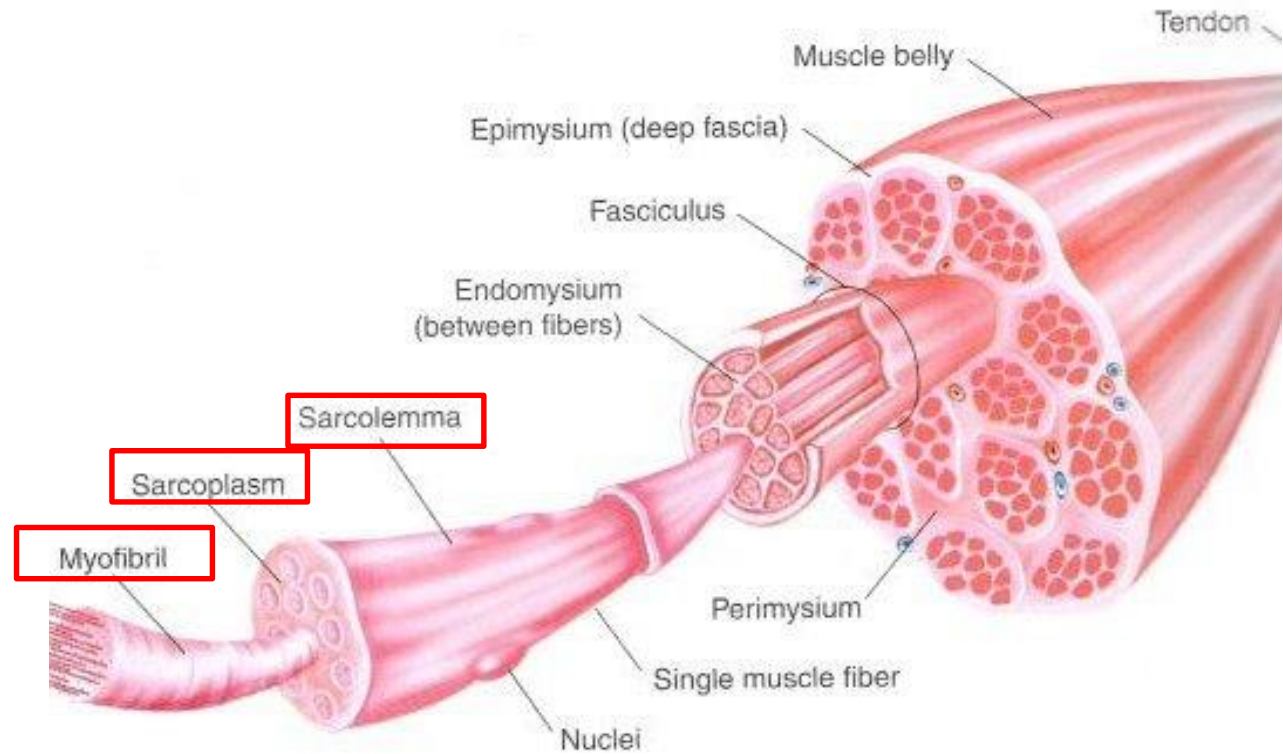
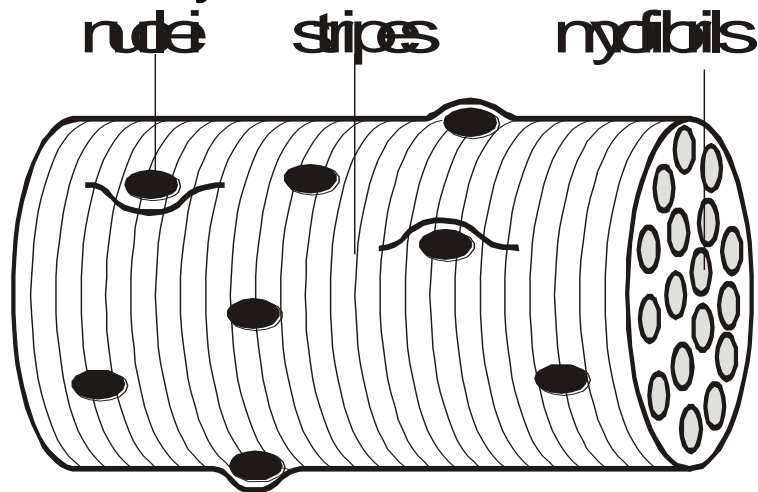
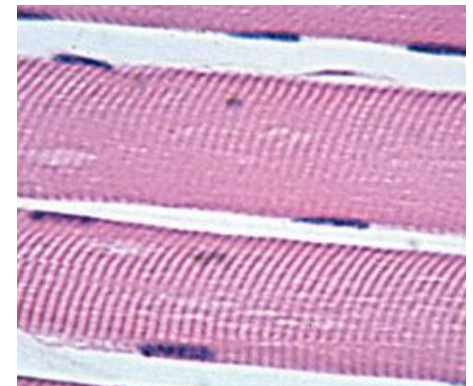
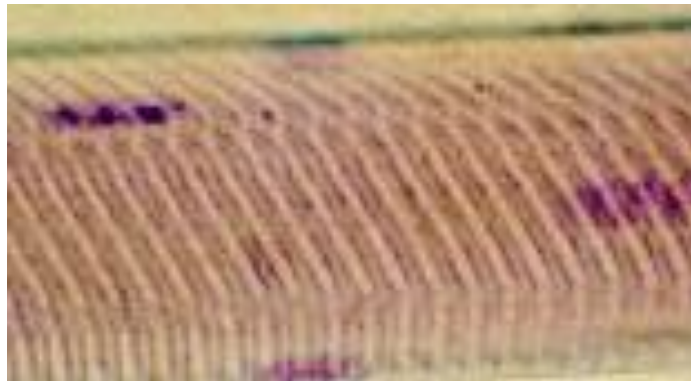
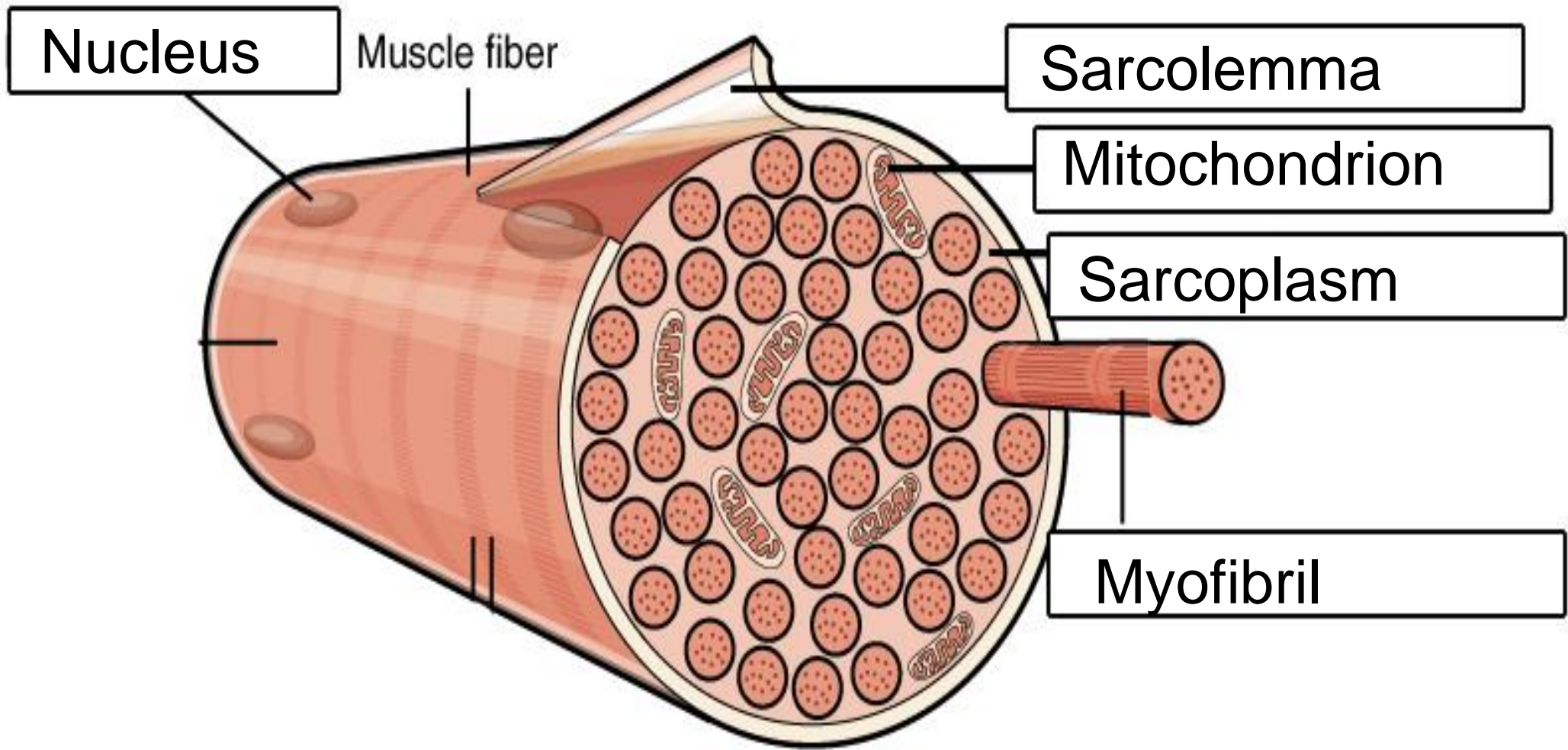


Figure 1: Muscle belly split into various component parts (from Essentials of Strength Training & Conditioning, National Strength & Conditioning Association)





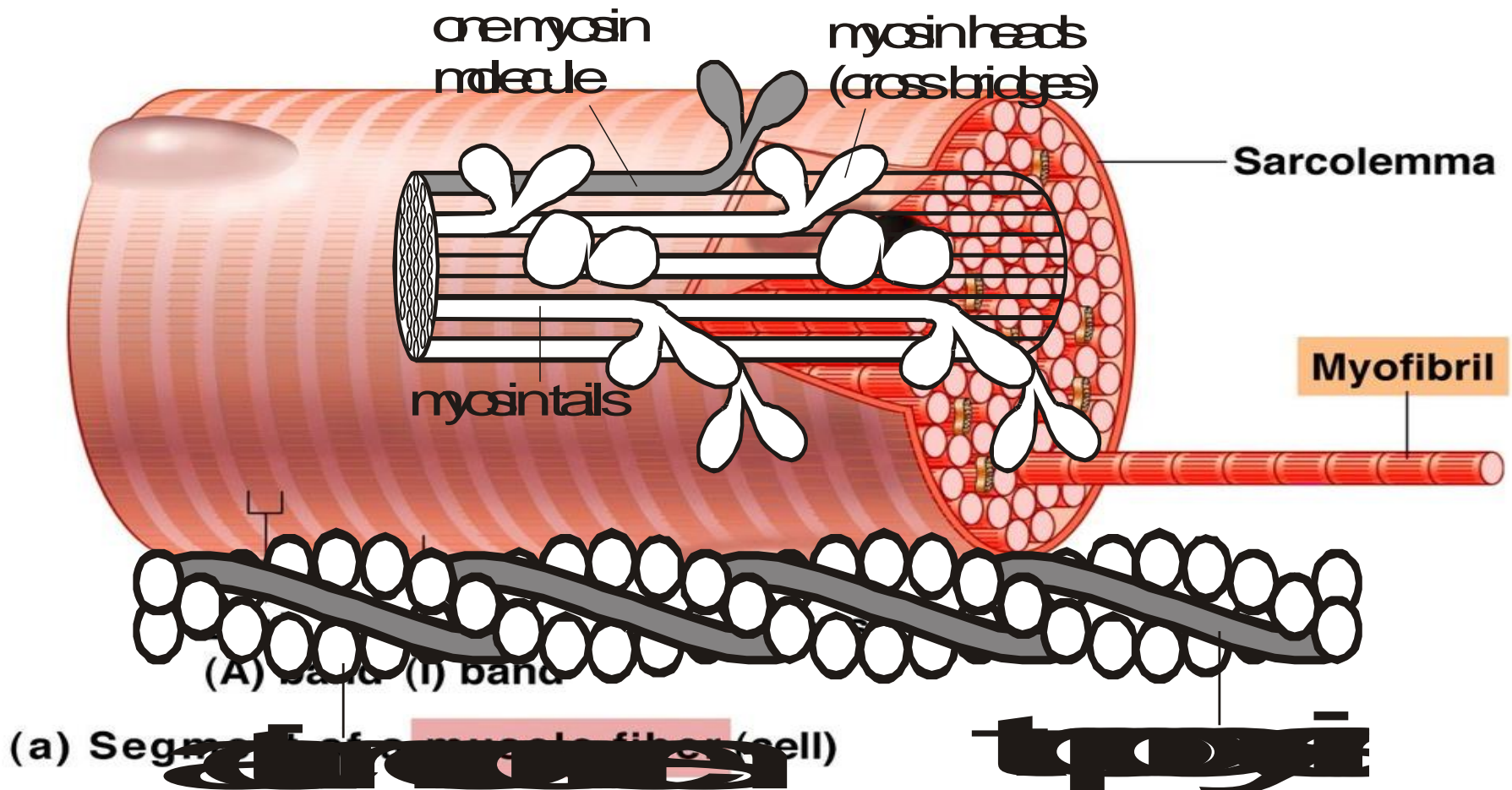
Myofibrils are made of

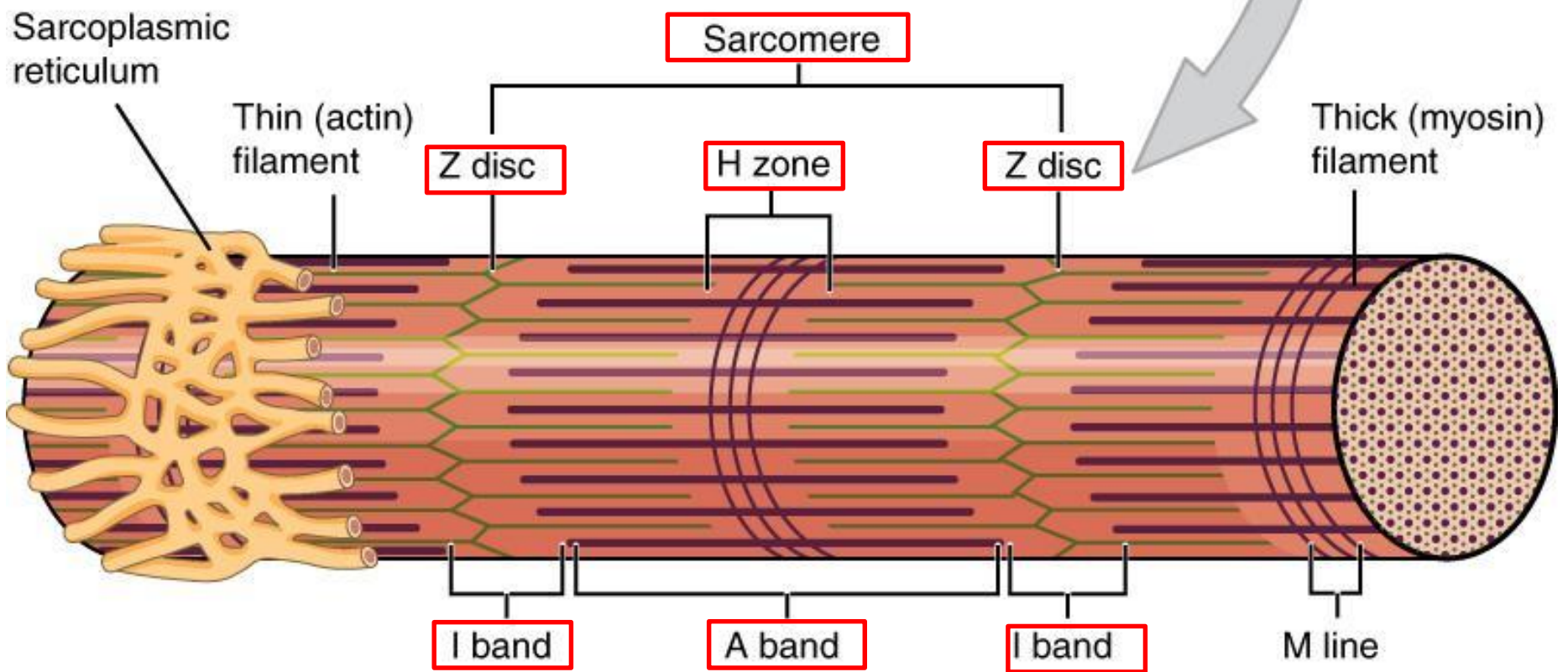
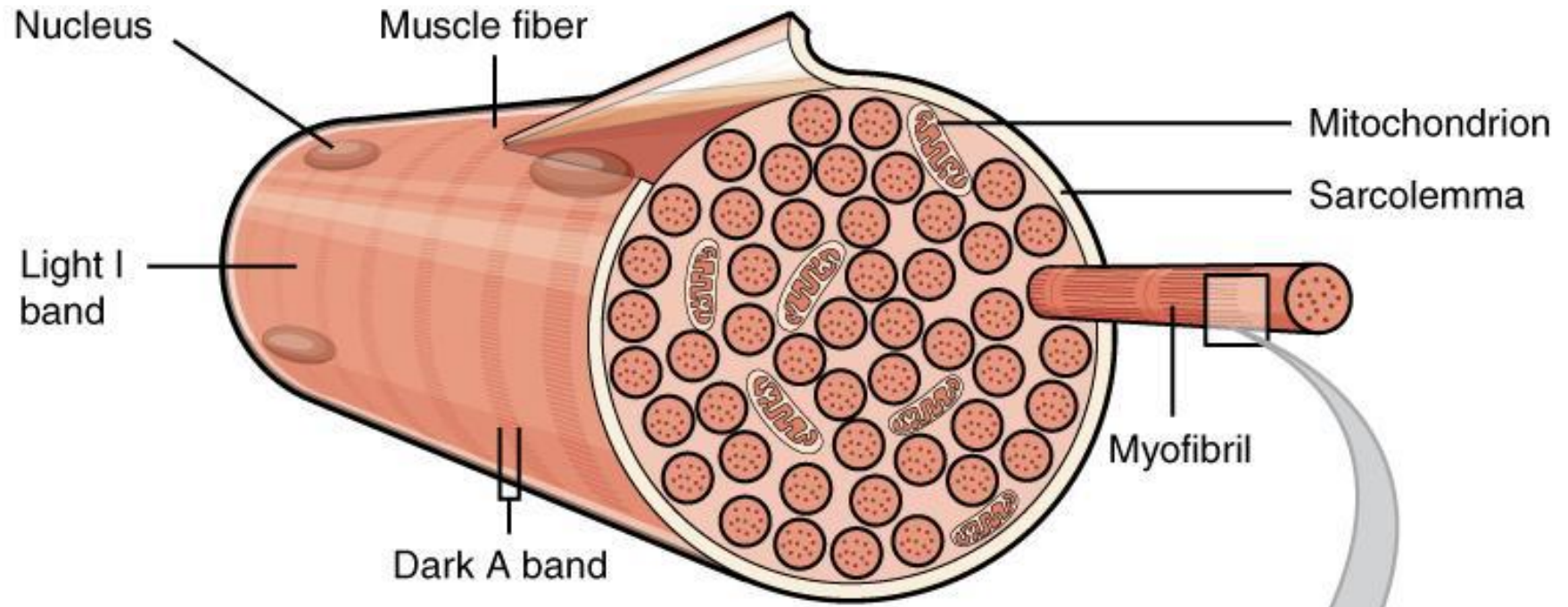
**ACTIN** = thin filaments

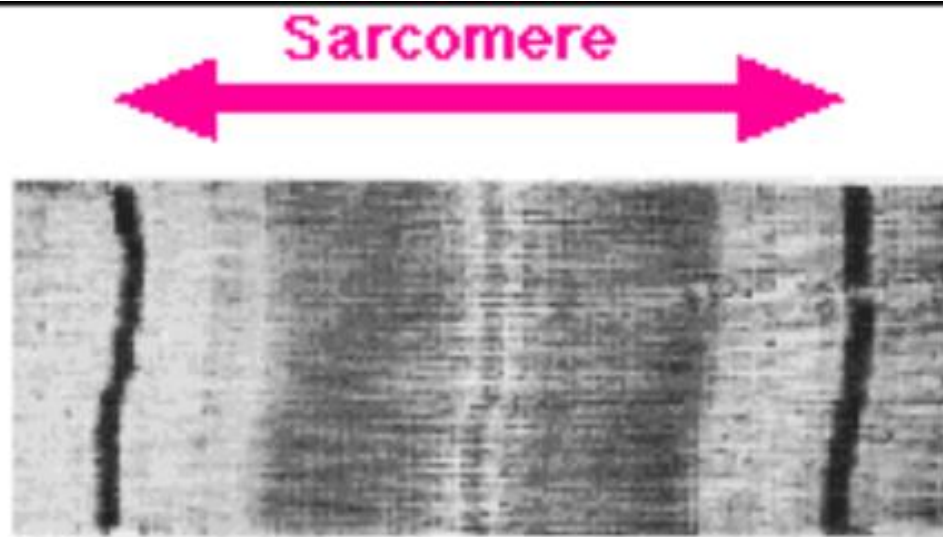
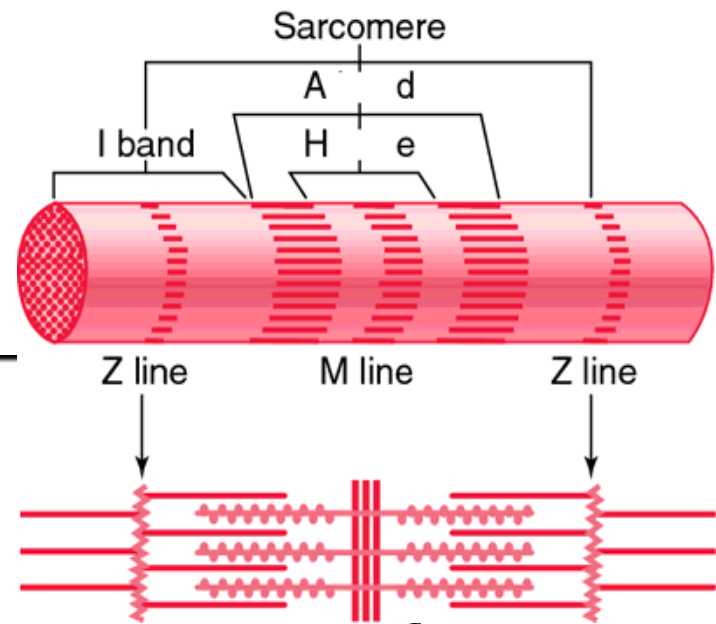
**MYOSIN** = thick filaments

# Myofilaments ACTIN (thin) and MYOSIN (thick)

- form dark and light bands
  - A band = dArk • thick (myosin)
  - I band = lIght • thIn (actin)

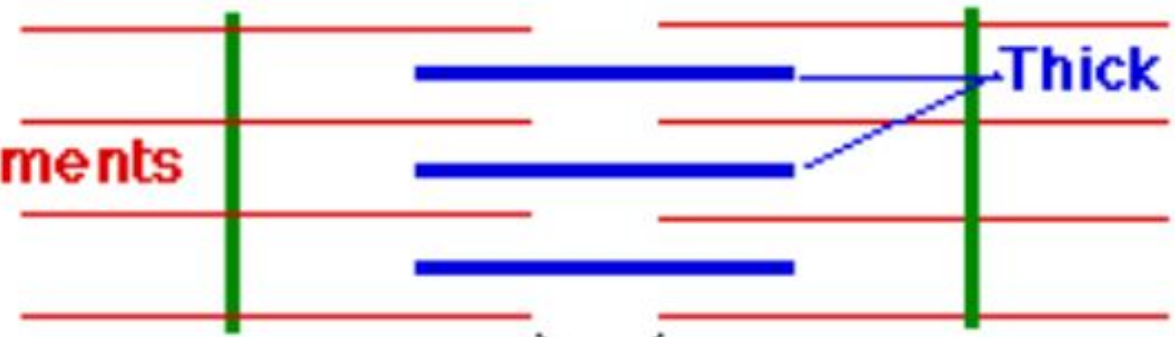






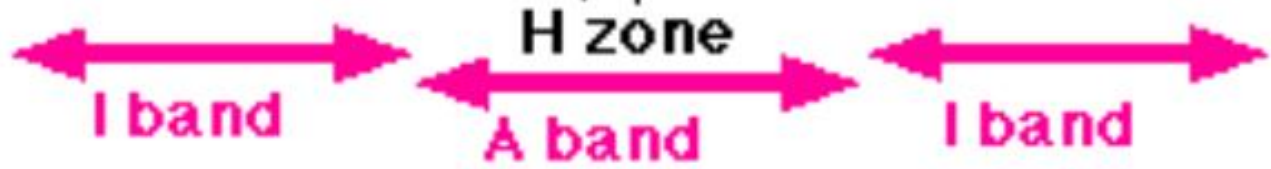
Z line

Z line

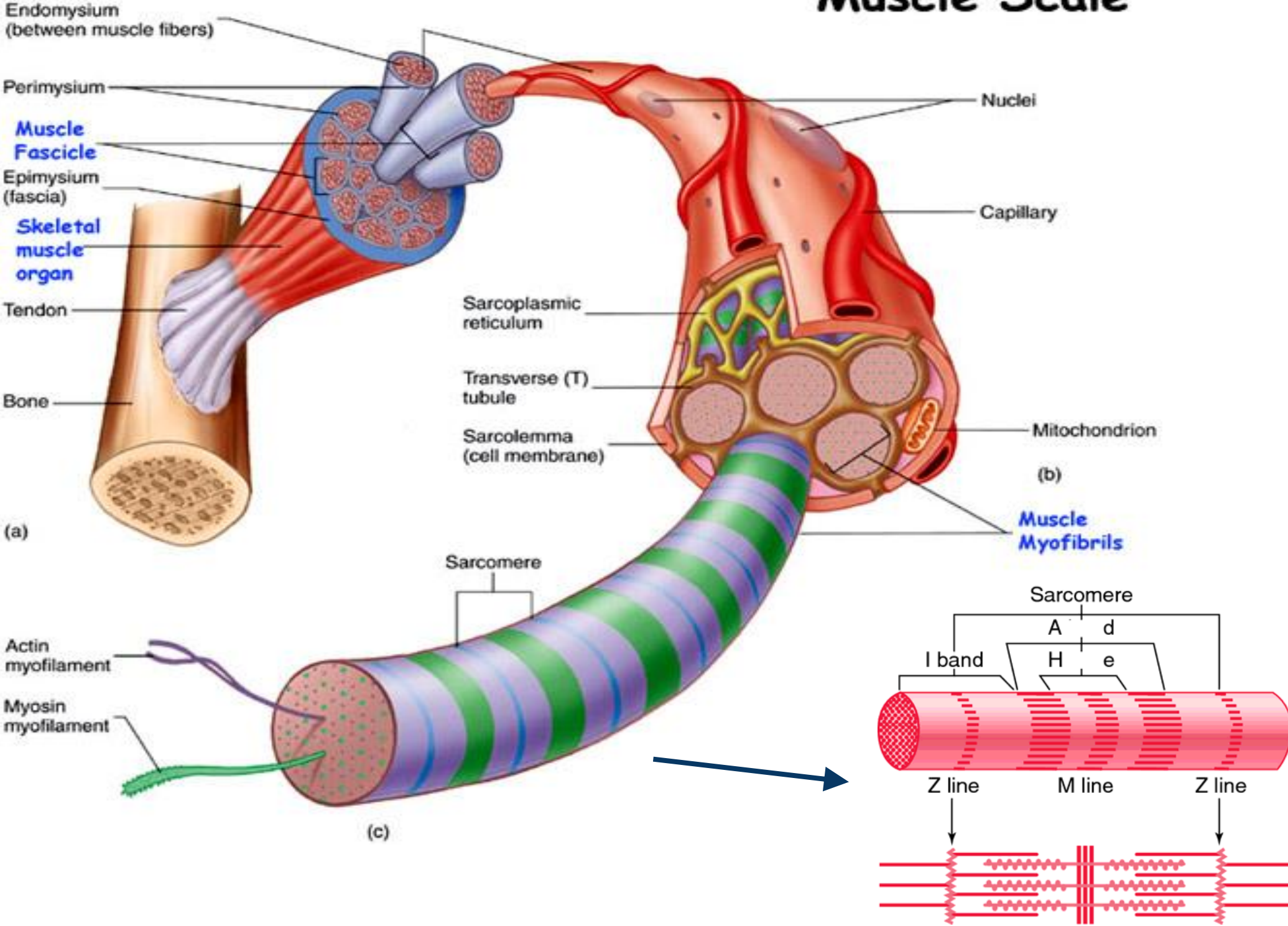


Thin filaments

Thick filaments



# Muscle Scale





It is important to remember the hierarchy

