

Essentials of Human Anatomy & Physiology

Seventh Edition

Elaine N. Marieb

Chapter 6

The Muscular System

The Muscular System

- Muscles are responsible for all types of body movement – they contract or shorten and are the machine of the body
- Three basic muscle types are found in the body
 - Skeletal muscle
 - Cardiac muscle
 - Smooth muscle

Characteristics of Muscles

- Muscle cells are elongated (muscle cell = muscle fiber)
- Contraction of muscles is due to the movement of microfilaments
- All muscles share some terminology
 - Prefix *myo* refers to muscle
 - Prefix *mys* refers to muscle
 - Prefix *sarco* refers to flesh

Skeletal Muscle Characteristics

- Most are attached by tendons to bones
- Cells are multinucleate
- Striated – have visible banding
- Voluntary – subject to conscious control
- Cells are surrounded and bundled by connective tissue = great force, but tires easily

Connective Tissue Wrappings of Skeletal Muscle

- Endomysium – around single muscle fiber
- Perimysium – around a fascicle (bundle) of fibers

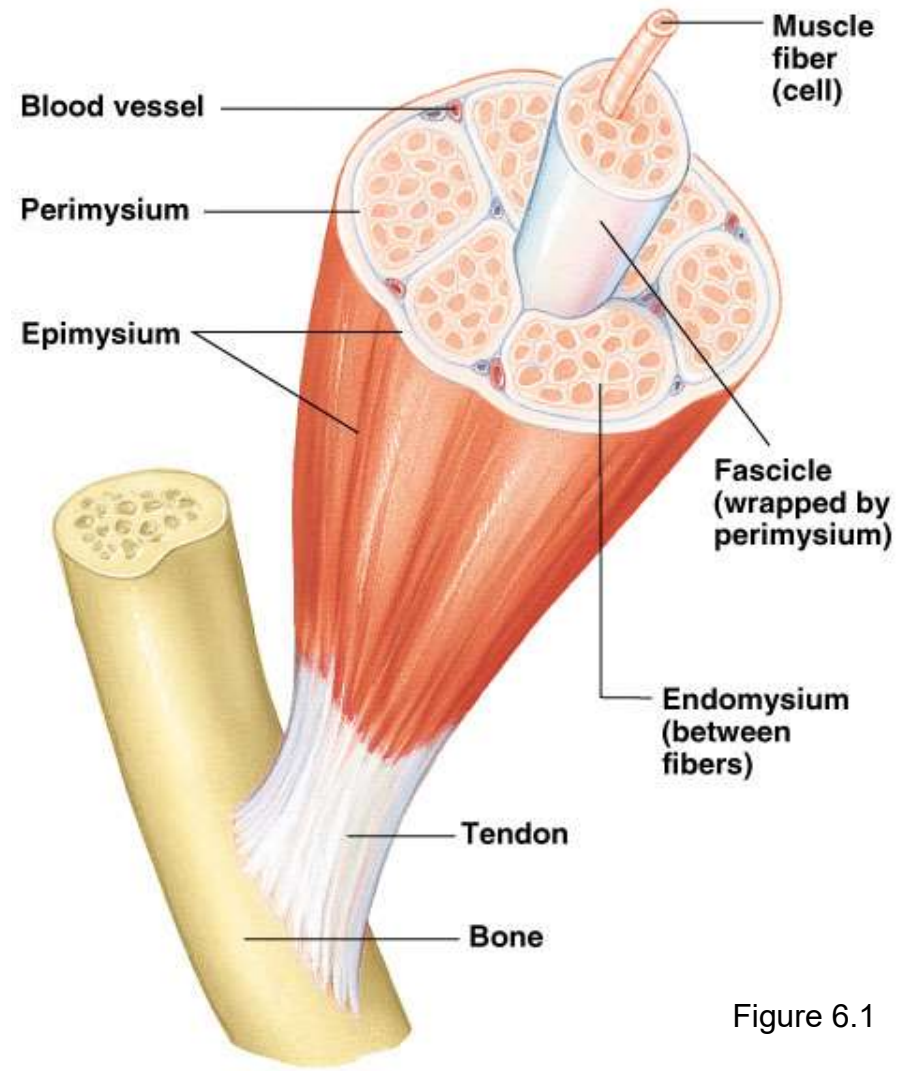


Figure 6.1

Slide 6.4a

Connective Tissue Wrappings of Skeletal Muscle

- Epimysium – covers the entire skeletal muscle
- Fascia – on the outside of the epimysium

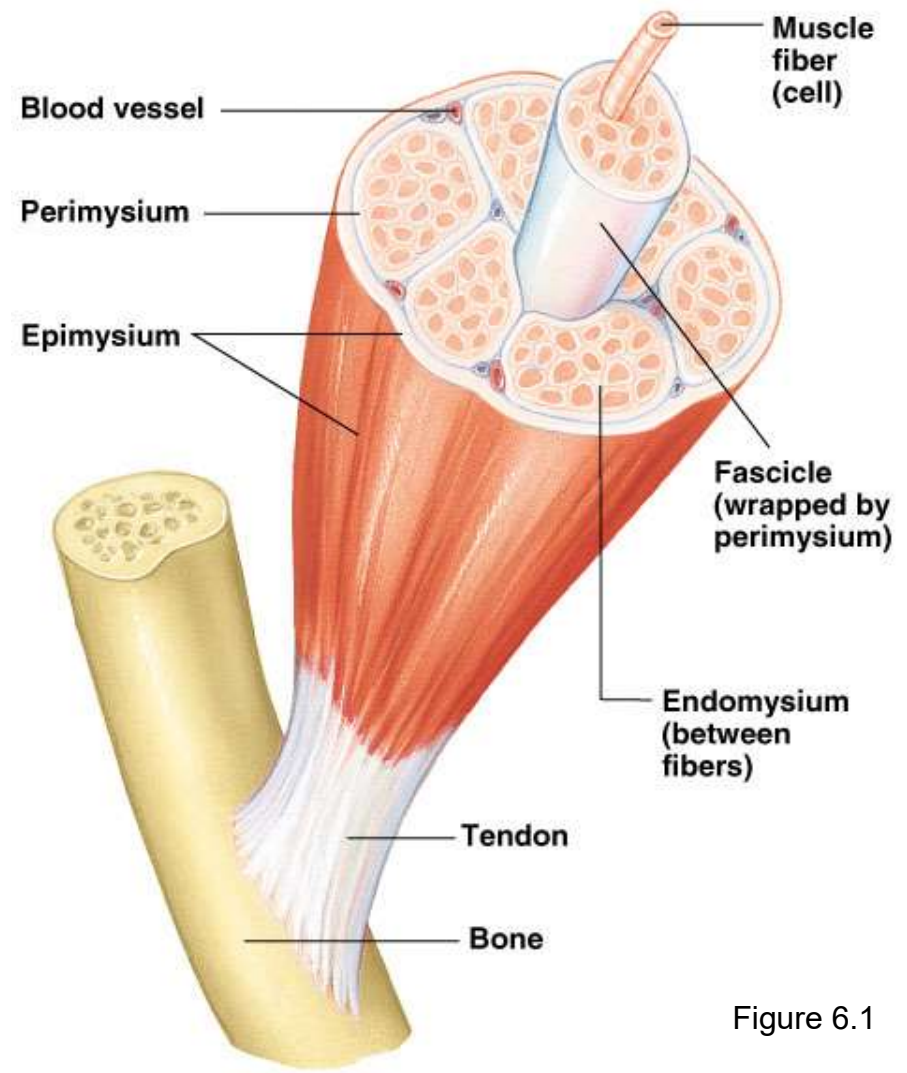


Figure 6.1

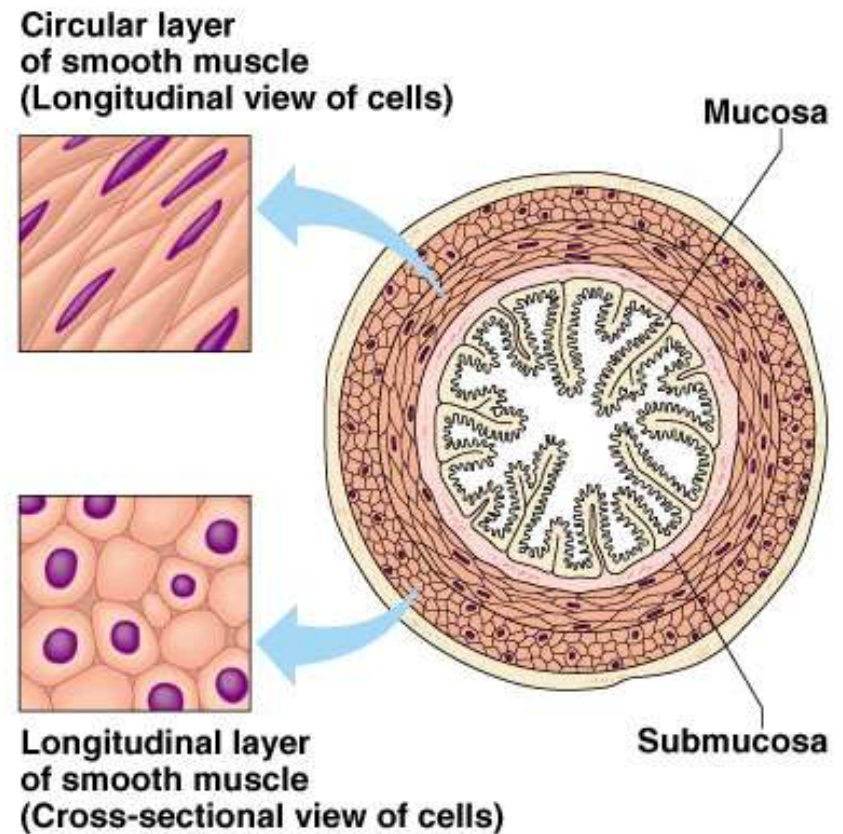
Slide 6.4b

Skeletal Muscle Attachments

- Epimysium blends into a connective tissue attachment
 - Tendon – cord-like structure
 - Aponeuroses – sheet-like structure
- Sites of muscle attachment
 - Bones
 - Cartilages
 - Connective tissue coverings

Smooth Muscle Characteristics

- Has no striations
- Spindle-shaped cells
- Single nucleus
- Involuntary – no conscious control
- Found mainly in the walls of hollow organs
- Slow, sustained and tireless

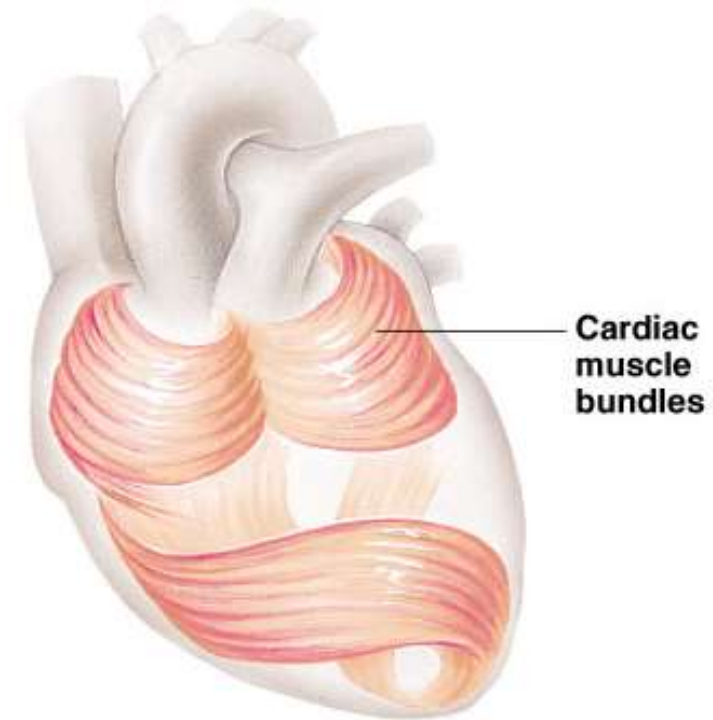


(a)

Figure 6.2a

Cardiac Muscle Characteristics




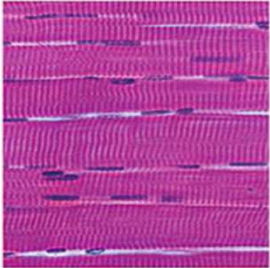

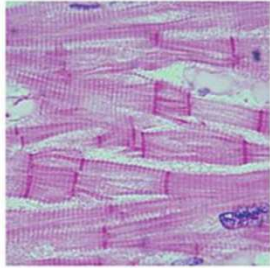

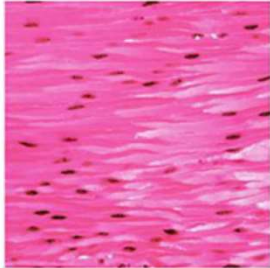

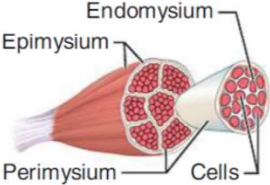
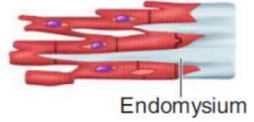
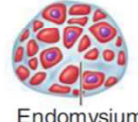
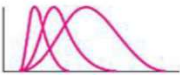

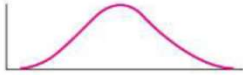
- Has striations
- Usually has a single nucleus
- Joined to another muscle cell at an intercalated disc
- Involuntary
- Found only in the heart
- Steady pace!



(b)

Figure 6.2b

Table 6.1 Comparison of Skeletal, Cardiac, and Smooth Muscles

Characteristic	Skeletal	Cardiac	Smooth
Body location	Attached to bones or, for some facial muscles, to skin 	Walls of the heart 	Mostly in walls of hollow visceral organs (other than the heart) 
Cell shape and appearance	Single, very long, cylindrical, multinucleate cells with very obvious striations  	Branching chains of cells; uninucleate, striations; intercalated discs  	Single, fusiform, uninucleate; no striations  
Connective tissue components	Epimysium, perimysium, and endomysium 	Endomysium attached to the fibrous skeleton of the heart 	Endomysium 
Regulation of contraction	Voluntary; via nervous system controls	Involuntary; the heart has a pacemaker; also nervous system controls; hormones	Involuntary; nervous system controls; hormones, chemicals, stretch
Speed of contraction	Slow to fast 	Slow 	Very slow 
Rhythmic contraction	No	Yes	Yes, in some

Function of Muscles

- Produce movement
- Maintain posture
- Stabilize joints
- Generate heat