Chapter 6

Getting in Gear: The Muscles

In This Chapter

- Understanding the functions and structure of muscles
- Classifying types of muscle
- Pulling together: Muscles as organs
- Breaking down muscle contractions, tone, and power
- Deciphering muscle names

Much of what we think of as "the body" centers around our muscles and what they can do, what we want them to do, and how tired we get trying to make them do it. With all that muscles do and are, it's hard to believe the word "muscle" is rooted in the Latin word *musculus,* which is a diminutive of the word for "mouse." Well, the muscle is a mouse that roars. Muscles make up most of the fleshy parts of the body and average 43 percent of the body's weight. Layered over the skeleton, they largely determine the body's form. There are over 500 muscles large enough to be seen by the unaided eye, and thousands more are visible only through a microscope. Although there are three distinct types of muscle tissue, every muscle in the human body shares one important characteristic: *contractility,* the ability to shorten, or contract.

Flexing Your Muscle Knowledge

The study of muscles is called *myology* after the Greek word *mys,* which means "mouse." Muscles perform a number of functions vital to maintaining life, including

- **Movement:** Skeletal muscles (those attached to bones) convert chemical energy into mechanical work, producing movement ranging from finger tapping to a swift kick of a ball by contracting, or shortening. Reflex muscle reactions protect your fingers when you put them too close to a fire and startle you into watchfulness when an unexpected noise sounds. Many purposeful movements require several sets, or groups, of muscles to work in unison.
- **Vital functions:** Without muscle activity, you die. Muscles are doing their job when your heart beats, when your blood vessels constrict, and when your intestines squeeze food along your digestive tract in *peristalsis.*
- **Antigravity:** Perhaps that's overstating it, but muscles do make it possible for you to stand and move about in spite of gravity's ceaseless pull. Did your mother tell you to improve your posture? Just think how bad it would be without any muscles!
- **Heat generation:** You shiver when you're cold and stamp your feet and jog in place when you need to warm up. That's because chemical reactions in muscles result in heat, helping to maintain the body's temperature.
- **Keep the body together:** Muscles are the warp and woof of your body's structure, binding one part to another.

As you may remember from studying tissues, muscle cells — called *fibers* — are some of the longest in the body. Fibers are held together by connective tissue and enclosed in a fibrous sheath called *fascia.* Some muscle fibers contract rapidly, whereas others move at a leisurely pace. Generally speaking, however, the smaller the structure to be moved, the faster the muscle action. Exercise can increase the thickness of muscle fibers, but it doesn't make new fibers. Skeletal muscles have a rich vascular supply that dilates during exercise to give the working muscle the extra oxygen it needs to keep going.

Two processes are central to muscle development in the developing embryo: *myogenesis*, during which muscle tissue is formed; and *morphogenesis,* when the muscles form into internal organs. By the eighth week of gestation, a fetus is capable of coordinated movement.

Following are some important muscle terms to know:

- **Fascia:** Loose, or areolar, connective tissue that holds muscle fibers together to form a muscle organ
- **Fiber:** An individual muscle cell
- **Insertion:** The more movable attachment of a muscle
- **Ligament:** Elastic connective tissue that supports joints and anchors organs
- **Motor nerve:** Nerve that stimulates contraction of a muscle
- **Myofibril:** Fibrils within a muscle cell that contain protein filaments such as actin and myosin that slide during contraction, shortening the fiber (or cell)
- **Origin:** The immovable attachment of a muscle, or the point at which a muscle is anchored by a tendon to the bone
- **Sarcoplasm:** The cellular cytoplasm in a muscle fiber
- **Tendon:** Connective tissue made up of collagen, a fibrous protein that attaches muscles to bone; lets muscles apply their force at some distance from where a contraction actually takes place
- **Tone, or tonus:** State of tension present to a degree at all times, even when the muscle is at rest

Complete the following practice questions to see how well you understand the basics of myology:

1. Which of the following is *not* a true statement?

a. Muscles represent 90 percent of the total body weight.

b. The ancient Greek word *mys* means "mouse."

c. The muscles covering the bones largely determine the form of the body.

d. Posture is an expression of muscle action.

2. Muscle functions include

a. Support of the bony tissues of the body

b. Blood formation

c. Converting chemical energy into mechanical work

d. Only a and c

3. A necessary property for a muscle to perform work is
   - **a.** Extensibility
   - **b.** Contractility
   - **c.** Elasticity
   - **d.** All of the above

4. The cellular unit in muscle tissue is the
   - **a.** Filament
   - **b.** Myofibril
   - **c.** Fiber
   - **d.** Fasciculus

5. A partial state of contraction, in part, defines
   - **a.** Rigor
   - **b.** Tonus
   - **c.** Clovus
   - **d.** Paralysis

6. It's possible to completely relax every muscle in the body.
   - **a.** True
   - **b.** False

7. During embryonic development, tissue development is called
   - **a.** Myogelosis
   - **b.** Morphogenesis
   - **c.** Myogenesis
   - **d.** Morpholysis

8. Exercise forms new muscle fibers.
   - **a.** True
   - **b.** False

Classifications: Smooth, Cardiac, and Skeletal

Muscle tissue is classified in three ways based on the tissue's function, shape, and structure:

- **Smooth muscle tissue:** So-called because it doesn't have the cross-striations typical of other kinds of muscle, the spindle-shaped fibers of smooth muscle tissue do have faint longitudinal striping. This muscle tissue forms into sheets and makes up the walls of hollow organs such as the stomach, intestines, and bladder. The tissue's involuntary movements are relatively slow, so contractions last longer than those of other muscle tissue, and fatigue is rare. Each fiber is about 6 microns in diameter and can vary from 15 microns to 500 microns long. If arranged in a circle inside an organ, contraction constricts the cavity inside the organ. If arranged lengthwise, contraction of smooth muscle tissue shortens the organ.

- **Cardiac muscle tissue:** Found only in the heart, cardiac muscle fibers are branched, cross-striated, feature one central nucleus, and move through involuntary control. An electron microscope view of the tissue shows separate fibers tightly pressed against each other, forming cellular junctions called *intercalated discs* that look like tiny, dark-colored plates. Some experts believe intercalated discs are not cellular junctions but rather special structures that help move an electrical impulse throughout the heart.
- **Skeletal muscle tissue:** This is the tissue that most people think of as muscle. It's the only muscle subject to voluntary control through the central nervous system. Its long, striated cylindrical fibers contract quickly but tire just as fast. Skeletal muscle, which is also what's considered meat in animals, is 20 percent protein, 75 percent water, and 5 percent organic and inorganic materials. Each multinucleated fiber is encased in a thin, transparent membrane called a *sarcolemma* that receives and conducts stimuli. The fibers, which vary from 10 microns to 100 microns in diameter and up to 4 centimeters in length, are subdivided lengthwise into tiny myofibrils roughly 1 micron in diameter that are suspended in the cell's sarcoplasm.

The following practice questions test your knowledge of muscle classifications:

9. This type of muscle tissue lacks cross-striations.

a. Cardiac

b. Smooth

c. Skeletal

d. Contracting

10. Skeletal muscle fibers are encased in

a. A sarcolemma

b. Sarcoplasm

c. Sarcomeres

d. A sarcophagus

11. Which muscle type appears only in a single organ?

a. Contractile

b. Smooth

c. Cardiac

d. Skeletal

12. Intercalated discs

a. Anchor cardiac muscle fibers to one another

b. May play a role in moving electrical impulses through the heart

c. Are found only in the muscles of the back

d. Contribute to tactile perception

Contracting for a Contraction

Before we can explain how muscles do what they do, it's important that you understand the anatomy of how they're put together. Use Figure 6-1 as a visual guide as you read through this section.

We base this description of muscle on the most studied classification of muscle: skeletal. Each fiber packed inside the sarcolemma contains hundreds, or even thousands, of myofibril strands made up of alternating filaments of the proteins *actin* and *myosin.* Actin and myosin are what give skeletal muscles their striated appearance, with alternating dark and light bands. The dark bands are called *anisotropic*, or *A-bands.* The light bands are called *isotropic*, or *I-bands.* In the center of each I-band is a line called the *Z-line* that divides the myofibril into smaller units called *sarcomeres.* At the center of the A-band is a less-dense region called the *H-zone.*

Now, here's where the actin and myosin come in. Each sarcomere contains thick filaments of myosin in the A-band and thin filaments of actin primarily in the I-band but extending a short distance between the myosin filaments into the A-band. Actin filaments don't extend all the way into the central area of the A-band, which explains why the less-dense H-zone can be found there. Those thin actin filaments are anchored to the Z-line at their midpoints, which holds them in place and creates a structure against which the filaments exert their pull during contraction.

The theory of contraction called the *Interdigitating Filament Model of Muscle Contraction,* or the *Sliding Theory of Muscle Contraction,* says that the myosin of the thick filaments combines with the actin of the thin filaments, forming *actomyosin* and prompting the filaments to slide past each other. As they do so, the H-zone is reduced or obliterated, pulling the Z-lines closer together and reducing the I-bands. (The A-bands don't change.) Voila! Contraction has occurred!

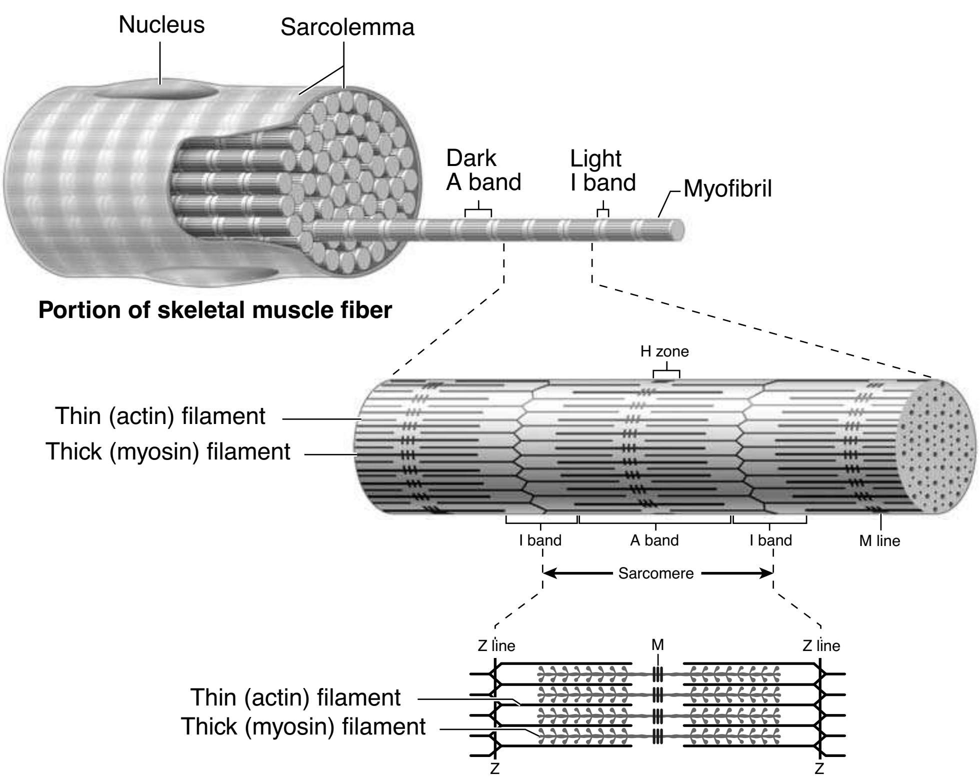

Figure 6-1: Microscopic anatomy of a skeletal muscle fiber.

Illustration by Imagineering Media Services Inc.

So you know how muscles contract. Now you need to figure out what stimulates them to do so. We cover the details of the nervous system in Chapter 15, but here you can find out what's happening as an impulse stimulates a skeletal muscle.

The *impulse,* or *stimulus,* from the central nervous system is brought to the muscle through a nerve called the *motor,* or *efferent,* nerve. On entering the muscle, the motor nerve fibers separate to distribute themselves among the thousands of muscle fibers. Because the muscle has more fibers than the motor nerve, individual nerve fibers branch repeatedly so that a single nerve fiber innervates from 5 to as many as 200 muscle fibers. These small terminal branches penetrate the sarcolemma and form a special structure known as the *motor end plate,* or *synapse.* This neuromuscular unit consisting of one motor neuron and all the muscle fibers that it innervates is called the *motor unit.*

Interference — either chemical or physical — with the nerve pathway can affect the action of the muscle or stop the action altogether, resulting in muscle paralysis. There also are *afferent,* or *sensory,* nerves that carry information about muscle condition to the brain.

When an impulse moves through the synapse and the motor unit, it must arrive virtually simultaneously at each of the individual sarcomeres to create an efficient contraction. Enter the *transverse system,* or *T-system,* of tubules. The fiber's membrane forms deep invaginations, or inward-folding sheaths, at the Z-line of the myofibrils. The resulting inward-reaching tubules ensure that the sarcomeres are stimulated at nearly the same time.

REMEMBER

Does it matter whether the signal received is strong or weak? Nope. That's the *all-or-none law* of muscle contraction. The fiber either contracts completely or not at all. In other words, if a single muscle fiber is going to contract, it's going to do so to its fullest extent.

Following are some practice questions that deal with muscle anatomy and contraction:

13.–17. Match each muscle component with the appropriate region.

13. _____ Myosin

14. _____ Segment of fibril from Z-line to Z-line

15. _____ Less-dense region of the A-band

16. _____ Structure to which filaments are attached

17. _____ Actin

a. H-zone

b. Z-line

c. I-band

d. A-band

e. Sarcomere

18. Which of these terms doesn't belong in the following list?

a. Anisotropic

b. Actin

c. Myosin

d. Isotropic

e. Sarcolemma

19. This part of a muscle doesn't change during contraction:

a. The H-zone

b. The A-bands

c. The I-bands

d. The Z-lines

20. A weak stimulus causes a muscle fiber to contract only partway.

a. True

b. False

Pulling Together: Muscles as Organs

A muscle organ has two parts:

- **The belly,** composed predominantly of muscle fibers
- **The tendon,** composed of fibrous, or collagenous, regular connective tissue. If the tendon is a flat, sheet-like structure attaching a wide muscle, it's called an *aponeurosis.*

Each muscle fiber outside of the sarcolemma is surrounded by areolar connective tissue called *endomysium* that binds the fibers together into bundles called *fasciculi* (see Figure 6-2). Each bundle, or *fasciculus,* is surrounded by areolar connective tissue called *perimysium.* All the fasciculi together make up the belly of the muscle, which is surrounded by areolar connective tissue called the *epimysium.* Blood vessels, lymph vessels, and nerves pass into the fasciculus through areolar connective tissue called the *trabecula.* These blood vessels in turn branch off into capillaries that surround the muscle fibers in the endomysium.

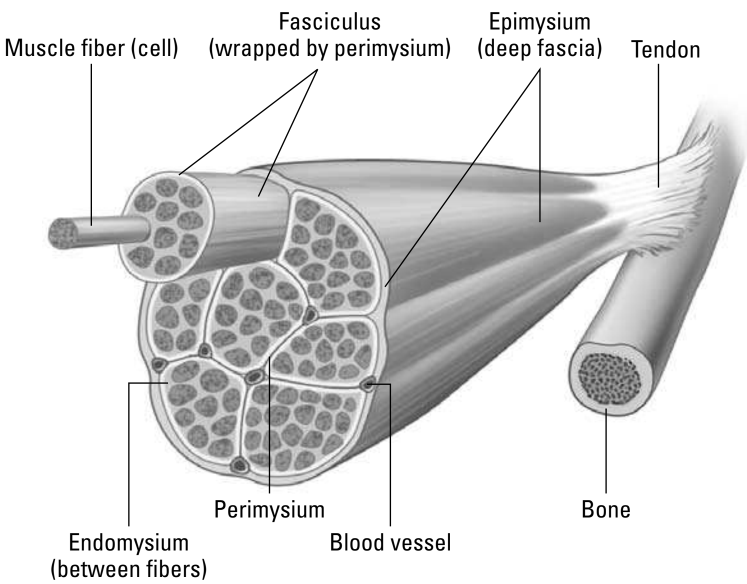

Figure 6-2: Connective tissue in a muscle.

Illustration by Imagineering Media Services Inc.

21.–25. Match the muscle structures with their descriptions.

21. _____ Membrane covering a muscle fiber

22. _____ Bundles of muscle fibers

23. _____ Connective tissue that surrounds a bundle of muscle fibers

24. _____ Connective tissue through which arteries and veins enter muscle bundles

25. _____ Flat, sheet-like tendon that serves as insertion for a large flat muscle

a. Perimysium

b. Aponeurosis

c. Trabecula

d. Fasciculi

e. Sarcolemma

Assuming the Right Tone

As we note earlier in this chapter, when it comes to contraction of a muscle fiber, it's an all-or-nothing affair. Nonetheless, it has been demonstrated that fewer action potentials — a weaker stimulus, as it were — causes fewer motor units to become involved in a contraction. Maximum stimulus, on the other hand, brings all motor units to bear together. So it's true that a muscle organ can have varying degrees of contraction depending on the level of stimulation. As for how this can be so, one theory proposes that individual fibers have specific thresholds of excitation; thus, those with higher thresholds only respond to stronger stimuli. The other theory holds that the deeper a fiber is buried in the muscle, the less accessible it is to incoming stimuli.

REMEMBER

In physiology, a muscle contraction is referred to as a *muscle twitch.* A twitch is the fundamental unit of recordable muscular activity. Complete fatigue occurs when no more twitches can be elicited, even with increasing intensity of stimulation.

The short lapse of time between the application of a stimulus and the beginning of muscular response is called the *latent period.* In mammalian muscle, latency is about .001 second, or one one-thousandth of a second.

Two types of muscle contraction relate to tone:

- **Isometric:** Occurs when a contracting muscle is unable to move a load (or heft a piece of luggage or push a building to one side). It retains its original length but develops *tension.* No mechanical work is accomplished, and all energy involved is expended as heat.
- **Isotonic:** Occurs when the resistance offered by the load (or the gardening hoe or the cold can of soda) is less than the tension developed, thus shortening the muscle and resulting in mechanical work.

But muscles aren't independent sole proprietors. Each muscle depends upon companions in a muscle group to assist in executing a particular movement. That's why muscles are categorized by their actions. The brain coordinates the following groups through the cerebellum.

- **Prime movers:** Just as it sounds, these muscles are the workhorses that produce movement.
- **Antagonists:** These muscles exist in opposition to prime movers.
- **Fixators or fixation muscles:** These muscles serve to steady a part while other muscles execute movement. They don't actually take part in the movement itself.
- **Synergists:** These muscles control movement of the proximal joints so that the prime movers can bring about movements of distal joints.

Flex your knowledge of muscle tone and function with these practice questions:

EXAMPLE

Q. Muscle movement that lifts an object involves an action known as

a. Isometric

b. Eccentric

c. Isotonic

A. The correct answer is isotonic. When the tension leads to movement (actual work), it's isotonic.

26. Muscles that tend to counteract or slow an action are called

a. Antagonists

b. Fixators

c. Primary movers

d. Synergists

27. Which of the following statements finishes this sentence and makes it *not* true: A contracting muscle unable to move a load

a. Involves an action known as isometric

b. Expends energy as heat

c. Is exemplified in the effect of the force of gravity on muscle contraction

d. Does no mechanical work and therefore doesn't develop any tension

e. Retains its original length

28. A muscle contraction is referred to as

a. Latency

b. Synergy

c. A twitch

d. Isotonic motion

Leveraging Muscular Power

Skeletal muscle power is nothing without lever action. The bone acts as a rigid bar, the joint is the fulcrum, and the muscle applies the force. Levers are divided into the *weight arm,* the area between the fulcrum and the weight; and the *power arm,* the area between the fulcrum and the force. When the power arm is longer than the weight arm, less force is required to lift the weight, but range, or distance, and speed are sacrificed. When the weight arm is longer, the range of action and speed increase, but power is sacrificed. Therefore, 90 degrees is the optimum angle for a muscle to attach to a bone and apply the greatest force.

Three classes of levers are at work in the body:

- **Class I, or seesaw:** The fulcrum is located between the weight and the force being applied. An example is a nod of the head: The head-neck joint is the fulcrum, the head is the weight, and the muscles in the back of the neck apply the force.
- **Class II, or wheelbarrow:** The weight is located between the fulcrum and the point at which the force is applied. An example is standing on your tiptoes: The fulcrum is the joint between the toes and the foot, the weight is the body, and the muscles in the back of the leg at the heel bone apply the force.
- **Class III:** The force is located between the weight and the fulcrum. An example is flexing your arm and showing off your biceps: The elbow joint is the fulcrum, the weight is the lower arm and hand, and the biceps insertion on the lower arm applies the force.

The direction in which the muscle fibers run also plays a critical role in leverage. Here are the possible directions:

- **Longitudinal:** Fibers run parallel to each other, or longitudinally, the length of the muscle. Example: sartorius.
- **Pennate:** Fibers attach to the sides of the tendon, which extends the length of the muscle. These come in subcategories:
  - **Unipennate,** where fibers attach to one side of the tendon; example: tibialis posterior
  - **Bipennate,** where fibers attach to two sides of the tendon; example: rectus femoris
  - **Multipennate,** where fibers attach to many sides of the tendon; example: deltoideus
- **Radiate:** Fibers converge from a broad area into a common point. Example: pectoralis major.
- **Sphincter:** Fibers are arranged in a circle around an opening. Example: orbicularis oculi.

The three types of *fasciae,* which *Gray's Anatomy* describes as "dissectable, fibrous connective tissues of the body," are as follows:

- **Superficial fasciae:** Found under the skin and consisting of two layers: an outer layer called the *panniculus adiposus* containing fat; and an inner layer made up of a thin, membranous, and highly elastic layer. Between the two layers are the superficial arteries, veins, nerves, and mammary glands.
- **Deep fasciae:** Holds muscles or structures together or separates them into groups that function in unison. It's a system of splitting, rejoining, and fusing membranes involving
  - An outer investing layer that's found under the superficial fasciae covering a large part of the body
  - An internal investing layer that lines the inside of the body wall in the torso, or trunk, region
  - An intermediate investing layer that connects the outer investing layer and the internal investing layer
- **Subserous fasciae:** Located between the internal investing layer of the deep fasciae and the peritoneum. It's the serous membrane that lines the *abdominopelvic* cavity, also known as the *peritoneal cavity.*

Got all that? Then try your hand at the following questions:

29. Which of the following in Figure 6-3 is a Class II lever?

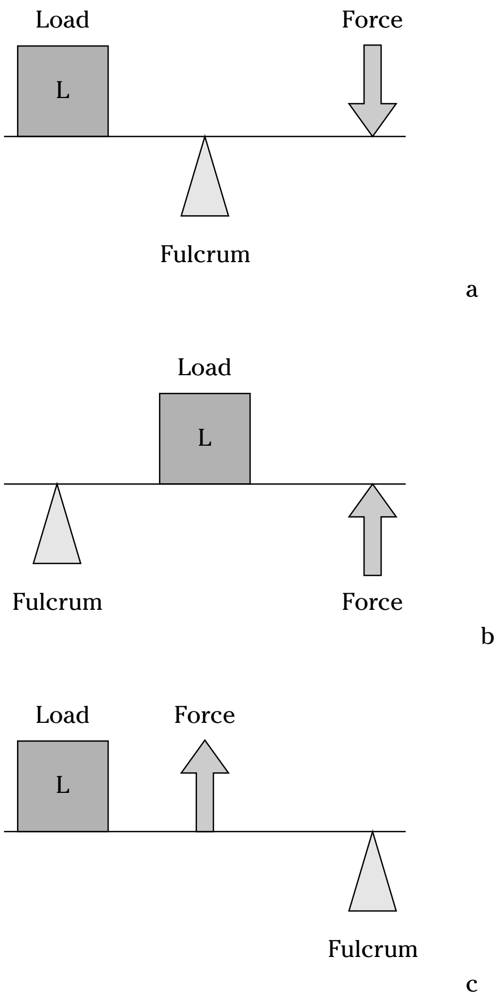

Figure 6-3: The three classes of muscle levers.

30. Which of the following would provide the force in a Class III lever?

a. Biceps brachii

b. Spenius capitus

c. Triceps brachii

d. Gastrocnemius

31. Which of the following would produce a wide range of movement with speed while sacrificing power?

a. Power arm and weight arm of equal lengths

b. Long weight arm, short power arm

c. Long power arm, shorter weight arm

32. Identify the bipennate bundle arrangement.

a. Sartorius

b. Rectus femoris

c. Pectoralis major

d. Tibialis posterior

e. Deltoideus

33. Which of the following is considered a dissectable connective tissue?

a. Aponeurosis

b. Bursae

c. Fasciae

d. Tendons

e. Ligaments

34. The most extensive fascia in the body is

a. Superficial

b. Deep

c. Subserous

d. None is more extensive than the other

What's In a Name? Identifying Muscles

It may seem like a jumble of meaningless Latin at first, but muscle names follow a strict convention that lets them be named for one or more of four things:

- **Function:** These muscle names usually have a verb root and end in a suffix (*–or* or *–eus*), followed by the name of the affected structure. Example: levator scapulae (elevates the scapulae).
- **Compounding points of attachment:** These muscle names blend the origin and insertion attachment with an adjective suffix (*–eus* or *–is*). Examples: sternocleidomastoideus (sternum, clavicle, and mastoid process) and sternohyoideus (sternum and hyoid).
- **Shape or position:** These muscle names usually have descriptive adjectives that may be followed by the names of the locations of the muscles. Examples: rectus (straight) femoris, rectus abdominus, and serratus (sawtooth) anterior.
- **Figurative names:** These muscle names are based on the muscles' resemblance to some objects. Examples: gastrocnemius (resembles the stomach) and trapezius (resembles a tablet).

Check out Table 6-1 for a rundown of prominent muscles in the body and key points to remember about each one.

Table 6-1 Muscles of the Body

Muscle	***Origin***	***Insertion***	***Action***
Head			
Frontal	Galea aponeurotica	Eyebrow	Expression
Buccinator			Mastication
Orbicularis oculi	Encircles eye		Closes eye
Orbicularis oris	Encircles mouth		Closes mouth
Masseter	Zygoma	Mandible	Mastication
Temporalis	Temporal fossa	Mandible	Mastication
Zygomaticus	Zygoma	Corner of mouth	Smiling
Neck			
Sternocleidomastoid	Sternum, clavicle	Mastoid process of temporal bone	Rotation and flexion of the neck vertebrae
Back			
Latissimus dorsi	Vertebral column	Humerus	Extends at shoulder joint
Trapezius	Vertebral column	Clavicle, scapula	Rotates scapula
Pectoral girdle			
Pectoralis major	Sternum, clavicle	Humerus	Adduction shoulder joint
Shoulder			
Deltoid	Clavicle, scapula	Humerus	Abduction shoulder joint
Abdominal wall			
External abdominal oblique, internal abdominal oblique, transversus abdominus		Aponeurosis to linea alba	Stabilizes, protects, and supports internal viscera
Rectus abdominus	Pubis	Costal cartilage	Stabilizes, protects, and supports internal viscera
Thorax			
Diaphragm	Separates thoracic and abdominal cavities		Respiration
External intercostals	Between ribs		Respiration
Internal intercostals	Between ribs		Respiration

(continued)

Table 6-1 *(continued)*

Muscle	***Origin***	***Insertion***	***Action***
Arm			
Biceps brachii	Humerus, glenoid fossa of scapula	Radius	Flexion at elbow joint
Triceps brachii	Scapula, humerus	Olecranon of ulna	Extension of elbow joint
Flexor carpi radialis	Humerus	2nd to 3rd metacarpals	Flexor of wrist, abducts hand
Flexor carpi ulnaris	Humerus, ulna	5th metacarpal	Flexor of wrist, adducts hand
Supinator	Humerus, ulna	Radius	Supinates forearm
Extensor carpi ulnaris			
Extensor carpi radialis longus	Humerus	2nd metacarpal	Extends and abducts wrist
Extensor carpi radialis brevis	Humerus	3rd metacarpal	Extends and abducts wrist, steadies wrist during finger flexion
Leg			
Quadriceps			
Rectus femoris	Acetabulum	Tibia (patella)	Extends knee joint and flexes at hip
Vastus lateralis, vastus medialis, vastus intermedialis	Femur	Tibia	Extends knee joint and flexes at hip
Sartorius	Ilium	Tibia	Flexes at knee and hip
Adductors	Pubis	Femur	Adduction at hip joint
Gracilis	Pubis	Tibia	Adduction at hip joint
Hamstring group			
Biceps femoris	Ischium	Fibula	Flexion at knee joint
Semimembranosus	Ischium	Tibia	Flexion at knee joint
Semitendinosus	Ischium	Tibia	Flexion at knee joint
Gastrocnemius	Femur	Calcaneus by Achilles tendon	Flexion at knee and plantar
Soleus	Tibia	Calcaneus by Achilles tendon	Plantar flexion

Muscle	*Origin*	*Insertion*	*Action*
Hip			
Gluteus maximus	Ilium, sacrum, coccyx	Femur	Extends knee joint and flexes at hip

35. In the naming of the muscles, the latissimus dorsi, the rectus abdominis, and the serratus anterior are names based upon

a. Shape

b. Attachment

c. Figurative name

d. Function

36. In the naming of muscles, the sternocleidomastoid is based upon

a. Function

b. Location

c. Attachment

d. Figurative name

37. In humans, the origin of the biceps brachii would best include which of the following?

a. Scapula

b. Clavicle

c. Fibula

d. Ulna

38. Which of the following are insertions for the triceps and biceps brachii?

a. Humerus and ulna

b. Radius and humerus

c. Scapula and humerus

d. Radius and ulna

39.–43. Match the origins and insertions for the following muscles.

39. _____ Semimembranosus

40. _____ Gracilis

41. _____ Sartorius

42. _____ Gastrocnemius

43. _____ Adductors

a. The pubis and the femur

b. The femur and the calcaneus

c. The ilium and the tibia

d. The ischium and the tibia

e. The pubis and the tibia

44.–48. Match the muscles with their actions.

44. _____ Semitendinosus

45. _____ Temporalis

46. _____ Biceps brachii

47. _____ Latissimus dorsi

48. _____ Trapezius

a. Rotates scapula

b. Flexion of leg at knee joint

c. Extension at shoulder joint

d. Mastication

e. Flexion of arm

49.–53. Match the muscles with their locations.

49. _____ Latissimus dorsi	**a.** Head
50. _____ Internal oblique	**b.** Abdomen
51. _____ Quadriceps	**c.** Back
52. _____ Masseter	**d.** Neck
53. _____ Sternocleidomastoid	**e.** Thigh

54. Which of the following is *not* included in the quadriceps group?

a. Vastus medialis

b. Vastus lateralis

c. Rectus abdominis

d. Rectus femoris

55. Where would you find the muscles called the biceps?

a. Arm

b. Neck

c. Leg

d. Back

e. Both a and c

56. What muscle divides the thoracic cavity from the abdominal cavity?

a. Diaphragm

b. External oblique

c. Transversus abdominis

d. Internal oblique

e. Rectus abdominis

57. The gastrocnemius and the soleus contribute to the

a. Dupuytren's contracture

b. Volkmann's contracture

c. Colles fracture

d. Klipped-Feil syndrome

e. Tendon of Achilles

58. Which of the following is *not* one of the muscles referred to as hamstrings?

a. Biceps femoris

b. Gracilis

c. Semimembranosus

d. Semitendinosus