Ram Balak Mahto
Guest faculty
Zoology department
v.s.j college Rajnagar Madhubani
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Muscles and its base of nomenclature

The human body enjoys an incredibly wide range of movements. The gentle blinking of your eye, standing on tiptoe, and wielding a sledgehammer are just a small sample of the different activities promoted by your muscular system.Muscle tissue includes all contractile tissues (skeletal, cardiac, and smooth muscle), but when we study the muscular system, **skeletal muscles** take center stage. These muscular "machines" that enable us to perform so many different activities are the focus of this chapter. Before describing the individual muscles in detail, we will describe the manner in which muscles "play"with or against each other to bring about movements, consider the criteria used for naming muscles, and explain the principles of leverage. Describe the function of prime movers, antagonists, synergists, and fixators. The arrangement of body muscles permits them to work either together or in opposition to achieve a wide variety of movements. As you eat, for example, you alternately raise your fork to your lips and lower it to your plate, and both sets of actions are accomplished by your arm and hand muscles. But muscles can only *pull*; they never *push*. Generally as a muscle shortens, its *insertion* (attachment on the movable bone) moves toward its *origin* (its fixed or immovable point of attachment).Whatever one muscle or muscle group can do, another muscle or group of muscles can "undo." Muscles can be classified into four *functional* groups: prime movers, antagonists, synergists, and fixators. A muscle that has the major responsibility for producing a specific movement is a **prime mover**, or **agonist** (ag_o-nist; "leader"), of that movement. The biceps brachii muscle, which fleshes out the anterior arm (and inserts on the radius), is a prime mover of elbow flexion. Muscles that oppose, or reverse, a particular movement are called **antagonists** (an-tag_o-nists; "against the leaders").When a prime mover is active, the antagonist muscles may be stretched or may remain relaxed. Usually however, antagonists help to regulate the action of a prime mover by contracting slightly to provide some resistance, thus helping to prevent overshooting the mark or to slow or stop the movement.As you might expect, a prime mover and its antagonist are located on opposite sides of the joint across which they act. Antagonists can also be prime movers in their own right. For example, flexion of the forearm by the biceps brachii muscle

of the arm is antagonized by the triceps brachii, the prime mover for extending the forearm. As noted in Chapter 9, it is important that the two members of any agonist/antagonist pair be challenged and developed equally to prevent undue tension on the less developed muscle and joint inflexibility. In addition to agonists and antagonists, most movements involve the action of one or more **synergists** (sin_er-jists; *syn* _ together, *erg* _ work). Synergists help prime movers by (1) adding a little extra force to the same movement or (2) reducing undesirable or unnecessary movements that might occur as the prime mover contracts. This second function deserves more explanation. When a muscle crosses two or more joints, its contraction causes movement at all of the spanned joints unless other muscles act as joint stabilizers. For example, the finger flexor muscles cross both the wrist and the interphalangeal joints, but you can make a fist without bending your wrist because synergistic muscles stabilize the wrist. Additionally, as some flexors act, they may cause several other (undesirable) movements at the same joint. Synergists can prevent this, allowing all of the prime mover's force to be exerted in the desired direction. When synergists immobilize a bone, or a muscle's origin so that the prime mover has a stable base on which to act, they are more specifically called **fixators** (fik_sa-terz). The fixator muscles that run from the axial skeleton to the scapula can immobilize the scapula so that only the desired movements occur at the mobile shoulder joint. Additionally, muscles that help to maintain upright posture are fixators. In summary, although prime movers seem to get all the credit for causing certain movements, antagonistic and synergistic muscles are also important in producing smooth, coordinated, and precise movements. Furthermore, a muscle may act as a prime mover in one movement, an antagonist for another movement, a synergist for a third movement, and so on.

Naming Skeletal Muscles

List the criteria used in naming muscles. Provide an example to illustrate the use of each criterion. Skeletal muscles are named according to a number of criteria, each of which describes the muscle in some way. Paying attention to these cues can simplify the task of learning muscle names and actions.

1. Location of the muscle. Some muscle names indicate the bone or body region with which the muscle is associated. For example, the temporalis (tem_por-aˇ_lis) muscle overlies the temporal bone, and intercostal (*costal*_rib) muscles run between the ribs.

2. Shape of the muscle. Some muscles are named for their distinctive shapes. For example, the deltoid (del_toid) muscle is roughly triangular (*deltoid* _ triangle), and together the right and left trapezius (trah-pe_ze-us) muscles form a trapezoid.

3. Relative size of the muscle.

Terms such as *maximus* (largest), *minimus* (smallest), *longus* (long), and *brevis* (short) are often used in muscle names—as in gluteus maximus and gluteus minimus (the large and small gluteus muscles, respectively).

4. Direction of muscle fibers.

The names of some muscles reveal the direction in which their fibers (and fascicles) run in reference to some imaginary line, usually the midline of the body or the longitudinal axis of a limb bone. In muscles with the term *rectus* (straight) in their names, the fibers run parallel to that imaginary line (axis).The terms

transversus and *oblique* indicate that the muscle fibers run respectively at right angles and obliquely to that line. Specific examples include the rectus femoris (straight muscle of the thigh, or femur) and transversus abdominis (transverse muscle of the abdomen).

5. Number of origins.

When *biceps, triceps,* or *quadriceps* forms part of a muscle's name, you can assume that the muscle has two, three, or four origins, respectively. For example, the biceps brachii (bra_ke-i) muscle of the arm has two origins, or *heads*.

6. Location of the attachments.

Some muscles are named according to their points of origin and insertion. The origin is always named first. For instance, the sternocleidomastoid (ster_no-kli_do-mas_toid) muscle of the neck has a dual origin on the sternum (*sterno*) and clavicle (*cleido*), and it inserts on the *mastoid* process of the temporal bone.

7. Action.

When muscles are named for the movement they produce, action words such as *flexor*, *extensor*, or *adductor* appear in the muscle's name. For example, the adductor longus, located on the medial thigh, brings about thigh adduction, and the supinator (soo_pı̆-na_tor) muscle supinates the forearm. (To review the terminology for various actions, see Chapter 8, Figures 8.5, 8.6, pp. 256–258.) Often, several criteria are combined in the naming of a muscle. For instance, the name *extensor carpi radialis longus* tells us

the muscle's action (extensor), what joint it acts on (*carpi* _wrist), and that it lies close to the radius of the forearm (radialis); it also hints at its size (longus) relative to other wrist extensor muscles.Unfortunately, not all muscle names are this descriptive.