"The body is a marvelous machine... a chemical laboratory, a power-house. Every movement, voluntary or involuntary, full of secrets & marvels!"
—Theodor Herzl (1860 - 1904)

Back to Basics:
Actions & Reverse Actions of a Muscle

There is no denying that one of the most important factors to massage therapists is excellent hands-on technique. However, when working clinically, a firm understanding and application of the principles of kinesiology is of equal value. Kinesiology literally means the study of motion. Given that motion of the body is primarily caused by the internal forces created within our body by muscle contractions, a solid understanding of the mechanism of muscle contraction is of paramount importance. This is true both when assessing a client's dysfunction as well as when determining the appropriate therapy for a client.

When a muscle contracts, it creates a pulling force on its attachments that is directed toward the center of the muscle. This pulling force attempts to shorten the muscle. If its contractile pulling force is greater than the resistance force it meets, the muscle succeeds in shortening (concentrically contracts) and creates movement of one or both of its attachments (Figure 1). It's essential to understand that when a muscle contracts, it has no ability to choose which one of its attachments will move—a muscle contraction

RESOURCES

For more reading about kinesiology, try "Kinesiology of the Musculoskeletal System: Foundations for Physical Rehabilitation" by Donald Neumann.

Figure 1 illustrates that when a muscle contracts, it creates a pulling force toward its center. If this pulling force is sufficient to cause movement, the muscle succeeds in shortening as it contracts. It's said to concentrically contract.

pulls equally upon both of its attachments. The determination of which attachment moves—in other words, the intention and control of musculoskeletal movement—resides within the central nervous system.

A muscle is effectively a machine under the will of the nervous system. When the nervous system wills a movement pattern, it co-orders certain muscles—or more precisely, specific motor units of certain muscles—to contract. The coordination of these forces acts upon the skeleton across joints, resulting in movement of our body parts at these joints. If the co-ordering is well done, we exhibit a well coordinated, graceful movement pattern. The term used to describe the nervous system's muscular coordination patterns of movement and/or posture is *muscle memory*. Muscle memory resides in the nervous system, not in the muscles themselves.

Insertion & Origin

To examine the mechanism of a muscle contraction, let's call the two attachments of a muscle Bone A and Bone B. When a muscle concentrically contracts, three different scenarios can result: 1) Bone A is mobile and moves toward Bone B, which is fixed; 2) Bone B is mobile and moves toward Bone A, which is fixed; and 3) both Bones A and B are mobile and move toward each other and neither attachment is fixed (Figure 2).

You probably learned to name muscle attachments as origin and insertion, and that when a muscle contracts, the origin stays fixed and the insertion moves.* For example, the humeral attachment of the brachialis muscle is called the origin, and the ulnar attachment is called the insertion. When the action of the brachialis is studied, you learn that its insertion (the forearm) moves toward its origin (the arm), resulting in flexion of the forearm at the elbow joint (Figure 3a). This action typically occurs because the forearm is lighter and, therefore, offers less resistance to moving than