Dynamic Chiropractic

DIAGNOSIS & DIAGNOSTIC EQUIP

Applied Kinesiology and the Motor Neuron

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Editor's note: This is the first in a series of three articles on applied kinesiology (three different authors).

Manual muscle testing (MMT) has been utilized by the medical and chiropractic professions for a half-century. Its utilization in the medical community, primarily by orthopedists and neurologists, is limited mainly to the evaluation of pathology. It took the genius of George J. Goodheart Jr., DC, DIBAK, to recognize the value of manual muscle testing in the chiropractic community as an assessment tool for functional disorders. His clinical research spearheaded the development of applied kinesiology (AK). Years later, Walter H. Schmitt, DC, DIBAK, DABCN, coined the phrase, "muscle testing as functional neurology," that launched the era of describing the neurological aspects of applied kinesiology manual muscle testing (AK MMT), and the realization of the breadth of possibilities it affords.

Over the decades that MMT has been used as an analytical tool, there have been a multitude of theoretical causes for a "weak" muscle: lymphatic stasis; craniosacral faults; disruptions of the body's electromagnetic properties; etc. However, regardless of what you call a zebra, it's still a zebra. The common denominator in AK with regard to a "weak" muscle is an aberrantly functioning motor neuron, limiting the subject's ability to normally contract the muscle. In other words, if the bias of the motor neuronal pool shifts toward hyperpolarization, the subject cannot sufficiently depolarize enough motor neurons to meet the demands of the test. This leaves us with the question, "What does a 'weak' muscle mean?"

The term "weak" muscle is really a misnomer. The muscle itself is not actually weak. In the absence of end-organ pathology, the weakness is the result of inhibition of the motor neuron. Just as red blood cells are not really cells, but corpuscles (in light of the fact that they have no nuclei), it is still common practice to refer to them as "cells," though technically inappropriate. In any event, a muscle is simply a contractile tissue, depolarized by an efferent signal from the motor neuron. Hence, the muscle test represents the bias of the motor neuronal pool and an integer of the extent of its conditional facilitation or inhibition, at that moment in time. This terminology more adequately reflects modern understanding of these phenomena.

The cell bodies of the motor neurons are located in the anterior (ventral) horn of the spinal cord; they are referred to as the "final common pathway" of the motor system. The bias of the anterior horn cells has been termed the "central integrative state," and is maintained by the convergence of multiple ascending and descending pathways.

The descending pathways originate at suprasegmental levels (above the *foramen magnum*), both pyramidally and extrapyramidally. They can be conscious (cortical) in nature, as in the execution of a volitional muscle test, or unconscious, i.e., reflexogenic (mesencephalic, cerebellar) and involuntary, as in gait patterns.

On the other hand, the ascending pathways are segmental, sensory, and arise from visceral or somatic origins. They include, but are not limited to, inputs from chemoreceptors, nociceptors and

mechanoreceptors from skin, fascia, viscera and articulations. Sensory pathways travel to the spinal cord and may provide visceral or somatic afferents at the same segmental level; or they may travel up the spinal cord to mesencephalic or cerebellar centers, to ultimately descend and affect other segments above or below the level of the original segment in question.

In the instance of an inhibited muscle, the sum total of the effects from these aforementioned converging pathways may shift the bias of the neuronal pool toward hyperpolarization. Consequently, when the muscle is evaluated by AK MMT, an insufficient number of motor neurons are brought to excitation threshold, and the subject is unable to produce the motor output necessary to meet the demands of the test.

A variety of reflexes innate to the human system are necessary to maintain existence. If there is somatic or visceral tissue dysfunction, there will be an associated reflex affecting motor neurons and, therefore, muscle function. A classic example is an inflamed appendix, in which the patient cannot extend the right hip. This flexion contraction is a withdrawal reflex and a consequence of tissue irritation resulting in a nociceptive barrage. For every muscle that becomes hypertonic due to the loss of appropriate inhibition of the corresponding motor neuronal pool, there is a reflexogenic inhibition or "weakness" of the antagonist muscle. As a result, nearly every visceral or somatic disruption results in an inhibited muscle. To varying degrees, all inhibited muscles identified with AK MMT are representations of the bias of the motor neuronal pools.

The central nervous system (CNS) monitors and drives virtually all subservient systems in the body. When there is aberrance, the CNS is altered and attempts to respond and maintain homeostasis. The soma and viscera communicate with the CNS neurologically (via hard-wired pathways and synaptic relationships) and chemically (via cytokines, hormones and neuropeptides). Therefore, it is reasonable to suspect that both chemical and neurological functions are reflected in muscle performance, and that they are accessible through the sophisticated analyses of AK MMT.

Regardless of the technique employed - acupuncture meridian therapy, osseous manipulation, cranial adjusting, etc. - when the central integrative state of the motor neuronal pool has been shifted, such that its bias is brought closer to depolarization, the muscle is properly facilitated.

Hardly a single human function takes place without muscular involvement. Consequently, proficiency in analyzing muscles via AK MMT, coupled with a thorough understanding of the central nervous system, provides clinicians with an almost limitless method of evaluating functional conditions and all their nuances.

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