Motor neuron

A motor neuron (or motoneuron) is a nerve cell (neuron) whose cell body is located in the spinal cord and whose fiber (axon) projects outside the spinal cord to directly or indirectly control muscles.

Motor neurons are efferent nerves (also called effector neurons), that carry signals from the spinal cord to the muscles to produce (effect) movement.

Chalif and Mentis presented Normal Development and Pathology of Motoneurons: Anatomy, Electrophysiological Properties, Firing Patterns and Circuit Connectivity. in Adv Neurobiol [1] They provided an introduction to motoneuron anatomy, electrophysiological properties, and firing patterns focusing on development and also describing several pathological conditions that affect mononeurons. It starts with a historical retrospective describing the early landmark work into motoneurons. The next section lays out the various types of motoneurons (alpha, beta, and gamma) and their subclasses (fast-twitch fatigable, fast-twitch fatigue-resistant, and slow-twitch fatigue resistant), highlighting the functional relevance of this classification scheme. The third section describes the development of motoneurons' passive and active electrophysiological properties. This section also defines the major terms one uses in describing how a neuron functions electrophysiologically. The electrophysiological aspects of a neuron are critical to understanding how it behaves within a circuit and contributes to behavior since the firing of an action potential is how neurons communicate with each other and with muscles. The electrophysiological changes of motoneurons over development underlies how their function changes over the lifetime of an organism. After describing the properties of individual motoneurons, the chapter then turns to reveal how motoneurons interact within complex neural circuits, with other motoneurons as well as sensory neurons, and how these circuits change over development. Finally, this chapter ends with highlighting some recent advances made in motoneuron pathology, focusing on spinal muscular atrophy, amyotrophic lateral sclerosis, and axotomy [2].

Types

Types of motor neurons are alpha motor neurons, beta motor neurons, and gamma motor neurons.

see Lower motor neuron.

see Upper motor neuron.

see Motor neuron disease.

In a typical F wave study, a strong electrical stimulus (supramaximal stimulation) is applied to the skin surface above the distal portion of a nerve so that the impulse travels both distally (towards the muscle fiber) and proximally (back to the motor neurons of the spinal cord). (These directions are also known as orthodromic and antidromic, respectively.)

[1], [2]
Chalif JI, Mentis GZ. Normal Development and Pathology of Motoneurons: Anatomy, Electrophysiological Properties, Firing Patterns and Circuit Connectivity. Adv Neurobiol.

2022;28:63-85. doi: 10.1007/978-3-031-07167-6_3. PMID: 36066821.