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Afferent and Efferent Impulses

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Synonyms

[Sensory and motor impulses](#)

Definition

Neural impulses which travel from sensory organs/receptors to the central nervous system (CNS) are known as afferent impulses, whereas those which travel from the CNS to the organs/glands are known as the efferent impulses.

Introduction

Those nerve cells which help in communication of action potentials (neural impulses) between the central nervous system and other body organs form the part of peripheral nervous system (PNS) (Baars and Gage, 2010). Depending upon the direction of this signal, neural impulses can be divided into two:

- (a) Afferent: neural impulse carries signals from sensory receptors or organs to the brain or spinal cord (CNS) for their further processing/analysis and
- (b) Efferent: neural impulse carries signals from brain or spinal cord (CNS) to the organs (like limbs, muscle, glands, etc.) for displaying proper reaction.

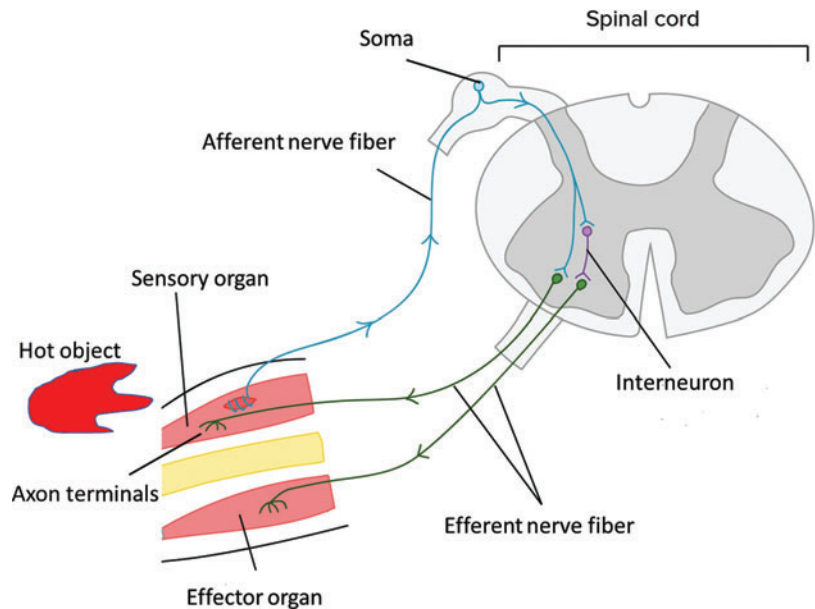
Due to their function, nerve fibers which carry afferent impulses are known as afferent nerves or sensory nerves, and those nerve fibers which carry efferent impulses are known as efferent nerves or motor nerves. On the other hand, the neurons which connect sensory nerves and motor nerves are known as interneurons or association nerve cells (Fig. 1).

General Description

Both afferent and efferent terms have been derived from French. Afferent from *ad ferens* (Latin *ad* literally means **to** and verb *ferre* means **bring**) = **bring towards**, and efferent from *ex ferens* (Latin *ex* means **from** and verb *ferre* means **carry**) = **carrying away**.

The PNS gathers information from the environment and directs it towards the CNS; the CNS processes this information and directs it back to the PNS for suitable reaction. For example, when you accidentally touch a hot iron-press, the heat sensation is transmitted by the peripheral nerve to

Afferent and Efferent Impulses, Fig. 1 Afferent and efferent nerve fiber (Image adapted from: <https://www.khanacademy.org/science/biology/human-biology/neuron-nervous-system/a/overview-of-neuron-structure-and-function>. This image is licensed under a CC BY-SA 4.0 license)



the spinal cord (afferent impulse), upon which spinal cord sends back signals through the nerves to the limb to initiate some motor action like to withdraw your limb or to push away the iron-press (efferent impulse). (Ganong, 2005) In former case, sensory neurons are involved; whereas in latter case, motor neurons execute the desired actions. The sensory neurons receive a wide variety of stimuli such as taste, smell, light, pain, etc. through different senses and sends these signals upwards through the nerves to reach in the CNS. Hence, these are also known as afferent or ascending pathways. The motor neurons form the efferent or descending pathways as they pass the signals along the nerves to the effector organ, which are primarily the muscles and glands (Fig. 1).

As evident from fig. 1, there is structural difference between afferent and efferent neurons. Afferent impulses are transmitted by pseudo-unipolar nerve cell, that is, it contains a soma with long axon that splits into two branches; one branch runs to the periphery and the other toward the spinal cord. Therefore, no dendrites are present in this case. The soma of efferent neuron is satellite shaped and consists of several shorter

dendrites projecting out of it along with a long axon. This axon generally forms a neuromuscular junction with the effectors. (Dharani, 2015) The motor neuron is present in the grey matter of the spinal cord and medulla oblongata and forms an electrochemical pathway to the effector organ or muscle.

Cross-References

- ▶ [Action Potentials](#)
- ▶ [Axon](#)
- ▶ [Nerve Cells](#)
- ▶ [Neural Impulse](#)
- ▶ [Neuron](#)

References

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