

MEDULLA

The medulla is the brainstem region located just above the spinal cord and just below the PONS (see Figure 1; see also Figure 1 in REM SLEEP MECHANISMS). The medulla alone contains mechanisms sufficient to keep us breathing, keep our hearts beating and regulated, and produce arousal in response to intense stimuli. The medulla is not sufficient to generate REM sleep; however, it does contain neurons contributing to the control of both REM and NREM sleep (see NREM SLEEP MECHANISMS; REM SLEEP MECHANISMS AND NEUROANATOMY)

A key neuronal group for NREM sleep control is located in the lateral medulla. Stimulation of the region adjacent to the nucleus solitarius can induce sleep, as can stimulation of the receptors in the carotid body (adjoining the carotid artery) monitoring blood pressure. The carotid body receptors connect with the region of the nucleus solitarius. The more medial portions of the medulla are critical for the suppression of muscle tone that occurs in REM sleep (see ATONIA). The nuclei involved in muscle tone suppression in

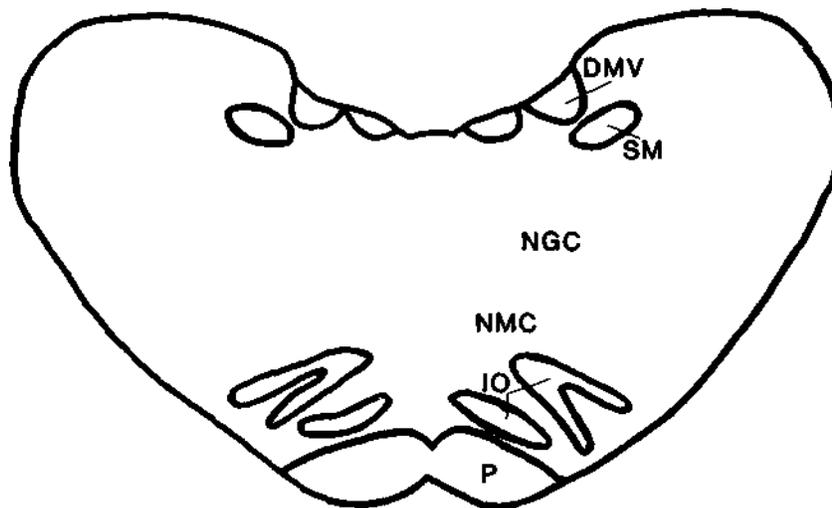


Figure 1. A cross-section of the medulla. DMV = dorsal motor nucleus of the vagus nerve, which controls certain visceral motor functions such as the heart and intestines; IO = inferior olive, a motor nucleus that works with the cerebellum; NGC = nucleus gigantocellularis; NMC = nucleus magnocellularis; P = pyramidal tract, which conveys motor information to the spinal cord; SM = medial nucleus of the solitary tract, which receives sensory signals from visceral areas and the circulatory system.

elude portions of the nucleus gigantocellularis (named for its large neurons) and, beneath this, the nucleus magnocellularis containing somewhat smaller cells. Closer to the spinal cord (just behind the nucleus gigantocellularis and magnocellularis) is a cell group called the nucleus paramedianus, also involved in the suppression of muscle tone in REM sleep. The medial medulla also contributes to the regulation of arousal through projections going forward through the brainstem to arousal-related regions of the PONS, MIDBRAIN, and THALAMUS. Therefore, this region can coordinate motor activity with level of arousal.

REFERENCE

Siegel JM. 1989. Brainstem mechanisms generating REM sleep. In Kryger MH, Roth T, Dement WC, eds. *Principles and practice of sleep medicine*, pp 104-121. Philadelphia: Saunders.

Jerome Siegel