# 29 - Ascending Reticular Activating System Neurotr

# Ascending Reticular Activating System - Neurotransmitters

© SPMM Course  Often they occur after sleep disturbances (e.g., brief sounds) and, like K complexes, may occur during brief semiarousals.

D. Regulation Hypothalamic controls  The master clock of the brain is the suprachiasmatic nucleus (SCN) located in the anterior hypothalamus - this orchestrates circadian rhythms and is synchronized by signals from the retina.  SCN is reset each day by signals of light from the retina. Specialized melanopsin-containing retinal ganglion cells project via retinohypothalamic tract to the SCN. This provides light input independent of vision.  In the absence of solar guidance, the 24-hour sleep-wake cycle will gradually increase to approximately 26 hours –this is called freerunning.  Pineal melatonin secreted during darkness can also reset the SCN. Thus, melatonin promotes sleep in those with delayed sleep onset or jet lag.  The ventrolateral preoptic nucleus (VLPO) is called the sleep switch nucleus. It has projections to the main components of the ascending arousal system. The VLPO induces sleep by putting the brakes on the arousal nuclei. People with damage to their VLPO have chronic insomnia.  The VLPO must be inhibited so that people can wake up. This is brought about by a negative feedback from the monoaminergic system. The switching to arousal is then stabilised by orexin (also called hypocretin) neurons in the hypothalamus. Orexin neurons are mainly active during wakefulness and reinforce the arousal system. Patients with narcolepsy have reduced number of orexin neurons, leading to repeated somnolence during the day. Ascending Reticular Activating System - Neurotransmitters Neurotransmitter Cell Bodies Function Cholinergic Midbrain-pons nuclei REM on neurons. Activation brings on REM sleep Noradrenergic Locus coeruleus REM off neurons. Activation reduces REM sleep. Dopaminergic Periaqueductal gray matter D2 possibly enhances REM sleep Serotoninergic Raphe nuclei 5HT2 stimulation possibly maintains arousal Histaminergic Tuberomammillary nucleus H1 stimulation possibly maintains arousal

SLEEP & AGEING

Newborns sleep about 16 hours a day. They spend >50% of sleep time in REM sleep. Sleep onset REM is also seen in neonates.

By 3-4 months of age, the pattern shifts so that the total percentage of REM sleep drops to less than 40, and entry into sleep occurs with an initial period of NREM sleep. By late teens adult pattern of sleep is established.

This distribution remains relatively constant until old age. Absolute reduction occurs in both slow-wave sleep and REM sleep in older persons. An increase in frequency of awakenings after sleep onset also occurs with age.

---

Revision #1
Created 2026-01-04 20:02:57 UTC by Omar Ayman
Updated 2026-01-04 20:02:57 UTC by Omar Ayman