

Abstract

Sleep is an essential physiological process driven by a circadian system with its main endogenous pacemaker in the suprachiasmatic nucleus of hypothalamus (SCN) and by sleep homeostasis, a process reflecting time spent awake.

This work is focused on basic characteristics of sleep, describes the two process model of sleep regulation and sleep homeostasis theory which connects synaptic plasticity with sleep. Next it describes the function and principles of the circadian system including the synthesis of melatonin and the principles of homeostatic sleep regulation. Within the sleep homeostasis, the focus is on the role of dopamine, prostaglandin D₂ and especially adenosine. Next are discussed genes involved in sleep homeostasis and connecting it with synaptic plasticity. Last are mentioned alterations in homeostatic regulation of sleep in people suffering from depression and the final chapter focuses on the interactions between circadian and homeostatic process, particularly on the role of clock genes in sleep homeostasis.

Key words: sleep, circadian system, sleep homeostasis, adenosine