

Functional neuroanatomy of sleep and circadian rhythms

Tarasova Sophiya Alexeevna

Belarusian State Medical University, Minsk

Tutor - Senior Researcher Sayanova Galina Ivanovna, Belarusian State Medical University, Minsk

Sleep is a natural state of mind and body, characterized by altered consciousness, relatively inhibited sensory activity, inhibition of nearly all voluntary muscles, and reduced interactions with surroundings. In 1929 a psychiatrist Hans Berger established that brain activity was different during wakefulness and sleep by recording cortical electrical potentials by dint of an electroencephalogram. The so-called "switch" that betrays signals that cause a person to sleep was found. It means that there is a group of neurons transmitting a signal that causes living organisms to retire to sleep. Those accumulations of neurons, the excitation of which causes the development of sleep are called hypnogenic centers. There are 3 hypnogenic centers:

- Structures that ensure the development of slow sleep: the anterior parts of the hypothalamus (preoptic nuclei), nonspecific nuclei of the thalamus, suture kernels (contain a serotonin inhibitory mediator), brake center Moruzzi (middle part of the pons);
- Rapid eye movement sleep centers: locus coeruleus, vestibular nuclei of the medulla oblongata, superior colliculus of the midbrain, reticular midbrain formation (rapid eye movement centers);
- Centers regulating the sleep cycle: locus coeruleus (stimulation - awakening), separate areas of the cerebral cortex.

Many processes in the body are rhythmic. The sleep-wake cycle is constantly adjusted to external sensors (the duration of the day and night). Synchronously, other rhythms of the organism are tuned to him - hormonal, biochemical, physiological, emotional and behavioral. Healthy sleep performs restorative functions in relation to the brain and the body as a whole and, in turn, is the key to the qualitative work of cognitive processes in the subsequent period of wakefulness. Wakefulness and natural sleep regularly replace each other, obeying circadian and diurnal biorhythms. There are two types of sleep: slow-wave sleep (so-called deep sleep) which lasts 80-90 minutes and consists of 4 stages, and rapid eye movement sleep (REMS) or paradoxical sleep (PS) which follows a slow one and lasts 10-15 minutes. Both kinds of sleep have their own differences. A slow sleep is suggested to be associated with the restoration of energy costs. The slow-sleep phase is the key to anchoring conscious "declarative" memories. A quick sleep provides the functions of psychological protection, the processing of information, its exchange between consciousness and the subconscious. During this stage of sleep secretion of adrenal hormones increases as well as cerebral blood flow, the heart rate changes, the blood pressure rises and the respiration rate changes. We know that sleep has a huge impact on the entire body and mind so it is important to understand sleep mechanisms because it can help us to avoid the development of some disorders and pathologies.