ABSTRACT

Most of physiological processes run in the organisms persistently, they begin in a definite rhythm again and again. The greatest attention is paid to the rhythms, whose period is equal to one day - they are called circadian rhythms. In case of mammals, these circadian rhythms are under control of the central circadian clock that resides in the suprachiasmatic nucleus, a part of the anterior hypothalamus. The mechanism of rhythm generation is based on interacting transcriptional-translational feedback loops that control expression of the clock genes in every single cell. Clock-controlled genes transmit these rhythms into the whole organism where they drive many physiological processes. Clock genes are expressed also in the peripheral oscillators (for example in liver, lungs, heart) and are under direct control of the central oscillator. Circadian clock needs to be entrained everyday to the external time to function precisely. The main entraining cue is the light part of the day. The length of the light part of the day, i.e. photoperiod, changes during the year rapidly in our latitudes and the central oscillator has to adapt to the changes all the time. The length of the photoperiod is encoded directly in the central oscillator by the transcriptional-translational relations among the clock genes and their protein products. The aim of the diploma thesis was to elucidate the effect of photoperiod on the central molecular circadian clock within the suprachiasmatic nucleus as well as the peripheral clock in the liver. Thorough understanding of the issue how the biological rhythms are generated and entrained by environmental cues seems to be important for new ways of the therapy, i.e., chronotherapy and chronopharmacology. The thing is that dysfunction of the normal circadian rhytmicity can lead as far as to serious health consequences, like depression, sleep disease, cancer, cardiovascular disorder, obesity etc. The manipulation of clock gene expression or functional clock gene activity could lead to the efficient treatment of such circadian diseases.