

MOLECULAR MECHANISM OF THE CIRCADIAN CLOCK – HOW ORGANISMS COUNT TIME

Summary

Almost all organisms exhibit circadian rhythms in behavior, metabolism and physiology. All these rhythms are controlled by a clock mechanism, which is composed of transcriptional feedback loops. Molecular composition and regulation of endogenous oscillators responsible for circadian rhythms, from cyanobacteria to humans, have been extensively investigated over past years. The molecular mechanism of the circadian clock is different between eukaryotes and prokaryotes, suggesting its independent origin. However, a common feature of the clock is that positive factors in the feedback loops activate the transcription of negative factors, which feedback to inhibit expression of positive factors. When the

level of negative factors is low, the positive factors can start the next cycle of transcription. The core clock is synchronized to the environment by means of input pathways which can detect external cues such as light, temperature and other. Clock proteins are not only self-regulated molecules but can also influence expression of other genes (clock-controlled genes). These genes are part of an output pathway which controls many behavioral and physiological pathways. In this paper, the circadian clock mechanisms in different model organism (*Synechococcus elongatus*, *Neurospora crassa*, *Arabidopsis thaliana*, fruit fly and mouse) are reviewed.