

The Rhythms of Sleep



The Biological Clock

The timing for sleep in humans is regulated by our internal biological clock. Biological clocks are not like other clocks with which we are all familiar. Rather, they are physiological systems that allow organisms to live in harmony with the rhythms of nature, such as day/night cycles and the changing of seasons. The most important function of our biological clock is that it regulates our sleep/wake cycle. Our clock, because it cycles once per day, is called a *circadian clock*. In humans, this clock is located in a very small area of the brain called the *suprachiasmatic nucleus* (SCN). The SCN receives light signals from the retina, interprets them, and sends signals to another area of the brain, the pineal gland, to release hormones that affect our sleep/wake cycle. Clock genes maintain the clock cycle by directing the synthesis of proteins that slowly enter the cell nucleus and turn off the clock genes. Over a period of about 24.5 hours, these proteins break down and the genes become active again. This type of biochemical cycle is called a *negative feedback loop*.



Resetting the Clock

The circadian clock in humans actually cycles at just over 24 hours. This means that the clock must be reset to match the environmental photoperiod (that is, the light/dark, or day/night, cycle). The cue for resetting the clock is light. Light receptors in the eye transmit signals to the SCN, which in turn directs the pineal gland to secrete a hormone called *melatonin*. Melatonin levels rise during the night and decline at dawn. The rhythmic secretion of hormones such as melatonin influences our sleepiness. If the clock fails to reset properly, it becomes out of sync with the environment and can produce various problems such as jet lag, seasonal affective disorder, and Monday morning blues.