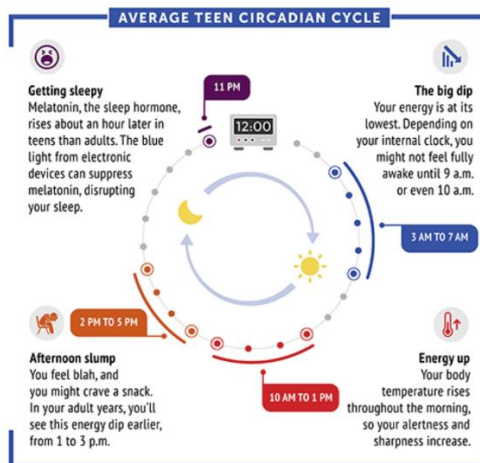


Biological clock in humans

We may have heard about “biological clocks” in different occasions, for instance during your English lessons in Form 3 or in our daily lives. We do know the importance of “biological clocks” to us, that is to help maintain our physical and psychological wellbeing.

To begin with, we would like to tell you what actually “biological clocks” are and what effects they bring to us.

In fact, “biological clocks” are scientifically called “circadian rhythms”. Circadian rhythms are physical, mental, and behavioral changes that follow a 24-hour cycle. These natural processes respond primarily to light and dark and affect most living things, including animals, plants, and microbes. Chronobiology is the study of circadian rhythms. One example of a light-related circadian rhythm is sleeping at night and being awake during the day. The Average Teen Circadian Cycle image shows the circadian rhythm cycle of a typical teen.



A master clock in the brain coordinates all the biological clocks in a living thing, keeping the clocks in sync. In vertebrate animals, including humans, the master clock is a group of about 20,000 nerve cells (neurons) that form a structure called the suprachiasmatic nucleus, or SCN. The SCN is in a part of the brain called the hypothalamus and receives direct input from the eyes.

What are controlled by the “biological clock” in our body? Well, there are several functions or activities that are regulated by them, like:

- sleeping
- metabolism
- immune response
- cell cycle and cellular differentiation (Yet without being disclosed in what way)

For humans, some of the most important genes in producing circadian rhythms are the Period and Cryptochrome genes. These genes code for proteins that build up in the cell's nucleus at night and lessen during the day. Studies in fruit flies suggest that these proteins help activate feelings of wakefulness, alertness and sleepiness. However, signals from the environment also affect circadian rhythms. For instance, exposure to light at a different time of day can reset when the body turns on Period and Cryptochrome genes.

Then you may ponder, can the “biological clocks” be affected? And how can it be affected?

“Biological clocks” can be affected by different conditions. Changes in our body and environmental factors can cause our circadian rhythms and the natural light-dark cycle to be out of sync.

For example:

- ✧ mutations or changes in certain genes can affect our biological clocks.
- ✧ jet lag or shift work causes changes in the light-dark cycle.
- ✧ light from electronic devices at night can confuse our biological clocks.

Let's take jet lag as an example.

When you pass through different time zones, your biological clock will be different from the local time. For example, if you fly east from California to New York, you “lose” 3 hours. When you wake up at 7:00 a.m. on the East Coast, your biological clock is still running on West Coast time, so you feel the way you might at 4:00 a.m. Your biological clock will reset, but it will do so at a different rate. It often takes a few days for your biological clock to align with a new time zone. Adjusting after “gaining” time may be slightly easier than after “losing” time because the brain adjusts differently in the two situations.

You may have the following symptoms during jet lag. They might be

- ◆ trouble with digestion,
- ◆ reduced physical and mental performance,
- ◆ mood disturbance (anxiety, depression, irritability),
- ◆ fatigue, and
- ◆ sleep problems (difficulty falling asleep or staying asleep, fractured sleep, waking up too early).

Jet lag is worse when more time zones you cross. It may be more severe if you fly east.

A point to note is that aging does not regulate circadian rhythms. This results in the elderly experiencing difficulties in basic day-to-day activities, such as sleep, energy production, etc.

A change in “biological clocks” might result in different health consequences which includes sleep disorders and other chronic health conditions, such as obesity, diabetes, depression, bipolar disorder and seasonal affective disorder.

To prevent the consequences, we would like to share some tips here.

First, **nap smartly**. Napping can increase your wakefulness and boost performance and your ability to learn, but only if you nap smartly. The ideal nap is between 20 and 30 minutes long in the early to mid-afternoon. Set an alarm on your clock so you do not oversleep. If you nap longer than that, you will not receive any additional benefits. In fact, habitually taking longer naps is associated with a higher risk of death and disease, especially in elderly people. Longer naps may also interfere with your ability to sleep at night.

Next, **keep a consistent sleep schedule**. One way to keep your biological clock on track is to maintain a consistent sleep schedule. Try to go to bed and wake up at the same time every day, even on the weekends. You want your body to get used to a routine. When you do this, you support a healthy circadian clock. Your bedtime and wake time should deviate by no more than half an hour earlier or later every day. Do this to support a healthy sleep-wake cycle.

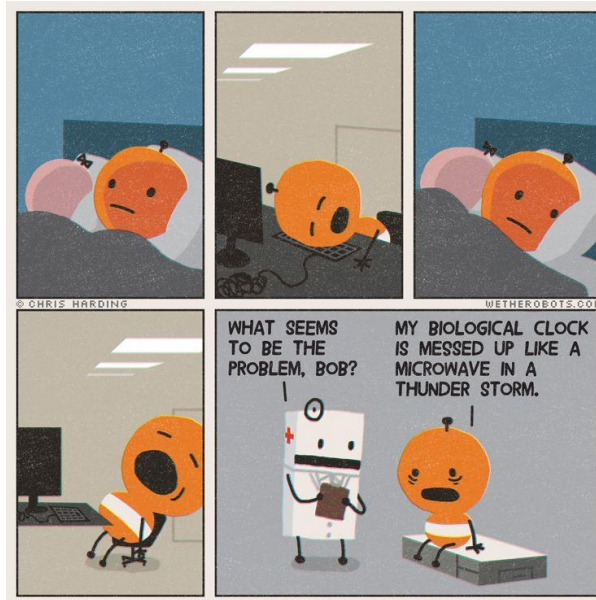
Moreover, **turn off the lights**. Indoor lighting and electronic devices that emit light like computers, tablets, smartphones and TVs are relatively new to the realm of human experience. For most of the time in history, humans were not exposed to these amenities. Historically, humans got up when the sun rose and went to bed when the sun set. Now, we live largely indoors and are exposed to many sources of artificial light that interfere with our internal clock. Turn off or limit your exposure to devices for several hours before bed so they do not affect your internal clock. Dim indoor lighting in the evening so it is less likely to affect your biological rhythms. Establish a relaxing bedtime routine with light reading, taking a warm bath or listening to soothing music to help you wind down.

Furthermore, **light up your day**. If you wake up feeling groggy or are a slow starter in the morning, use natural sunlight to energize yourself. Expose your eyes to sunlight as soon as you wake up. Open your curtains or pull the shades all the way up. Go for a stroll outdoors. Sunlight turns certain genes on or off that affect the molecular function of biological clocks. As you get ready for your day, turn on bright lights. Exposing yourself to as much light as possible turns off production of melatonin, the hormone that promotes sleepiness. The master clock in the brain, the suprachiasmatic nucleus (SCN), controls melatonin production. Light exposure helps regulate your internal physiological day-night cycle.

Last but not least, **mind nighttime eating**. Eating late at night may interfere with sleep. If you suffer from acid reflux, eating too close to bedtime sets the stage for nighttime heartburn. Eat dinner at the same time every evening, making sure to eat several hours before bedtime. Avoid heavy, greasy meals and spicy food. Skip caffeine in the late afternoon and evening. Caffeine consumption late in the day may interfere with sleep. If you have the munchies before bed, have a small snack, like an apple with a few tablespoons of peanut butter or some cheese and crackers.

To sum up, it is vital for us to have a normal “biological clock” so we can have ourselves well physically, mentally and psychologically. It is hoped that the tips we have shared are helpful to maintain a normal “biological clock” for all of you.

COMIC CORNER



RELAXING ZONE

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2		4	5					
4		1				3		6
			1				8	2
					2			

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9	3	8	2	4	6	5	7	1
6	7	5	3	8	1	2	4	9
8	9	2	6	5	3	4	1	7
3	5	7	4	1	9	6	2	8
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