

CHRONOBIOLOGY: HOW BIOLOGICAL RHYTHMS CONTROL OUR HEALTH

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Abstract: Our internal biological clocks determine when we are alert and active and when we need rest. They influence sleep, metabolism, heart function, and the immune system. Disruption of biorhythms leads to fatigue, weight gain, illnesses, and reduced cognitive abilities. In this article, we examine the mechanisms of circadian rhythms, their impact on the body, and science-based recommendations for maintaining them.

Keywords: chronobiology, biorhythms, circadian rhythms, sleep, metabolism, melatonin, cortisol, health, immunity, cardiovascular system, nutrition, productivity.

Аннотация: Внутренние биологические часы определяют, когда мы бодрь и активны, а когда нуждаемся в отдыхе. Они влияют на сон, обмен веществ, работу сердца и иммунную систему. Нарушение биоритмов ведет к усталости, набору веса, болезням и снижению когнитивных способностей. В этой статье мы разберем механизмы циркадных ритмов, их влияние на организм и научно обоснованные рекомендации по их поддержанию.

Ключевые слова: хронобиология, биоритмы, циркадные ритмы, сон, обмен веществ, мелатонин, кортизол, здоровье, иммунитет, сердечно-сосудистая система, питание, продуктивность.

Annotatsiya: Ichki biologik soatimiz qachon hushyor va faol bo'lishimiz, qachon dam olishimiz kerakligini belgilaydi. Ular uyqu, moddalar almashinuvi, yurak faoliyati va immun tizimiga ta'sir ko'rsatadi. Bioritmlarning buzilishi charchoq, vazn ortishi, kasalliklar va kognitiv qobiliyatlarning pasayishiga olib keladi. Ushbu maqolada biz sirkadiy ritmlarning mexanizmlarini, ularning organizmga ta'sirini hamda ularni saqlab qolish bo'yicha ilmiy asoslangan tavsiyalarni ko'rib chiqamiz.

Kalit so‘zlar: xronobiologiya, bioritmlar, sirkadiy ritmlar, uyqu, moddalar almashinuvi, melatonin, kortizol, sog‘liq, immunitet, yurak-qon tomir tizimi, ovqatlanish, mahsuldorlik.

Introduction: Why do some people wake up easily at 6 a.m., while others feel energized only in the evening? Why does shift work often lead to health problems? The answer lies in biological rhythms-our body's internal clocks that regulate physiological processes. These rhythms control not only sleep but also hormone production, metabolism, cognitive functions, and even how we respond to medications. Modern lifestyles, artificial lighting, and irregular schedules disrupt these internal clocks, leading to fatigue, illness, and reduced performance.

Understanding biological rhythms can help optimize daily routines, improve well-being, and boost productivity. What Are Biological Rhythms?

Types of Biological Rhythms Biological rhythms fall into three main categories:

- Circadian rhythms-24-hour cycles that regulate processes like sleep, hormone production, and body temperature.

- Ultradian rhythms- cycles shorter than 24 hours, such as heartbeat, breathing, and attention spans.

- Infradian rhythms - cycles longer than 24 hours, such as the menstrual cycle and seasonal hormone changes.

Circadian rhythms are the most crucial, as they regulate the body's core functions.

How Do Circadian Rhythms Work?

Circadian rhythms are controlled by the suprachiasmatic nucleus (SCN) in the hypothalamus. This "internal clock" receives signals from the eyes and responds to changes in light and darkness.

During the day, cortisol production increases-this hormone promotes wakefulness and activity. At night, melatonin is released-a hormone that induces

sleep and supports recovery. Disruption of this rhythm (e.g., working nightshifts) can lead to chronic fatigue, obesity, and weakened immunity.



Влияние биоритмов на здоровье, Сон и регенерация

Melatonin and Sleep

Melatonin production begins around 9:00 p.m., peaks by 2:00 a.m., and declines by morning. Going to bed too late can lead to:

- Disrupted cellular repair processes
- Increased risk of cardiovascular diseases
- Impaired memory and concentration

To support optimal brain and body function, it is recommended to go to bed before 11:00 p.m., avoid bright lights and screens for at least one hour before sleep, and sleep in complete darkness.

Metabolism and Nutrition

The body processes food differently depending on the time of day:

- In the morning, insulin sensitivity is higher, making it easier to metabolize carbohydrates.
- In the evening, metabolism slows down and excess calories are more likely to be stored as fat.

Recommendations:

- Eat breakfast within the first 1–2 hours after waking up
- Have dinner no later than 3 hours before bedtime
- Avoid late-night snacking

Cardiovascular System

Between 6:00 a.m. and 12:00 p.m., blood pressure rises, increasing the risk of heart attacks. In the evening, blood vessels relax, and the heart works more efficiently.

Important points:

- People with hypertension should take medications in the morning
- Physical activity is better tolerated in the afternoon

Immunity and Recovery

During the night, the body actively produces immune cells. Sleeping less than 7 hours weakens the immune system and increases susceptibility to infections.

Healthy habits:

- Sleep 7-9 hours per night
- Maintain a consistent sleep schedule, even on weekends
- Avoid stress before bedtime

How to Use Biological Rhythms for Better Health

- Sleep on schedule: Go to bed and wake up at the same time every day
- Eat at the right time: A hearty breakfast, light dinner
- Be physically active: Morning or afternoon exercise is best; evening workouts can disrupt sleep
- Control light exposure: Get more sunlight in the morning, reduce screen time in the evening
- Manage stress: Meditation, walks, and daily routines help stabilize your biological rhythms



Conclusion: Biological rhythms are a fundamental system that governs our body. They influence sleep, metabolism, cardiovascular function, and immune health. When these rhythms are disrupted, it can lead to fatigue, weight gain, and various diseases.

To maintain good health and energy levels, it is important to:

- Go to bed on time
- Eat according to a regular schedule
- Plan physical and mental activities at biologically optimal times

Even simple lifestyle adjustments can enhance productivity, improve well-being, and contribute to a longer, healthier life!

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