



Review Article

CIRCADIAN RHYTHM, BIORHYTHMS, *DINACHARYA* AND *DOSHA* CYCLE: AN INTEGRATIVE REVIEW OF CHRONOBIOLOGY AND AYURVEDIC TEMPORAL PHYSIOLOGY

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ABSTRACT

Biological rhythms are intrinsic to human physiology, governing sleep, metabolism, hormonal secretion, and cellular repair. Modern chronobiology identifies circadian rhythm as a master regulator, whereas Ayurveda conceptualizes similar temporal organization through *Dinacharya* (daily regimen) and *Dosha* cycles. Despite their distinct origins, both systems exhibit notable parallels. **Objective:** To critically analyze circadian rhythm and biorhythms in the context of Ayurvedic principles of *Dinacharya* and *Dosha* cycles, and to explore their integrative significance in health maintenance and disease prevention. **Materials and Methods:** A narrative review was conducted using classical Ayurvedic texts including Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, alongside contemporary literature on chronobiology. Conceptual correlations were drawn based on physiological timing, functional dominance, and clinical implications. **Results:** Circadian rhythm corresponds closely with the cyclical predominance of *Kapha*, *Pitta*, and *Vata Doshas*. Ayurvedic *Dinacharya* aligns with optimal biological functioning as described in modern chronobiology, particularly in sleep-wake regulation, digestion, and metabolic activity. Disruption of these rhythms is associated with systemic disorders including metabolic, psychological, and inflammatory conditions. **Conclusion:** Ayurveda offers a structured, time-oriented lifestyle framework that complements modern circadian science. Integration of these paradigms can enhance preventive healthcare strategies and promote holistic well-being.

INTRODUCTION

Temporal organization is a fundamental aspect of life. Biological systems exhibit rhythmicity at molecular, cellular, and systemic levels, enabling organisms to adapt to environmental cycles. Modern science recognizes this phenomenon as chronobiology, with circadian rhythm representing its most prominent manifestation.

Long before the emergence of chronobiology, Ayurveda articulated a sophisticated understanding of biological timing through concepts such as *Dinacharya* (daily regimen) and *Dosha Kala* (time-dependent

predominance of *Doshas*). These principles emphasize synchronizing human activities with natural cycles to preserve physiological equilibrium.

In contemporary society, characterized by artificial lighting, irregular dietary habits, and disrupted sleep patterns, there is increasing desynchronization between internal biological clocks and external environmental cues. This mismatch has been implicated in the rising prevalence of non-communicable diseases. Our modern lifestyle involves irregular eating habits and extended periods spent indoors under artificial lighting. This lifestyle contrasts with the body's circadian rhythms and likely contributes to an increase of chronic diseases worldwide.^[1]

This review aims to bridge the conceptual framework of modern circadian biology with

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Ayurvedic temporal principles, highlighting their relevance in preventive and lifestyle medicine.

Circadian Rhythm: A Chronobiological Perspective

Circadian rhythm refers to endogenous, entrainable oscillations of approximately 24 hours that regulate physiological and behavioral processes. These rhythms are governed by a central pacemaker located in the suprachiasmatic nucleus (SCN) of the hypothalamus.

Circadian rhythms (CRs) are entrainable endogenous rhythms that respond to external stimuli and regulate physiological functions. The suprachiasmatic nucleus (SCN) in the hypothalamus is the mammalian master clock that synchronizes all other tissue-specific peripheral clocks, primarily through gamma-aminobutyric acid (GABA) and vasoactive intestinal polypeptide (VIP). The SCN follows Earth's 24-hour cycle by light entrainment through the retinohypothalamic tract. At the cellular level, the core clock genes *CLOCK*, *BMAL1*, *PER1-PER3*, *CRY1*, and *CRY2* regulate CRs in a negative feedback loop. The circadian disruption of the sleep-wake cycle manifests in at least six distinct clinical conditions.^[2]

At the molecular level, circadian rhythms are regulated by clock genes such as *CLOCK*, *BMAL1*, *PER*, and *CRY*, which operate through transcription-translation feedback loops.

Physiological Functions Regulated by Circadian Rhythm

The homeostatic physiology of the circadian rhythm, or the sleep/wake cycle, controls sleep. Our brain's 24-hour internal clock, known as the circadian rhythm, responds to changes in light levels in our surroundings to control cycles of alertness and slumber. The Earth's rotation around its axis shapes our physiology and behavior. Humans have developed this endogenous circadian clock to help them anticipate and adjust to variations in radiation, temperature, and food supply.^[3]

Sleep-wake cycle

Hormonal secretion (melatonin, cortisol)

Core body temperature

Digestive enzyme activity

Immune responses

Light serves as the primary external cue (zeitgeber), synchronizing internal rhythms with the external environment.

Disruption of circadian rhythm, termed chronodisruption, is associated with:

Numerous physiological functions and facets of daily living, such as food habits, sleep-wake cycle management, and metabolic balance, are impacted by circadian rhythms, which oscillate over a 24-hour

period. Resynchronization with the external clock and environment is the goal of treatment since a misalignment between the endogenous biological clock and the extrinsic light-dark cycle can result in severe suffering and malfunction.^[4]

Metabolic disorders (obesity, diabetes)

Cardiovascular diseases

Mood disorders

Impaired immune function

Biorhythms: Classification and Biological Significance

We demonstrate the scientific inappropriateness of the term "biorhythm" by contrasting it with the biological rhythms identified by contemporary chronobiology, such as circadian, ultradian, and infradian, which have quantifiable physiological correlates, and by analyzing its application in interpreting the biological effects of environmental factors. A mechanical, quantifiable, and falsifiable framework for researching physiological rhythms and how the environment affects them is provided by contemporary chronobiology.^[5]

Biorhythms encompass cyclic variations in physiological processes and are categorized as:

Circadian Rhythms (≈ 24 hours)

Regulate daily physiological functions.

Ultradian Rhythms (< 24 hours)

Include cycles such as heartbeat, respiration, and sleep stages.

Infradian Rhythms (> 24 hours)

Examples include menstrual cycles and seasonal biological variations.

Seasonal Rhythms

Reflect adaptation to environmental changes such as temperature and daylight duration.

These rhythms interact dynamically, maintaining homeostasis and optimizing biological efficiency.

Dinacharya: Ayurvedic Daily Regimen

Dinacharya refers to an optimal daily routine in Ayurveda that provides a lifestyle promoting positive physiological and psychological impacts on the body and mind. It is termed ideal as it balances the body humors (*Dosha*), tissues (*Dhatu*), and wastes (*Mala*), optimizes digestion (*Agni*), nurtures a joyful mind, soul, and sense organs, and ensures a disease-free, long life.^[6] *Dinacharya* represents a structured daily routine aimed at maintaining equilibrium of *Doshas*, enhancing *Agni* (digestive fire), and preventing disease. Traditional texts like Charaka Samhita and Ashtanga Hridaya advocate for daily rituals such as waking during *Brahma Muhurta*, tongue scraping (*Jihva Nirlekhana*), nasal treatments (*Nasya*), oil massages

(*Abhyanga*), powder massages (*Udwartana*), physical exercise (*Vyayama*), bathing (*Snana*), dietary guidelines (*Ahara Vidhi Vidhan*), and controlled sleep (*Nidra*).^[7]

Components of *Dinacharya*

1. *Brahma Muhurta Uttishtha* (Early rising): Waking before sunrise promotes mental clarity, respiratory efficiency, and circadian alignment.
2. *Dantadhavana* and *Jihva Nirlekhana*: Oral hygiene practices eliminate toxins (*Ama*) and stimulate digestive reflexes.
3. *Abhyanga* (oil massage): Enhances circulation, nourishes tissues, and mitigates *Vata Dosha*.
4. *Vyayama* (exercise): Improves metabolic activity and reduces *Kapha* accumulation.
5. *Snana* (Bathing): Facilitates physical and मानसिक purification.
6. *Ahara* (dietary regulation): Emphasizes timely and balanced food intake according to digestive capacity.
7. *Nidra* (Sleep): Night sleep is essential for restoration and tissue repair.

Dinacharya serves as a behavioral adaptation to biological rhythms, ensuring optimal physiological functioning.

Dosha Cycle: Temporal Physiology in Ayurveda

The *Dosha* exert their influence upon us in four-hour increments throughout the 24-hour day. Each four-hour time period is dominated by one *Dosha*,

Circadian Phase	<i>Dosha</i> Dominance	Functional Correlation
Morning	<i>Kapha</i>	Low metabolic activity, heaviness
Midday	<i>Pitta</i>	Peak digestion and enzyme secretion
Afternoon	<i>Vata</i>	Increased neural and mental activity
Night	<i>Kapha</i> → <i>Pitta</i> → <i>Vata</i>	Sleep, repair, and awakening cycles

This correspondence highlights Ayurveda's intuitive understanding of biological timing.

Scientific Validation of *Dinacharya*

Ayurveda is an eternal science of life, emphasizing the quality of life and disease prevention over the treatment of illnesses. Due to stressful living, poor nutrition, and a lack of physical activity, today's society is encountering lifestyle-related issues such as obesity and diabetes. To support the health of healthy individuals, Ayurveda has outlined several core principles including *Dinacharya*, *Ritucharya*, and *Sadvritta*.^[9]

Modern research supports several principles of *Dinacharya*

- Early waking aligns with cortisol peak and improved alertness.
- Daytime eating corresponds with optimal insulin sensitivity.

and thus influenced by the qualities of that *Dosha*. In other words, there's a *Vata*, *Pitta* and *Kapha* time of day and a *Vata*, *Pitta* and *Kapha* time of night. Understanding this allows you to choose activities, food choices, etc. that will support the dominant energy inside and around you at that time. ^[8] Ayurveda divides the day into cyclical phases dominated by three *Doshas*:

***Kapha Kala* (6 AM – 10 AM & 6 PM – 10 PM)**

Dominated by heaviness, stability, and cohesion.

Morning phase: Sluggishness and reduced metabolic activity

Evening phase: Preparation for sleep

***Pitta Kala* (10 AM – 2 PM & 10 PM – 2 AM)**

Characterized by heat, transformation, and metabolism

Day phase: Peak digestive activity (*Agni*)

Night phase: Internal metabolic repair and detoxification

***Vata Kala* (2 PM – 6 PM & 2 AM – 6 AM)**

Governs movement, neural activity, and communication.

Afternoon: Enhanced cognitive function.

Early morning: Ideal for meditation and creativity.

Correlation Between Circadian Rhythm and *Dosha* Cycle

A comparative analysis reveals strong parallels:

- Night sleep supports melatonin-mediated repair mechanisms.
- Regular routines stabilize circadian gene expression.
- Irregular lifestyle patterns disrupt gut microbiota, hormonal balance, and metabolic pathways.

Pathophysiology of Rhythm Disturbance

Daytime rhythms happen during the day and rest or inactivity at night, circadian rhythms finish one cycle in 24 hours and are recognized as midday activity, ultradian rhythms are recurring cycles within 24 hours, infradian rhythms complete their cycles in longer than one day, and circannual rhythms finish their cycles in either 24 hours or a year. Body rhythms can be affected by conditions such as delayed sleep phase syndrome, disrupted sleep, shift work disorder, and circadian rhythm sleep issues.^[10]

Disruption of circadian and *Dosha* cycles leads to systemic imbalance:

Metabolic disorders
Insulin resistance
Obesity
Neuropsychological disorders
Anxiety
Depression
Digestive disorders
Impaired *Agni*
Ama formation

Ayurveda conceptualizes such disturbances under *Pragya Aparadha* and *Kala Viparyaya*.

Chronotherapy and Ayurvedic Relevance

Chronotherapy involves timing medical interventions according to biological rhythms to enhance efficacy. The objective of chronotherapy is to optimize medical treatments taking into account the body's circadian rhythms. Chronotherapy is referred to and practiced in two different ways: (1) to alter the sleep-wake rhythms of patients to improve the sequels of several pathologies; (2) to take into account the circadian rhythms of patients to improve therapeutics.^[11]

Ayurveda inherently applies this concept:

- Largest meal during *Pitta Kala*.
- Sleep during *Kapha* dominance.
- Meditation during *Vata* phase.

This demonstrates Ayurveda as an early chronotherapeutic system. Chronotherapy is increasingly being recognized as an important and effective therapy in various diseases, including cancer, hypertension, depression and asthma.^[12]

Integrative Implications in Preventive Medicine

Integration of circadian biology and Ayurveda offers:

- Personalized lifestyle interventions
- Improved metabolic regulation
- Enhanced mental health
- Prevention of chronic diseases
- Adopting time-synchronized living can significantly improve quality of life.

CONCLUSION

Circadian rhythm and biorhythms constitute the biological foundation of human physiology, while Ayurveda provides a practical framework for aligning with these rhythms through *Dinacharya* and *Dosha* cycles. The convergence of these systems underscores the timeless relevance of Ayurvedic principles.

Incorporating these insights into modern healthcare can promote holistic well-being and address the growing burden of lifestyle disorders.

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