

## DIURNAL VARIATION OF TRI-DOSHA WITH SPECIAL REFERENCE TO EFFECT OF LIGHT ON HUMAN CIRCADIAN PHYSIOLOGY

Vikas Chandra Gupta<sup>1</sup>, Vijay Kumar<sup>2</sup>, Rajni Bala<sup>3</sup>

<sup>1</sup>Department of Swasthavritta

Lecturer, Lalit Hari State Ayurvedic College, Pilibhit, Uttar Pradesh, India

<sup>2</sup>Department of Swasthavritta

Associate Professor, Patanjali Bharteeya Ayurvedigyan Evam Anusandhan Sans-  
than, Haridwar, Uttar Khand, India

<sup>3</sup>Reader, Himalayiya Ayurvedic Medical College, Dehradun, Uttar Khand, India

### ABSTRACT

Three forces, named *Vata*, *Pitta*, *Kapha*, in our body maintain the balance are called *Tri-Doshas*. They are considered as tripod on which human body stands. For a healthy body, these should be in a state of equilibrium or *Samyavastha*. The three *doshas* – *Vata*, *Pitta* & *Kapha* follows a circadian rhythm and by this rhythm all the metabolic functions of the body are regulated. Disruption in this rhythm leads to production of various pathological states. Many studies show that circadian system in humans, being near but not exactly 24-hours in cycle length. It's readjusted continuously on a daily basis to make synchrony with external environmental time. Light and dark exposures help to achieve this process of entrainment. Circadian rhythms are variations in physiology and behavior in a cyclic form that persists with a cycle length close to 24 hours even in the absence of periodic environmental stimuli.

Early reports from studies of human circadian rhythms had suggested that humans were unlike other organisms, being relatively insensitive to light and more sensitive to social cues to entrain their circadian systems. However, subsequent studies, and re-analysis of results from those early studies, have found that the human circadian system is like that of other organisms in its organization and its response to light, and is as sensitive to light as other diurnal organisms.

**KEY WORDS:** Diurnal variation, *Dincharya*, *Ritucharya*, circadian, *doshas*.

### INTRODUCTION

Each individual entity is a unit presentation of the infinite macrocosm. We are small particles, qualitatively identical to this universal nature. Therefore we must maintain a balance with nature to remain in harmony with it. Nature has a unique character of changing every moment. It changes day to day,

season to season and Ayurveda explains these changes as *Dincharya* and *Ritucharya*. Living being has to change similarly if they have to maintain harmony which is essential for life. This system, very similar to the ancient Indian medical system, is based on the five element theory of Earth, Water, Fire, Air, and

Ether. These five are combined to become the three primary energies of the body: *Vata*, *Pitta*, and *Kapha*. *Vata* consists of the air and earth, *Pitta* contains fire along with water, and *Kapha* has earth and water elements. Thus it is considered that all facets of the anatomy and physiology are governed by these *Doshas* and that homeostasis is the re-

sponsible for the balance of these three *Doshas*.

All periods of time may be broken down into *Kapha*, *Pitta*, and *Vata* periods where the predominating qualities of those *Doshas* are prevalent. During a given 24 hour period, two time segments for each *Dosha* are as follows:

Sr. No.	Parameter	<i>Vata</i> Predominance	<i>Pitta</i> Predominance	<i>Kapha</i> Predominance
1	Day	End of day 2pm-6pm	Mid day (10am-2pm)	First phase of day (6am -10am)
2	Night	End of night 2am-6am	Mid night (10pm-2am)	First phase of night (6pm-10am)

In *Purvahan* (forenoon) and last phase of night there is predominance of *VATA*. In the *Madhyaha*(noon), there is predominance of *Pitta*, also considered as *Agnikala* and at that time digestion of food takes place. According to Ayurvedic classics, *Agni* is assessed by the ability of taking food & it's digestion (*Abhyaharan & Jarana shakti*). Adaptation of *Dincharya* of *Ayurveda* according to this *Doshic* interference is the rudimental concept for our life & it takes a component in the development of a disease process due to disturbed life style.

#### Neuro-anatomy of the human circadian system

Ayurveda explains that *Pran Vayu*, which is first component of *Vata* control all the sensual functions. It carries information of light and dark exposure from *Chakshuendriye* (eyes) up to *Mastishka* ( brain). *Pran vayu*, which

also controls higher functions of body, effectively circulate this message to all remaining four component of *Vata*. *Vata* is not only sensitive for Light/darkness but also sensitive for temperature and humidity. As the sensation reaches to lower level of *Saman Vayu*, it influence *Agni*. *Jaran Shakti* and *Abhyavharn Shakti* also change on light variation. As the information reach to *Vyan Vayu*, secretion and circulation of body fluids change according to information for maintaining homeostasis. Similar effects are noted when *Udan vayu* get information and *Praytan* (ambition to do work) and *Urja* (energy to do work) changes time to time according to diurnal/seasonal variations of light exposure. In modern science, it was established that *Suprachiasmatic nucleus (SCN)* of the hypothalamus works as the central circadian pacemaker in humans. Indi-

vidual cells of this pacemaker, when isolated, repeat their physiological functions independently within a near-24-hour period. The *Suprachiasmatic nucleus* receives direct input from the retina, providing a mechanism by which entrainment to light-dark cycles occurs. Retina has a subset of specially formed ganglion cells which are distributed all over the retina and supposed to serve as photoreceptors for circadian responses. Photo-pigment *Melanopsin* is present in these ganglions which sensitize them for light. These photosensitive retinal ganglion cells along with rod and cone mediate circadian responses to light. It is assumed that intensity, spectral distribution and temporal pattern of light may affect the relative contribution of different photoreceptors to circadian responses.

#### **Effect of light on phase dependent response of the human circadian system**

Many researches had indicated that circadian system of human is most sensitive to light during the biological night. The manipulation of sleep-wake timing was a concern in the earliest human light studies. Because humans sleep most of their biological night, so influence of light on the human circadian system is that the sleep-wake cycle is shifted in order to deliver of light stimulus at the time of highest expected sensitivity. In the experiment researchers had conducted, the subject was exposed to several hours of light every evening for a week, and the timing of his rhythms of core body temperature and plasma cortisol were assessed before and after that week of evening light exposure. Both

rhythms were shifted by approximately 6 hours, and examination of temperature data collected throughout the experiment suggested that the shift had already occurred after only 2 days.

#### **Effect of light intensity on human circadian system**

Researchers had done investigation for intensity-response relationship to light, by applying different intensity light stimuli of the same duration and spectral composition at a fixed circadian phase. Early reports on human studies had demonstrated that varying the intensity of a light stimulus would produce different amounts of suppression of the pineal hormone melatonin. In those studies, researchers found that the groups exposed to light greater than room light level showed a significant phase advance shift, while the groups exposed to darkness or dim light for the same 3-cycle 5-hour stimulus timing drifted to a later phase consistent with the longer than 24-hour period of the human circadian system.

#### **Effect of intermittent bright light exposure the human circadian system**

Many Studies of light effects on humans had demonstrated that brief pulses of light could affect the circadian system, and that the system appeared to integrate brief light pulses applied in sequence. Studies were conducted to explore whether the human circadian system is responsive to short duration stimuli or not. Findings had demonstrated that humans were responsive to shorter durations of bright light exposure, and that the magnitude of the response was related in a non-linear way to the dura-

tion of light contained within the stimulus.

### **Adaptation of the human circadian system to prior light-dark exposure**

Many Studies in humans have provided results that the response of the circadian system to light is influenced by prior exposure to light and darkness. In a study scientists had exposed subjects to a 6.5-hour 200 lux light stimulus during the biological night-time, and measured the degree of melatonin suppression. Before the light stimulus, subjects were in a background light that was very dim (0.5 lux) or of room intensity (200 lux, the same intensity as the light stimulus) for 15 hours. Exposure to the dim background resulted in significantly greater melatonin suppression in response to the 200-lux light stimulus than did exposure to 200-lux background light. These studies have demonstrated that the response of those photoreceptors are influenced by prior light history, demonstrating larger responses to light stimuli after dim light exposure, and reduced responsiveness to light stimuli after bright background light exposure. Together, these findings suggest that the overall 24-hour pattern of light and darkness to which humans are exposed plays a role in subsequent sensitivity to light exposure, and thus to entrainment.

---

### **CONCLUSION**

As described above, exposure to light and darkness on regular basis is the chief synchronizer of the human circadian system in normal sunny day. The intensity of light, duration of exposure to light, periodic exposure to light and dark all

influence human physiology by changing some chemical signals. Human hormonal system plays a big role in this external-internal environment coordination. It means that in order that the circadian system remains in synchrony with the external environment, in most people it must be reset by a small phase advance shift each day as the seasons move. Hormonal secretion and their secreting hours and blood concentration all changes according to this phase dependant light exposure.

Effect of light influence theory states that the range of influence is related to the strength of the synchronizing signal, meaning that a weak signals will be able to entrain individuals whose periods are very close to 24 hours, but a stronger light signals is required to entrain those individuals whose periods are further away from 24 hours. Furthermore this may be the scientific explanation of *DINCHARYA* and *RITUCHARYA* as explained in *Ayurvedic* literature. In different seasons there are variable changes in light illuminacy, brightness, duration of exposure on retina. So each and every season has its own physiological effects on body. Similar is also applicable for diurnal variation of light exposure. Sun movement causes these changes of all seasons and diurnal variations of a day. So now it may be understood easily about predominance of different *Doshas* in different times.

---

### **REFERENCES**

1. Dr Brahmanand Tripathi, Charak Samhita, Chaukhamba Subharati

- Prakashan, Varanasi U.P., India, 2011, p-102-162
2. Kaviraj Atridev Gupta, Astang Samgrh, Chaukhamba Prakshan, Varanasi U.P., India, 2008, p-36-79
3. Horowitz TS, Cade BE WolfeJM, WolfeJM, et al. Efficacy of bright light and/darkness scheduling in alleviating circadian maladaptation to night work, *Am J Physiol*, 2001;281;E384-E301
4. Santhi N, Duffy JF, Horowitz TS, et al, Scheduling of sleep/darkness affects the circadian phase of light shift workers, *Neurosci Lett*, 2005; 384(3); 316-320.
5. Cain.SW, Rimmer DW, Duffy JF, et al, Exercise distributed across day and night does not alter circadian period in humans, *J Biol Rhythms*, 2007;22(6);534-541
6. Minnors DS, Waterhouse JM, WirzJustice A, A Human phase-response curve to light, *Neurosci Lett*, 1991;133;36-40
7. Honma K, Honma S, A human phase response curve for bright light pulses, *Jpn J Psychiatry Neurol*, 1988;42(1);163-168
8. StephanFK, Zucker I, Circadian rhythms in drinking behavior and locomotor activity of rats are eliminated by hypothalamic lesions, *Proc Natl Acad Sci USA*, 1972;69;1583-1586
9. Ralph MR, Foster RG, Davis FC, Menaker M, Transplanted suprachiasmatic nucleus determines circadian period, *Sciences*, 1990;247;975-978

---

#### **CORRESPONDING AUTHOR**

**Dr. Vijay Kumar**

Department of Swasthavritta

Associate Professor, Patanjali Bharateeya Ayurvedigyan Evam Anusandhan Sansthan, Haridwar, U.K.

**Email:** drvkdwivedi670@gmail.com

---