KNOW THOU BIOLOGICAL CLOCK NEWSLETTER - Volume 2, Issue 7
(*Saur Ashwin* 1941 / September – October 2019)

Welcome to the Know Thou Biological Clock Newsletter

In this issue:

---

1. WHAT IS NEW IN THIS MONTH

Registration for ChronoPrakriti workshop is now available at the following URL. We would like to request all of you to go through the link give your comments and circulate in your contacts if find suitable. (https://punefree.com/offers/chrono-prakriti). Also, the domain name is booked (www.chronoprakriti.com) which will be linked to Bhide foundation soon. (http://bhidefoundation.org/chronobiology/)

Not much progress has been achieved regarding finalization of Prakriti questionnaire in the last month. Our panel of Ayurvedic experts needs more time to formulate the questions before we could proceed to finalize the recommendations format and restarting the ChronoPrakriti workshops.

Our newsletter has been published for the last 12 consecutive months without any break. Though the number of readers both passive and active are not increased, the content has been generated for each topic. We have decided to add a few more heads starting from this issue. Hope you will appreciate it.

The next Saturday club/open forum meeting is scheduled on 28th September, 11.30 am at Bhide Foundation situated within SP college premises. We are completing a year of

this activity at Bhide foundation. The maiden open forum was conducted in October 18. In the coming meeting we will discuss about how to make it more interactive/informative and available to a wider audience. Ankita Galinde will brief us about the nasal sensor development at Design Innovation Center, SPPU as well.

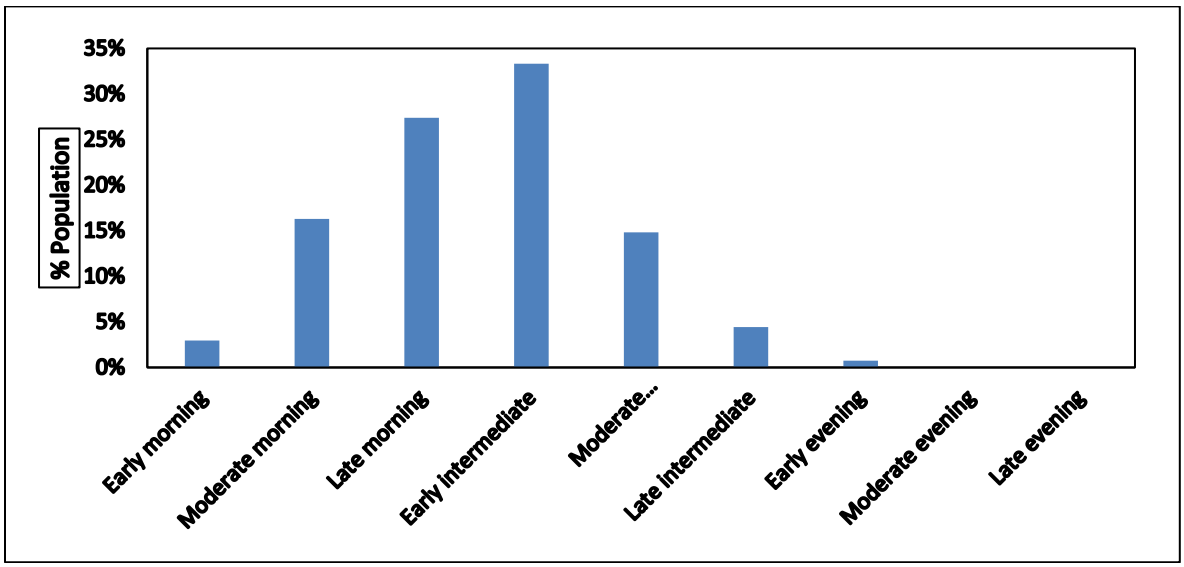
Following are the links for your active participation in the subject. If you wish to understand functioning of your own biological clock, you may enter the data for specific duration in the online google document.

Henceforth compiled data of chronotype assessment of all those who have participated so far will be presented in each newsletter.

Online Chronotype assessment

Chronotype assessment will inform your natural preference for doing specific task in the day. Knowing your own chronotype (morning/intermediate/evening) will help you to plan your daily schedule more effectively.

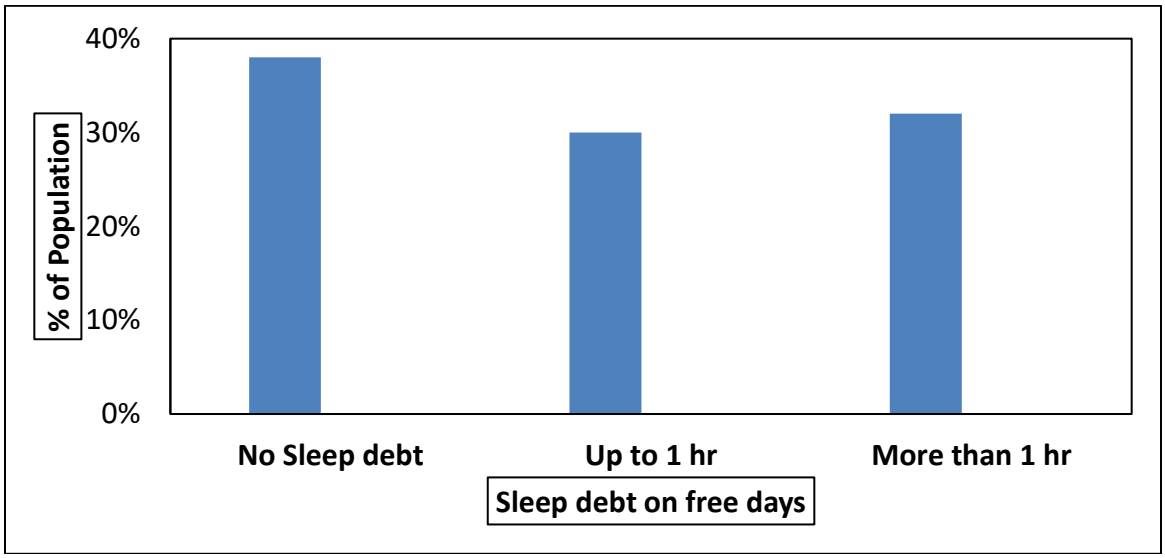
https://forms.gle/tc9NwtbbAT4RN8he6



Online Sleep quality assessment

Sleep quality assessment will inform you the sleep debt you have accumulated due to social and professional commitments. Sleep debt should be more worrisome than financial debt as eventually we are at the loosing end in terms of health and money both.

https://forms.gle/5pSf5TEoxf7XVhrD6



Autorhythmometry

Autorhythmometry is the methodology in chronobiology where a person acts as both researchers and experimental subjects, recording their own rhythms. Recording own rhythms have multiple benefits. Firstly, you are more attentive to your own body language. Secondly, you help body to self-heal without pharmacological intervention.
And most important, without disturbing your daily schedule, you can help generate scientific data for research community. For volunteering in Autorhythmometry data collection and analysis please register at:

https://forms.gle/ZxAi4AcaSBzYtdTW8

Online Prakriti type assessment

We will be initiating a project of data collection and analysis of chronotype and prakruti type. We are interested in finding correlation if any and whether such data can be utilized to diagnosis. As of now, the final outcome will be by combination of online questionnaire and personal interview by the Ayurvedic doctor. Nadipariksha will be carried out during the workshop. Those who will only fill the online questionnaire and not attending the workshop are requested to take an appointment with our Ayurvedic expert for Prakriti analysis at chronobiology2017@gmail.com, to get the report. Here is the link for the Prakriti assessment.

https://forms.gle/2WcRYPqbDTVdWhmU7

Glossary

Each subject has its own technical terminology. Henceforth we will provide meaning of few terms in this section.

Fourier analysis: A mathematical procedure for the determination of periodicity in time series with equally spaced data points. Fourier analysis is based on the decomposition of the time series into periodic components described by sine and cosine functions.

Frequency: The number of times a specified phenomenon occurs within a specified time interval. Note: Frequency is the reciprocal of period (f = 1 / P). Unit of measurement: hertz (Hz).

Illuminance: Density of the flow of energy, traveling in the form of electromagnetic waves as perceived by the human eye per unit time, incident on a surface. Unit of measurement: lux (lx)

---

2. UNDESTANDING BIOLOGICAL CLOCK

Why do certain types of flowers open/ close at particular times of the day? Why some people are more active in the morning while others prefer to work late in the night? Why do we feel hungry at a particular time in a day? How do plants sprout new leaves at particular time of the year? How do marine turtles know when to come on shore to lay eggs? How do migratory birds know an appropriate time to start migration? Why do humans get jet lagged after inter-continental travel? The answer to all these random questions is one phenomenon- the “biological clocks”. Even if we don’t directly hear them ticking inside us, they are part of us. In fact, biological clocks have been reported in a wide range of organisms- from bacteria to giant redwood trees and everything in between.

A variety of chemical, physiological, metabolic processes as well as many behaviours in all kinds of organisms show repeating pattern after regular intervals. These repeated or rhythmic patterns/ processes are governed by biological clocks in most cases and can be collectively called as biological rhythms. Based on how frequently these processes or behaviours repeat one can categorise the rhythmic processes (biological rhythms) as follows:

1. Circadian rhythms: (Circa= approximate, dias= day) These are by far the most commonly observed and studied biological rhythms which refer to processes or behaviours that repeat approximately once per 24 hours. E.g. sleep-wake cycles in many organisms including humans.

2. Ultradian Rhythms: Biological processes that repeat at much shorter frequency than a day are called as ultradian rhythms, e.g. neuronal firing, heartbeats
3. Circatidal rhythms: Marine organisms like sea louse, marine diatom exhibit rhythmic behaviours that are synchronised to ocean tides (approx. 12.4 hours). Such rhythms are called as circatidal rhythms.
4. Infradian rhythms: Biological processes that repeat with frequency much longer than a day can be generally grouped under infradian rhythms. Some of them repeat once in a month (synchronised with lunar calendar, e.g. menstrual cycles), others repeat once a year (circannual rhythms, see below) or follow some other regular schedule.
5. Circannual rhythms: Some biological processes repeat with a frequency of once in approximately a year, e.g. new leaves sprouting/ falling, bird migrations in winter, nuptial flights of ant/ termite queens at the beginning of rainy season, annual fruiting of Mango, hibernation of many animal species in winter. These are called as circannual rhythms.

   We see many of these rhythmic phenomena around us, feel them within us but hardly ever take notice of them, think about mechanisms that drive these biological rhythms or their significance in our daily lives. In the upcoming series we will take a deeper look at these rhythmic phenomena from various perspectives.

Compiled by: Dr. Dhanashree Paranjpe

---

3. LATEST TREND IN CHRONOBIOLOGY RESEARCH

Coffee first, then good morning!' Caffeine, the active ingredient in coffee, is the most consumed psychoactive substance. It competes with sleep molecule receptors and boosts brain function by increasing attention span, focus, and stabilizing your mood. Thus, it is a potent stimulant, but only when it is consumed in moderation. Over consumption of caffeine is harmful for health as it promotes circadian rhythm disruption by disturbing your natural sleep-wake cycle. Following article talks about connection between caffeine-related circadian rhythm disorders and chronotypes.

Morningness-eveningness and caffeine consumption: A large scale path-analysis study

It is still not clear how chronotype influences caffeine consumption (CC) and caffeine use disorder (CUD). The aim of the study was to investigate the relationship between chronotype, CC, CUD, and wellbeing. Participants of an online survey in Hungary (N = 2259) answered the CUD Questionnaire, Morningness-Eveningness Questionnaire and the WHO-5 Well-Being Index. Morningness positively associated with tea

consumption, and negatively with cola and energy drink consumption. Severe CUD was more common among evening-type participants. Two significant mediations were found in the path model: Morningness→Tea consumption→Wellbeing and Eveningness→Energy drink consumption→CUD. It is concluded that CUD like other substance use disorders is associated with eveningness. The results indicate that the carrier beverages of the chemical compound of caffeine should be examined separately. Energy drink use can be accompanied by more unfavorable consequences, especially for evening-types, while tea consumption, which was associated with morningness, had more favorable consequences, like higher wellbeing.

Csilla Ágoston, Róbert Urbán, Adrien Rigó, Mark D. Griffiths & Zsolt Demetrovics
Chronobiology International, Volume 36, Issue 9, Jun 2019
Published online: 20 Jun 2019 doi.org/10.1080/07420528.2019.1624372

Compiled by: Ms. Ankita Galinde

---

4. CHRONOBIOLOGY AND MODERN MEDICINE

Gut microbiota-circadian clock axis- a novel and crucial mechanism for deciphering metabolic memory

According to the latest data from the International Diabetes Federation (IDF), there are approximately 425 million adults with diabetes mellitus (DM) worldwide in 2017. By 2045, this number is expected to increase to 629 million. What is the best way to identify groups that are at high risk of developing diabetes early? How can an earlier intervention be carried out? How can treatment effectiveness be improved? These are key issues in the prevention and treatment of metabolic diseases such as DM.

In recent years, the relationship between the adverse developmental environment in early life and glucose metabolism has gained wide attention from the academic community. “Metabolic memory” and the Developmental Origins of Health and Disease (DOHaD) hypothesis were subsequently proposed. Previous research [1,2] have indicated that an adverse nutritional environment in the uterus significantly increases the risk of chronic metabolic diseases in adulthood. The biological basis of the relationship between the early-life nutritional environment and adult chronic diseases may be the key to the pathogenesis of T2DM.

It is well known that there is a close relationship between circadian rhythm and metabolism. As early as the 1970s and 1980s, Professor Panda discovered that some

patients who had poor glucose response in the evening had no symptoms of DM when they received the same challenge in the morning. Even in healthy people, the rate of glucose metabolism at night-time meals is also much slower than that at breakfast, indicating that glucose metabolism is associated with circadian rhythm [3]. A large number of clinical studies on shift workers and animal experiments have confirmed that circadian rhythm disorders play an important role in the pathogenesis of DM. Therefore, circadian misalignment might be a crucial factor in mediating abnormal nutritional intake and glucose intolerance.

In light of the significantly increased risk of metabolic diseases in later life after exposure to an adverse nutritional environment in early life, Liyuan Zhou discussed the role of the circadian clock in “metabolic memory.” [4] Early life, including intrauterine development and the neonatal period, is a critical period for foetal growth and development. The early developmental environment has a lasting memory effect that lasts the whole life, called “metabolic memory,” which has been widely accepted and recognized by the academic community. Thus, disorders in circadian rhythm might be a crucial mechanism in linking an adverse nutritional environment in early life and increased risks of metabolic disorders in later life.

There is significant relationship between gut microbiota and nutrient intake and whether gut microbiota is a crucial factor during this process is unknown. Zhou et al discussed the crosstalk between the circadian clock and the gut microbiota in mediating “metabolic memory.” The intestine is the largest immune organ of the human body. As one of the peripheral circadian clock organs, it receives the synchronized information of the central circadian clock. The intestine also has its own oscillator, which is mainly regulated by the nutrition in food. The gut microbiota, with a total weight of 1-2 kg in the intestine, includes more than 1000 species and more than 10^{14} microorganisms. These microorganisms usually have a balanced symbiotic relationship with the host and play an important role in human health. Therefore, the circadian clock influences the composition of gut microbiota, and inversely, the gut microbiota can also regulate the circadian rhythm, which indicates bidirectional communication between gut microbiota and circadian clock. In other words, there is a “gut microbiota-circadian clock axis.”
In light of the important roles of circadian rhythm and gut microbiota, respectively, in early-life nutrition and metabolic health in later life and the close communication between gut microbiota and circadian clock, Zhou et al proposed that the “gut microbiota-circadian clock axis” might be a novel and crucial mechanism for deciphering “metabolic memory.” Adverse early-life exposures can significantly alter the composition and function of gut microbiota and associated microbe-derived metabolites, which further regulate the circadian clock and metabolism in peripheral tissues. However, the evidence is still scarce and more related studies need to be done in the future.

References
1. Zheng J., Xiao X., Zhang Q., et al. The effects of maternal and post-weaning diet interaction on glucose metabolism and gut microbiota in male mice offspring. *Bioscience Reports*. 2016;36(3)
2. Zheng J., Xiao X., Zhang Q., et al. The programming effects of nutrition-induced catch-up growth on gut microbiota and metabolic diseases in adult mice. *Microbiology Open*. 2016;5(2):296–306.
3. Longo V. D., Panda S. Fasting, circadian rhythms, and time-restricted feeding in healthy lifespan. *Cell Metabolism*. 2016;23(6):1048–1059.
4. Liyuan Zhou, Lin Kang, Xinhua Xiao, Lijing Jia, Qian Zhang, and Mingqun Deng. 'Gut Microbiota-Circadian Clock Axis" in Deciphering the Mechanism Linking Early-Life Nutritional Environment and Abnormal Glucose Metabolism". International Journal of Endocrinology, Volume 2019.1-9.

Compiled by: Dr. Meenal Joshi

---

5. CHRONOBIOLOGY AND AYURVED

Compilation of original texts on Prakriti in Ayurveda to understand the correlation between chronotype and Prakriti type.

Ayurveda describes seven broad constitution (Prakriti) types.

सप्त प्रकृतयो भवन्ति–दोषैः पृथक्, द्विशः, समस्तैश्च ॥६२॥

su.sa.4/62

Three most contrasting Prakriti types are most vulnerable.

त्रयस्तु पुरुषा भवन्त्यातुराः, ते त्वनातुरास्तन्त्रान्तरीयाणां भिषजाम्; तद्यथा—वातलः, पित्तलः, श्लेष्मलश्चेति। तेषामिदं विशेषविज्ञानं—वातलस्य वातनिमित्ताः, पित्तलस्य पित्तनिमित्ताः, श्लेष्मलस्य श्लेष्मनिमित्ता व्याधयः प्रायेण बलवन्तश्च भवन्ति ॥ १५ ॥ c.vi.6/15

Prakriti is a consequence of relative proportion of three entities Vata, Pitta and Kapha which is not only genetically determined but also influenced by environment etc.

शुक्रशोणितसंयोगे यो भवेद्दोष उत्कटः ॥
प्रकृतिर्जायते तेन तस्या मे लक्षणं शृणु ॥६३॥

su.sa.4/63

तत्र प्रकृत्यादीन् भावाननुव्याख्यास्यामः । तद्यथा—शुक्रशोणितप्रकृतिं, कालगर्भाशयप्रकृतिं, आतुराहारविहारप्रकृतिं, महाभूतविकारप्रकृतिं च गर्भशरीरमपेक्षते । एतानि हि येन येन दोषेणाधिकेनैकेनानेकेन वा समनुबध्यन्ते, तेन तेन दोषेण गर्भोऽनुबध्यते; ततः सा सा दोषप्रकृतिरुच्यते मनुष्याणां गर्भादिप्रवृत्ता । तस्माच्छ्लेष्मलाः प्रकृत्या केचित्, पित्तलाः केचित्, संसृष्टाः केचित्, समधातवः केचिद्भवन्ति । तेषां हि लक्षणानि व्याख्यास्यामः ॥ ९५ ॥

c.vi.8/95

Vata, Pitta and Kapha doshas work in conjunction and maintain homeostasis throughout lifetime right after fertilization. These are restrained within normal limits and disease is a perturbation from the threshold.

नित्याः प्राणभृतां देहे वातपित्तकफास्त्रयः । विकृताः प्रकृतिस्था वा तान् बुभुत्सेत पण्डितः ॥ ४८ ॥

c.su.18/48

सर्वशरीरचरास्तु वातपित्तश्लेष्माणः सर्वस्मिञ्छरीरे कुपिताकुपिताः शुभाशुभानि कुर्वन्ति—प्रकृतिभूताः शुभान्युपचयबलवर्णप्रसादादीनि, अशुभानि पुनर्विकृतिमापन्ना विकारसंज्ञकानि ॥ ९ ॥

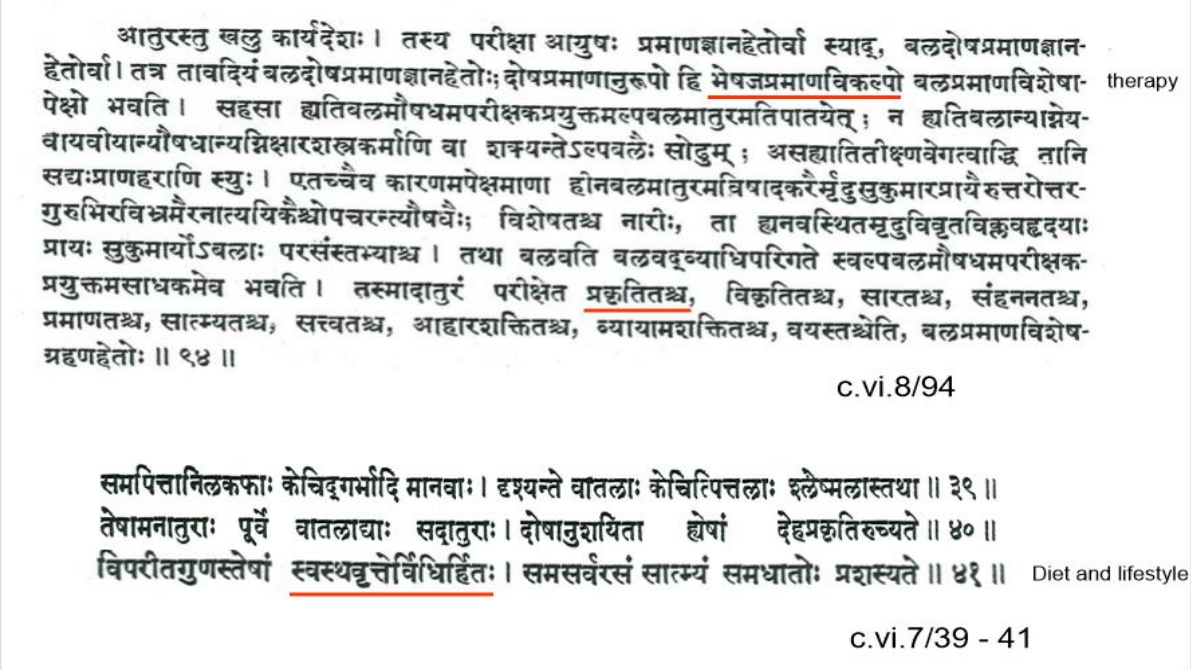
c.su.20/9

Distinct functions have been ascribed for Vata,Pitta and Kapha.

उत्साहोच्छ्वासनिःश्वासचेष्टा धातुगतिः समा । समो मोक्षो गतिमतां वायोः कर्माविकारजम् ॥४९॥ → Vata
दर्शनं पक्तिरूष्मा च क्षुत्तृष्णा देहमार्दवम् । प्रभा प्रसादो मेधा च पित्तकर्माविकारजम् ॥ ५० ॥ → Pitta
स्नेहो बन्धः स्थिरत्वं च गौरवं वृषता बलम् । क्षमा धृतिरलोभश्च कफकर्माविकारजम् ॥ ५१ ॥ → Kapha

c.su.18/42

Basic Constitution or Prakriti determines the therapy, diet and lifestyle regime.



आतुरस्तु खलु कार्यदेशः। तस्य परीक्षा आयुषः प्रमाणज्ञानहेतोर्वा स्याद्, बलदोषप्रमाणज्ञान-
हेतोर्वा। तत्र तावदियं बलदोषप्रमाणज्ञानहेतोः; दोषप्रमाणानुरूपो हि भेषजप्रमाणविकल्पो बलप्रमाणविशेषा- therapy
पेक्षो भवति। सहसा ह्यतिबलमौषधमपरीक्षकप्रयुक्तमल्पबलमातुरमतिपातयेत्; न ह्यतिबलान्याग्नेय-
वायवीयान्यौषधान्यग्निक्षारशस्त्रकर्माणि वा शक्यन्तेऽल्पबलैः सोढुम्; असह्यातितीक्ष्णवेगत्वाद्धि तानि
सद्यःप्राणहराणि स्युः। एतच्चैव कारणमपेक्षमाणा हीनबलमातुरमविषादकरैर्मृदुसुकुमारप्रायैरुत्तरोत्तर-
गुरुभिरविभ्रमैरनात्ययिकैश्चोपचरन्त्यौषधैः; विशेषतश्च नारीः, ता ह्यनवस्थितमृदुविवृतविक्लवहृदयाः
प्रायः सुकुमार्योऽबलाः परसंस्तभ्याश्च। तथा बलवति बलवद्व्याधिपरिगते स्वल्पबलमौषधमपरीक्षक-
प्रयुक्तमसाधकमेव भवति। तस्मादातुरं परीक्षेत प्रकृतितश्च, विकृतितश्च, सारतश्च, संहननतश्च,
प्रमाणतश्च, सात्म्यतश्च, सत्त्वतश्च, आहारशक्तितश्च, व्यायामशक्तितश्च, वयस्तश्चेति, बलप्रमाणविशेष-
ग्रहणहेतोः ॥ ९४ ॥

c.vi.8/94

समपित्तानिलकफाः केचिद्गर्भादि मानवाः। दृश्यन्ते वातलाः केचित्पित्तलाः श्लेष्मलास्तथा ॥ ३९ ॥
तेषामनातुराः पूर्वे वातलाद्याः सदातुराः। दोषानुशयिता ह्येषां देहप्रकृतिरुच्यते ॥ ४० ॥
विपरीतगुणस्तेषां स्वस्थवृत्तेर्विधिर्हितः। समसर्वरसं सात्म्यं समधातोः प्रशस्यते ॥ ४१ ॥ Diet and lifestyle

c.vi.7/39 - 41

---

6. SITE OF THE MONTH

https://www.alaskasleep.com/

Alaska Sleep Clinic was established as the first independent diagnostic testing facility (IDTF) sleep clinic in Alaska in 2002. The International Classification of Sleep Disorders (ICSD) is the authorative clinical text for the diagnosis of sleep disorders. Now in its 3rd edition (as of 2014), the ICSD groups sleep disorders into 6 major categories. These categories are:

1. Insomnia
The ICSD-3 defines insomnia as "a repeated difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity and circumstances for sleep, and results in some form of daytime impairment.
2. Sleep-related breathing disorders
These disorders are divided into those of central origin (characterized by a lack of breathing effort) and those caused by an obstruction of the airways.
3. Central disorders of hypersomnolence
The ICSD-3 categorizes this class of sleep disorders as those in which "the primary complaint is daytime sleepiness not caused by disturbed nocturnal sleep or misaligned circadian rhythms."

4. Circadian rhythm sleep-wake disorders
These disorders are characterized by a disturbance or disruption to the normal circadian rhythm, which causes patients to experience excessive daytime sleepiness, insomnia, or both.
5. Parasomnias
A parasomnia is an unwanted physical movement or action during sleep. This group of disorders is classified by disorders or arousal from NREM sleep, those associated with REM sleep, and other parasomnias.
6. Sleep-related movement disorders
This class of disorders is characterized by simple, often repetitive movements during sleep or wake that can disrupt the sleep of the patient, the patient's bed partner, or both.

---

7. CHRONOBIOLOGY FOR STUDENTS

For school children – Understanding body functions

Why we need sleep!!!

Brain – rests so that it can think clearly the next day

Skin – repairs itself so you can look healthy the next day

Bones – calcium is added during rest to make you grow taller

Eyes – rest after watching the world all day

Muscles – grow during rest so that you become stronger

Heart – slows down during sleep after pumping blood through your body all day

Liver – removes all the toxins from the body which is accumulated as a by product

Kidney – slows down during sleep after filtering the unwanted material all day

Stomach – rests so that you can digest food better next day

Lung – rests so that blood will be kept oxygenated throughout the day

Gut microbiome – multiplies to assist you in many bodily functions

https://www.amazon.com/Denise-Fleming/e/B001HCX9PS/ref=dp_byline_cont_book_1

For university students – Career in Chronobiology

Laboratory of Cognitive Neurobiology, at Boston university medical campus
http://www.bumc.bu.edu/anatneuro/research/cognitive-neurobiology/

The Laboratory of Cognitive Neurobiology focuses its research efforts on the neurobiological bases of learning and memory in non-human primates. We have particular interest in the structural, physiological, and neurotransmitter correlates of cognitive decline in aging and age-related diseases, the separate and interactive roles of the prefrontal cortices and hippocampal complex in executive function and declarative memory, and the structural and functional changes in the brain as a consequence of prenatal malnutrition. Collaborative studies are conducted on the role of melatonin in sleep and circadian rhythms in the aged monkey; on studies of the brain in human subjects using structural and related MRI techniques; and on the integrity of the blood-brain barrier in aging, hypertension, and substance abuse.

---

8. CHRONOBIOLOGY FOR PROFESSIONALS

Is Artificial Daytime Light Making You Sleepy?

There was a time when most humans spent their days in the sun. In modern times, however, most of us work indoors under artificial lighting. How is this affecting our health and energy levels? A new study looks closely at how natural daytime light of different wavelengths affects us differently from indoor light.

Humans evolved to have circadian rhythms that mirror the rhythms of the sun. The presence (or absence) of sunlight tells our brains when it is time to wake and sleep as well as serving as a cue for a variety of other biological processes.

When our eyes are exposed to light, several different processes occur. First, our pupils change size, either dilating (getting larger) or constricting (getting smaller) to allow in just the right amount of light for good vision. Second, our retinas send messages to specialized areas of our brains that we are in light, and thus should remain awake. Our brains release hormones associated with wakefulness and suppress the release of melatonin to help us to feel as alert as possible.

Although this is the way we evolved, our lives have changed immensely in the past few hundred years. Most of us no longer are exposed to bright natural light throughout the day. Instead, we spend our days indoors, with artificial lighting such as lamps and

fluorescent lights. How is this affecting our lives? Researchers set out to find the answer to this question.

Modern people have traded natural sunlight for fluorescent lamps and other artificial lighting. Does this affect us on a physiological level? Do our bodies react the same way to artificial light as they do to natural sunlight?

In order to find out, researchers took a group of volunteers and had them make several visits to a special lab. They were exposed to a variety of different light wavelengths for three hours at a time. All participants spent a block of time in very dim light, followed by time spent in light of varying wavelengths. Some of these lights were designed to perfectly mimic natural outdoor light while others were more similar to indoor lights. Their pupillary responses, or how our pupils dilate and constrict in response to light, were measured. In addition, the test subjects had to report how sleepy or alert they felt throughout the different light exposures.

It was found that test subjects had a greater pupillary response to light that mimicked natural outdoor light. In addition, they reported feeling far less sleepy than they did in the dim and artificial lights. This raises a lot of questions about how we are all affected by exposure throughout the day to artificial rather than natural light. Are we all spending much of our days sleepier than we would be with a simple change in lighting? The research suggests that we all could benefit from a little more sunshine.

Although most of us would love to spend more time outside, obligations such as work and school often keep us indoors. How can artificial lighting be adjusted to have the right effects on our bodies? Several studies have been performed to answer this question.

One study looked at whether white light (the usual color of indoor light) could improve alertness when people were exposed to more intense and bright light. The researchers found that the brightness of white light actually does not make a difference. However, switching to a cooler white light rather than the more common warm-tinted white lights may improve alertness and performance.

Blue light, the wavelength emitted by most computers and devices, has been found in several studies to increase both alertness and performance. However, this wavelength of light also can interfere with sleep, which may decrease alertness in the long run. This is the reason that most sleep experts recommend turning off smartphones and other devices several hours before bedtime.

Red wavelengths of light similarly have been found to improve wakefulness and performance. However, we still do not know how these lights can affect health and the

circadian rhythm over a longer time period. People using these lights to feel more awake should do so with caution.

If you want the full effects of natural light, getting more sunlight appears to be the answer. Even short amounts of time spent outdoors can stimulate your brain to wake up and be more productive. In addition, people who feel sleepy when indoors can try to sit next to a window or otherwise get more sunlight exposure throughout their days. There are also lamps created to mimic natural sunlight. These appear to have effects that are similar to the real thing.

Many of us are forced to spend much of our days sitting at a desk indoors. Despite this, getting a little sunlight throughout the day will help us to maintain good health and to feel our best.

https://www.chronobiology.com/is-artificial-daytime-light-making-you-sleepy/

---

9. CHRONOPRAKRITI DIET PLAN

Chronobiologists prescribes ‘Chronodiet’ which is consuming carbohydrates in the morning, a mixture of proteins and carbohydrates for lunch and just proteins for dinner. This prevents an overproduction of insulin (provided you abstain from snacks). The insulin is out of the bloodstream by night-time, thus triggering fat burning. Fat then becomes free fatty acids that are converted into energy.

The time schedule will be:

Breakfast – five hours fasting – Lunch – five hours fasting – Dinner – 12 hours fasting
Ayurvedic practitioners insists that the diet must be personalized based on the prakriti and season.

We bring the best of both the world to you in the form of ChronoPrakriti diet

Recipe of the month –

Sprouts Roll

Ingredients:

Sprout mixture -

2 tsp oil, 2 tsp ginger garlic paste, ¾ cup finely chopped onion, 1 ½ cup boiled mixed sprouts like mung, mataki, chana…, ½ cup boiled peeled and mashed potatoes, ½ tsp turmeric powder, 2 tsp chilli powder / as per taste, 4 tbsp tomato ketchup,

¼ cup finely chopped corriander leaves, 1tsp lemon juice, salt as per taste

Chutney -

1 cup corriander leaves, ½ cup fresh mint leaves, 2 chopped green chillies,1tsp chat masala, 1tsp lemon juice, 1 tsp sugar, 3 tbsp yogurt, salt to taste

Rotis - 4

Method -

1.Heat oil in a non-stick pan, add ginger-garlic paste, add onion and sauté till lightly coloured. Add sprout mixture, mashed potatoes, turmeric powder, chilli powder. Add tomato ketchup, mix well and cook on medium flame for 5 minutes. Add coriander, lemon juice, salt and mix well. Keep aside to cool.

2.To make the chutney, put coriander leaves, mint leaves, green chillies, chaat masala, sugar, yogurt, salt and 1 tsp lemon juice in a grinder jar and grind finely.

3.Spread a little chutney on each roti, place ¼ amount of sprout mixture at one end and roll.

4.Heat a non-stick tawa and put little oil on it. Keep the rolls on it and cook, turning sides, till they are evenly golden and crisp on all sides.

Serve hot

Compiled by: Mrs. Manjusha Savardekar

---

10. TUNE YOUR CLOCK – GAMES / MEDITATION TECHNIQUES

Like deep sleep, observing oneself is also the best method for tuning of your clock. Unfortunately, we are so much engrossed into daily life, we forgot to take a pause and

look as if we are looking into the mirror. Meditation techniques are the possible way for witnessing yourself. You may practice meditation either for spiritual experiences or for mundane physical benefits, the technique will remain the same.

FEEL YOURSELF AS PERVADING ALL DIRECTIONS, FAR, NEAR

Tantra and yoga both think that your narrowness is the problem. Because you have made yourself so narrow, so tightly narrow, you feel always in bondage. The bondage is not coming from anywhere else: the bondage is coming from your narrow mind. And it goes on being narrower and narrower and you are very confined. That confinement gives you the feeling of bondage. You have an infinite soul and an infinite being but that infinite being feels imprisoned. So whatsoever you do, you feel limitations everywhere.

You cannot move beyond it. Everywhere there is a boundary. There is no open sky to fly. But that boundary is created by you -- that boundary is your own creation. You have created it for certain reasons: for security, safety. You have created a boundary. And the narrower the boundary, the more you feel secure. If you have a very large boundary you cannot watch over all of it, you cannot be alert and watchful everywhere. It becomes vulnerable. Narrow the boundary and you can watch it, you can remain closed, you are not vulnerable, you feel safe. The safety, the security has created the boundary. But then you feel a bondage.

This is how the mind is paradoxical. You go on asking for more safety and you go on asking for more freedom. Both cannot be together. If you want freedom you will have to lose safety, security -- in any case the safety is just illusory, it is not really there. If you are too concerned about security and safety, then remain in bondage. Really, prison is the most secure place. So we have created mental prisons around us, psychological prisons around us, and we carry those prisons with us, they are portable. You need not remain with them, they move with you. Wherever you go, your prison goes with you.

You are always behind a wall. Only sometimes, rarely, do you stretch your hand out of it to touch someone. You are afraid. Someone may make you a possession, someone may overpower you, someone may make you a slave... afraid of this, you have created a prison, a safety wall around you. Cautiously you move, cautiously you take every step. Life becomes a drudgery; life becomes a boredom. If you are too cautious, life cannot be an adventure. If you are protecting yourself too much, hankering after security too much, you are already dead.

You simply begin in the heart and end nowhere. You have a center and no periphery. The periphery goes on expanding -- on and on. The whole space is surrounded by it. Stars move in it. Earths are born and dissolve. Planets arise and set. The whole cosmos becomes your periphery. In this vastness where will your ego be? In this vastness where

will your suffering be? In this vastness where will your mean mind be? The mediocre mind, where will it be? It cannot be there in such vastness, it simply disappears. It can exist only in a narrow field. It can exist only when it is walled, enclosed, encapsulated. The encapsulation is the problem. Live dangerously and be ready to live in insecurity.

Peace happens only to those who are alive; peace is not a dead thing. Remain alive, live dangerously, live a vulnerable life, open, so that everything can happen to you. And let everything happen to you. The more that happens to you the richer you will be.

http://www.oshoworld.com/tantra_medi/otantra.asp?news_id=99

---

11. BOOK REVIEW

Chronobiology: Biological Timekeeping

JAY C. DUNLAP, JENNIFER J. LOROS, AND PATRICIA J. DECOURSEY, EDS. Sinauer Associates, Inc., Sunderland, Massachusetts, 2003, 382 p., 278 illustrations. (ISBN 0-87893-149-X $77.95).

Chronobiology is a fascinating field that deals with biological rhythms from their molecular and cellular basis to their impact on the behavior and physiology of whole organisms. For many years, this field has deserved a comprehensive text which examines the impressive progress in the understanding of the timekeeping mechanisms. However, this very progress deterred many scientists from the task of writing a book; one could easily argue that any summary of a fast-moving field will be outdated before its publication. Finally, this great need for a book on biological rhythms has been satisfied with the arrival of “Chronobiology: Biological Timekeeping.” This book is the brainchild of two editors, Jay Dunlap and Jennifer Loros; the final product is a collaborative effort from several specialists in the field with predominant contributions from Pat DeCoursey, a passionate chronobiologist striving to understand the adaptive evolutionary significance of biological timing.

The book contains a delightful blend of historical background, current scientific discoveries, and their relevance for everyday life. An extensive introduction sets the stage for more detailed coverage of important topics such as the fundamental properties of circadian (daily) rhythms, circannual rhythms and photoperiodism, physiological and molecular aspects of circadian pacemaker systems and their output rhythms. The narrative form of headings and subheadings within each chapter provides an instant summary of the content, enabling a student to rapidly locate specific sections of interest.

Abundant examples of animals with unique life histories make this book a fascinating read for any biologist.

Resulting from its broad scope, the book provides somewhat limited detail regarding molecular basis of the clock function in model organisms; only 3 pages are dedicated to the core clock mechanism in *Drosophila*. Readers that desire a more detailed coverage of molecular clock aspects may now satiate their appetites with a second book entitled “Molecular Biology of Circadian Rhythms” recently published by John Wiley & Sons, in which an entire chapter is dedicated to the *Drosophila* molecular clock.

The final two chapters of the book discuss human circadian organization and the relevance of circadian rhythms for human welfare. Readers are made aware that ignoring our circadian clocks may have dangerous consequences. This reviewer became a data point in statistics showing high accident rates at night-time by ending up in a roadside ditch at 4 AM while driving into the airport to catch an early flight! The book promotes awareness that human disregard for physiological needs, especially rest and sleep, leads to both small and large-scale disasters, such as the Chernobyl nuclear accident.

This superbly edited, richly illustrated book would be properly employed as a textbook for courses focused on chronobiology. Because biological rhythms can be found in all kinds of species, the book also serves as a non-technical primer for scientists and general students of ecology, physiology, neuroscience, or psychology. Finally, the book is a great resource for scientists chipping away at the particular aspects of clock mechanism who may want to take a step back and gain a broader chronobiological perspective. In summary, this fascinating synthesis of the field should find a wide audience and become a useful resource on biological timing for many years to come.

Book review published at:
Jadwiga Giebultowicz, Integrative and Comparative Biology*, Volume 44, Issue 3, June 2004, Page 266, https://doi.org/10.1093/icb/44.3.266*

---

12. CHRONO QUIZ

Arrange the following bodily functions in the chronological order starting from morning.

a) Physical activity at peak, b) Highest creativity, c) Highest pain sensation, d) Phase of learning and long term memory, e) System in regeneration mode, f) Optimal brain function, g) Peak of lung functioning, h) Optimal sense of smell and taste, i) Hormones at their peak, j) Digestion at peak

Answer will be given in the next newsletter!

---

13. SUPPORT KNOW THOU BIOLOGICAL CLOCK

To ensure that this activity stays available, we need your help

- Please send this newsletter to your contacts (*cc'ing me for further follow up*)
- Please arrange virtual or on-site introductory talk / workshop about the subject for various groups such as students / professional colleagues / neighbours
- Please contribute writing in the newsletter in context of the subject
- You can take freely available online 'Chronotype Assessment Test & Prakrit Assessment Test' (link available at the beginning of the newsletter)
- You can be a volunteer and submit your daily schedule to us for generating database for future circadian medicine (link available at the beginning of the newsletter)

---

14. ANNOUNCEMENTS

- Chronobiology open forum – 28th September 11.30 am, SP college campus
- Its time to tune your ChronoPrakriti: A daily rhythm awareness workshop for professionals – 6th October at Bhide foundation, SP college
- Introductory Course in Chronobiology – 05th October – 27th October at Bhide foundation, SP College.
- Certificate Course in Chronobiology – 8th August – 31st August at Garware college is postponed till further notice due to inadequate number of registrations.

Your comments and suggestions about this newsletter are always welcome. This newsletter is always evolving — tell us what you think!

Thanks for reading!

If there are any specific topics that you would like to see here, you are most welcome to contribute and/or let me know.

Prashant S. Duraphe, PhD
(e-mail: chronobiology2017@gmail.com) (URL: http://chronomics.blogspot.com/)