

## The impact of chrono types on respiratory pathology

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### ABSTRACT

The influence of multiple primary synchronizers, also known as "zeitgebers," adjusts the circadian rhythm of sleep's cyclical pattern. The light-dark cycle is the most effective synchronizer, although socioeconomic factors like social and professional ties also matter. Regulation of the circadian rhythm is essential for maintaining human health. The disruption of circadian rhythm can raise the risk of cardiovascular disease, stroke, diabetes, obesity, cancer, and other degenerative diseases as well as the prevalence of those

illnesses. The circadian rhythm of each individual is influenced by polygenic differences and environmental variables. The degree to which each person prefers the morning or the evening is referred to as Chrono type. There are signs that suggest a connection between personal Chrono type preferences and how respiratory diseases behave.

**Key Words:** *Circadian rhythm*

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### INTRODUCTION

The field of research known as chronobiology focuses on biological rhythms. Initially, the phrase was limited to the study of plants, but as time went on, research was expanded to include animals and even humans. Who made the biological clock first public? He described how plants' endogenous rhythm for moving their leaves. Their own biological clock indicated the movement of their leaves even when there was no light. Later research revealed that humans, animals, and even plants have a biological clock that helped them prepare for the peaks and valleys of the day. The amounts of this protein fluctuated throughout the cycle in time with the circadian rhythm because it built up in the cell at night and was destroyed during the day. They proposed that the *PER* protein prevented its own creation by inhibiting the *PERIOD* gene's activity via a negative feedback loop. Mammals have a *PER* activator that has been identified as *CLOCK*. This confirmed a negative feedback loop that is largely conserved from flies to humans and helped to explain how the biological clock is made up of activators that trigger the expression of their own repressors. The influence of multiple primary synchronizers, also known as "zeitgebers," adjusts the circadian rhythm of sleep's cyclical pattern. The light-dark cycle is the most effective synchronizer, although socioeconomic factors like social and

professional ties also matter. The Suprachiasmatic Nucleus (SCN), which is made up of a cluster of neurons in the medial hypothalamus at the midline above the optic chiasm, houses the major circadian clock that regulates behavioral and mood rhythms in humans. The control of circadian rhythms is important for maintaining human health. Circadian disruption is a phrase that is still without a precise meaning at this time. This disruption may be caused by inherent changes at the molecular, cellular, tissue, organ, or systemic levels as well as by mismatches between various organizational levels and/or behavioral and environmental cycles. Circadian disruption has a significant negative influence on public health and is linked to a number of ailments as a result of its high occurrence in modern culture. Numerous studies demonstrate that the risk of hypertension and left ventricular hypertrophy is raised at the cardiovascular level. Endothelial dysfunction is accompanied by an increase in inflammatory markers (C-reactive protein, interleukin-6, resistin, and tumor necrosis factor- $\alpha$ ), a decrease in vasodilator substances (nitric oxide and prostaglandins), and an increase in prothrombotic factors (plasminogen activator inhibitor). A loss in insulin sensitivity and insulin secretion caused by circadian disturbance, on the other hand, affects glucose tolerance and raises the risk of diabetes. However, it also raises the chance of being overweight, obese, and

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developing osteoporosis. Furthermore, circadian disturbance in neurological disorders is linked to multiple sclerosis, epilepsy, migraines, multiple sclerosis, cerebrovascular disease, and other neurodegenerative disorders. The desynchronization of circadian regulation in DNA replication, transcription, and cell metabolism has also been linked to the development and progression of neoplastic disorders, including cancer. It has been mentioned in relation to malignancies of the breast, prostate, colorectal, lung, hepatic, and T-cell lymphoma. The circadian rhythm of each individual is influenced by polygenic differences and environmental variables. This leads to the trait known as Chronotype, which shows up as an individual's predilection for the morning or the evening. It has been feasible to identify three distinct circadian Chrono types: eveningness, boringness, and intermediate, through the study of the changes in rhythmic fluctuations. The eveningness chorotype's melatonin profile sets it apart from the early or boringness Chronotype. The pineal gland secretes melatonin, a hormone that has an impact on physiology and behavior due to its cyclical production. The strongest indicator of when sleep will start is melatonin. It functions as an endogenous rhythm synchronizer and encourages sleep by lowering core temperature through vasodilator actions. Scientists have created a number of questionnaires that divide persons into morning vs evening tendencies for research reasons. The Morning-Eveningness Questionnaire (MEQ) and the Munich Chrono Type Questionnaire are two of the most widely used surveys (MCTQ). Knowing the Chronotype is crucial for making shift assignments that are compatible with the worker's abilities as well as for making an accurate diagnosis of Chrono pathologies, or diseases linked to changes in the circadian rhythm. Understanding that rhythmic bodily function is a health trait and that disturbance of circadian rhythm can result in an increased incidence of the disease has made it easier to comprehend the relationship between circadian rhythm and specific disorders. The findings highlight that the evening type may be a risk factor for the emergence of psychological issues and mental diseases, whereas the morning type may be regarded as a protective factor, even though additional research with longitudinal designs is required. Bronchial hyper responsiveness and varying airflow restriction are the symptoms of bronchial asthma, a chronic inflammatory disease of the airways. A century-old Roman physician named Caelus Aurelianus first noticed the nocturnal deterioration of asthma when he wrote: "Heavy, wheezy breathing, which the Greeks call ASTHMA, this sickness is a burden that worsens in the winter and at night more than during the day." Clinically, the morning hours are when asthma exacerbations happen most frequently. The airways exhibit diurnal variability: during the night, there is a reduction in airway capacity and an increase in inflammation, which can aggravate asthma. Peak Expiratory Flow (PEF) has also been demonstrated to vary more during the course of the night in both asthmatic and healthy individuals. When Trans bronchial biopsies were carried out on individuals with/without asthma (when lung function is optimal) and (when airflow limitation is highest), tissue biopsies from nocturnal asthma patients showed strong circadian fluctuation, with considerably higher eosinophil counts. Numerous neuroendocrine and airway dynamic variables have been linked to nocturnal asthmatic flare-ups. Analyzed, using logistic regression, whether there is a relationship between Chrono types and bronchial asthma. The sample was split into two groups, one with teenagers

who had been diagnosed with asthma and the other without any respiratory pathology. The findings showed that the group of teenagers with asthma slept less than the group of adolescents in good health. The results of this study revealed that the evening Chronotype was strongly linked to a higher prevalence of teenagers with asthma compared to intermediate Chrono types. The researchers discovered that teenagers with an eveningness Chrono type experienced higher respiratory symptoms than those with a boringness Chronotype. A lower extent of this effect was also seen in intermediate types. Possible interpersonal, environmental, or genetic factors did not change this connection. Another relationship under investigation is that between various Chrono types and the occurrence of sleep disorders, particularly the most common, Obstructive Sleep Apnea (OSA). Analyzed the prevalence of various Chrono types in a representative sample of residents and looked at how they affected how severe this pathology was. The scientists discovered that an intermediate Chrono type for OSA may have a preventive effect, which is especially pronounced in older, overweight individuals. Although stratified by age, Body Mass Index (BMI), and gender did not affect the severity of OSA, the morning and evening Chrono types showed the greatest Apnoea-Hypopnoea Index (AHI) measured by nocturnal polysomnography. Regardless of BMI and neck circumference, the frequency of OSA was twice as high in those with "night owl" Chrono types as it was in people with morning personalities. Additionally, they showed how this Chrono type is connected to alterations in eating habits, a higher resting heart rate, poorer HDL-C levels, and a propensity for a higher BMI. Additionally, there was an increase in stress hormones, as seen by greater morning plasma ACTH levels and higher urinary adrenaline levels. All of this points to the adrenal sympathetic system being activated, which foretells increased cardiovascular morbidity. One of the three major causes of death worldwide, Chronic Obstructive Pulmonary Disease (COPD) is defined by irreversible airflow obstruction brought on by considerable exposure to toxic particles or gases. The worst times of the day for COPD patients to experience symptoms and lung function are early in the morning and late at night. This is compounded when lung function is compromised, which affects the quality of sleep. The factors that cause this variety of symptoms include an increase in the parasympathetic nocturnal system, a decrease in bronchial diameter, and an increase in mucus production and retention. Additionally, we are aware that circadian rhythms have an impact on pulmonary function in COPD. For example, airway resistance increases at night and in the early morning, and Forced Expiratory Volume in One Second (FEV1) fluctuates throughout the day with a peak and a decline. At the SCN and pulmonary levels, both acute and chronic exposure to Tobacco Smoke (TS) disturbs circadian rhythms. It modifies the transcript levels of *CLOCK* molecular targets and the expression of key *CLOCK* genes, affecting protein synthesis (reducing *BMAL1*, *REV-ERB*, and *PER2*, and elevating *ROR*). All of this affects the length and quality of sleep in COPD patients as well as the inflammatory response and oxidative stress levels. In addition to telomere shortening and inflammasescence in COPD patients, the lowering of *SIRT1* activity by TS has also been linked to circadian disturbance, increasing the risk of exacerbations and comorbidities, as well as speeding up the development of the disease. Since circadian rhythms are involved in the regulation of the cell cycle, metabolism, apoptosis, and DNA repair, circadian disturbance is linked to

tumorigenesis and tumor development. It has been demonstrated that the circadian clock genes in humans are responsible for maintaining a sufficient regularity of cell division and DNA damage repair. Lung cancer has been linked to nocturnal Chrono types more so than diurnal Chrono types. This is most likely because of the circadian disruption that these lifestyle choices would produce, while they are not the only potential source of circadian disruption. participants supplied written informed consent after receiving all necessary information. A right to privacy and knowledge-based consent. This is most likely because of the circadian disturbance that these lifestyle choices would induce, even if they are not the only potential source, as we have already observed. The impact of altered circadian rhythms on tumor growth has been proven using animal models, with a decreased expression of specific circadian clock genes in tumor cells. These changes would reduce survival, promote the formation and spread of tumors, and are risk factors for the emergence of lung cancer. *BMAL1*, which is involved in apoptosis, the response to DNA damage, the regulation of homeostasis, and cell cycle progression, is one of the important circadian clock genes in cancer. These outcomes may also be influenced by gender. Women made up the majority of the asthma group in our sample, with early-to-mid Chrono types being the most common. People were tracked over a long period of time to show how the eveningness Chrono type was linked to increased mortality. A higher prevalence of all comorbidities was strongly related to being a night owl. The strongest correlations were found for psychiatric problems, which were followed by respiratory, gastrointestinal/abdominal, neurological, and diabetic disorders. A slight increase in the probability of death from all causes was linked to later Chrono type.